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Topic 1. SMOOTH OPERATION OF ‘LAM’ CRITICAL TO ADITYA-L1 SUCCESS

Important for the subject: Science and technology

Introduction

The **Indian Space Research Organisation (ISRO)** is preparing for the Aditya-L1 mission, aimed at studying the sun.

The **Liquid Apogee Motor (LAM) engine**, developed by the **Liquid Propulsion Systems Centre (LPSC)**, has a pivotal role in achieving the mission’s objectives.

Role of LAM in Aditya-L1 Mission

- LAM engine, also known as Liquid Apogee Motor, is responsible for executing **crucial orbital adjustments to position the Aditya spacecraft at Lagrangian point L1**.
- Its historical contributions include the **Mars Orbiter Mission (Mangalyaan)** and **Chandrayaan-3**, underlining its significance.
- The LAM engine uses **mono-methyl hydrazine (MMH)** and **mixed oxides of nitrogen (MON3)** as propellants.
- While the **LAM engine and its propellant combination** remain consistent, **variations in engine volume** necessitate **adjustments in propellant tank sizes**.

Propulsion System of Aditya-L1

- The propulsion system comprises multiple components:
- A **440 Newton LAM engine** for major thrust. **Eight 22 Newton thrusters** for precise adjustments. **Four 10 Newton thrusters** are intermittently used for orientation control.

Mission Timeline and Challenges

- The scheduled launch date for the **Aditya-L1 mission is September 2**, utilizing a **Polar Satellite Launch Vehicle (PSLV-XL)**.
- During the spacecraft’s **four-month journey** toward point L1, the LAM engine will remain **inactive**.
- A **critical challenge** involves restarting the LAM engine accurately to adjust the trajectory and transition the spacecraft into the intended halo orbit.

Significance of Lagrangian Point L1

- Lagrangian point L1 is located **approximately 1.5 million kilometers** away from Earth, **between the Earth and the sun**.
- Aditya-L1’s objective is to position itself in a halo orbit at L1, facilitating **comprehensive solar observations** using its seven scientific payloads.

Liquid Apogee Motor (LAM)

- **Purpose:** The type of rocket engine used to adjust the highest point of **an orbit (apogee)**

in space missions.

- **Propellants:** LAM engines use **hypergolic liquid propellants** that **ignite spontaneously upon contact**.
- **Function:** They perform **precise orbital maneuvers**, such as circularizing elliptical orbits or positioning satellites at desired altitudes.
- **Thrust:** LAM engines provide **lower thrust compared to launch engines**, enabling accurate and controlled orbital adjustments.
- **Control:** Designed for precise control, allowing engineers to calculate and execute specific burn durations for desired orbit changes.
- **Redundancy:** Many spacecraft have **multiple LAM engines or chambers** for reliability even if one chamber fails.
- **Integration:** LAM engines are incorporated into spacecraft designs, strategically **positioned for optimal thrust and maneuverability**.
- **Examples:** Used in satellites and missions by various space agencies like **NASA, ESA, and ISRO**.
- **Safety:** Hypergolic propellants are reliable but **toxic**, requiring careful handling and disposal procedures.

Topic 2. WHAT TO DO WITH SPENT NUCLEAR FUEL?

Important for the subject: Science and technology

Japan has initiated the release of treated radioactive water from the **Fukushima nuclear power plant** into the ocean.

Nuclear Energy as a Clean Energy Alternative Nuclear energy plays a vital role in mitigating **climate change**.

- Approximately **10% of global electricity** is generated from nuclear energy. Countries like the U.S., India, and China are **considering increased nuclear energy to achieve net-zero emissions** and **reduce reliance on carbon-based power**.

Challenges

- The **safe storage and disposal** of nuclear waste pose significant challenges. The **long-term persistence of nuclear waste** in dangerous states necessitates a permanent solution.

Temporary Storage Techniques

- **Spent fuel** can be stored in **cooling pools** until their **radioactivity decreases**. **Dry cask storage** is another technique for **temporary storage**.
- **Burying waste in near-surface disposal facilities** with protective **coverings** is common for low-level and intermediate-level waste.
- These temporary solutions are crucial **but not sufficient** for managing high-level nuclear waste effectively.
- **Deep Geological Disposal for High-Level Waste** High-level waste, due to its **higher**

- radioactivity**, requires more sophisticated disposal techniques.
- **Finland's Onkalo repository** showcases deep geological disposal as a promising solution.
 - Employs the **Swedish KBS3 concept**, proposing waste stored in **copper canisters**, wrapped in **bentonite clay**, and buried **over 400 meters below ancient bedrock**.
 - **Release barriers** are employed to keep the waste isolated from its surroundings.

The Future of Onkalo Repository

- The Onkalo repository is projected to **become operational in 2025**. A fill-up period of **100-120 years for the repository**. **SKB's KBS-3 Method for Final Disposal of Spent Nuclear Fuel** SKB (Swedish Nuclear Fuel and Waste Management Company) employs the KBS-3 method for the final disposal of spent nuclear fuel.
- This method is based on three protective barriers: **copper canisters, Bentonite clay, and the Swedish bedrock**.

Copper Canisters

- Copper canisters are five meters long with nodular cast iron inserts. Each filled canister weighs about 25 tons.
- The outer casing consists of **five-centimeter-thick copper**. Canisters are **designed to withstand corrosion and mechanical forces resulting from rock movements**.

Buffer with Bentonite Clay

- Copper canisters will be placed in the repository's tunnels, embedded in **Bentonite clay**.
- **Bentonite clay acts as a buffer, protecting canisters from corrosion and minor rock movements**.
- Clay **absorbs water, swells to fill spaces and cracks, and prevents water from entering cracked canisters**. The buffer **prevents the release of radioactive substances into the rock**.

Bedrock as the Final Barrier

- The bedrock serves as the final barrier, isolating the waste. The rock offers a **stable chemical environment and protection from surfacelevel events**.
- Groundwater flows through rock fractures but can trap any escaped radioactive substances.

Topic 3. CAPILLARY ACTION: HOW BLOTTING PAPER ABSORBS INK

Important for the subject :Science and technology

Capillary Action Explained:

Capillary action is a **natural phenomenon** displayed by liquids aiming to **reduce surface**

tension.

Liquids in thin tubes with very fine bores, known as **capillary tubes**, exhibit this action.

- When immersed in a liquid, the liquid rises higher inside the capillary tube than outside, driven by **capillary forces**.
- Liquids with **contact angles less than 90 degrees** exhibit capillary action, causing them to rise; those **like mercury do not**.
- **Adhesive Forces:** The liquid molecules are attracted to the surface of the cellulose fibers in the blotting paper. This attraction is due to **intermolecular** forces, such as **hydrogen bonding or van der Waals forces**.
- **Cohesive Forces:** The liquid molecules also exhibit cohesive forces, meaning they are attracted to each other and tend to stick together.

Blotting Paper Composition:

- Blotting paper is composed of **cellulose** derived from **cotton linter, wood, or straw**.
- It's created by directly pressing **purified pulp paste**, forming **sheets with microscopic capillaries**.

Absorption Mechanism:

- When blotting paper comes into contact with ink, water, or aqueous solutions:
- The liquid enters the microscopic capillaries in the paper. Capillary action allows the solution to spread throughout the paper.

Everyday Applications:

- Capillary action is responsible for several common phenomena:
- **Plant Sap Movement:** Helps plants transport sap from roots to the top via the stem.
- **Wickstove Function:** Draws kerosene or oil up to the wick tip in lamps, where it's burned.

Topic 4. SUN'S UPPER ATMOSPHERE: THE CORONA

Important for the subject :Science and technology

Sun's Corona

Nature and Location

The corona is the Sun's **outermost atmospheric layer**. It extends thousands of kilometres above the visible surface of the Sun. Gradually transforms into **the solar wind** that permeates the solar system. Envelops all planets, including Earth, in an **extended atmosphere**.

The Challenge of Observing the Corona

- Corona is usually **concealed** due to the **Sun's overwhelming brightness**.

- **Total solar eclipses** provide unique opportunities to see the corona.
- Moon temporarily **blocks the Sun's surface light**, revealing the corona's wispy, white streamers.
- The corona's **dynamic nature** leads to constant shape and size changes.

Corona's Temperature Discrepancy

- The corona is significantly hotter than the Sun's surface: **about 1 million °C compared to 5,500 °C**.
- The exact cause of this temperature difference is **still under investigation**. **Possible Explanations for Corona's Heat**
- **Nanoflares Hypothesis**: Microscopic explosions (nanoflares) at the solar surface may contribute to heating.
- **Solar Tornadoes**: Giant vertical plasma spirals interacting with the Sun's magnetic field might raise temperatures.

Solar Wind and Solar Flares

- **High-speed particles in the corona** create the solar wind, influencing the entire solar system.
- **Solar flares release immense energy**, affecting Earth's atmosphere, power grids, and satellite communications.
- A special instrument called a **coronagraph** is used to observe the corona and monitor solar flares.
- Space missions like **NASA's Parker Solar Probe** offer crucial insights into the Sun and the corona.
- The **ISRO** will launch India's first space mission to study the **sun's atmosphere, Aditya L1**, on September 2, 2023

Parker Solar Probe's Achievements

- Launched in 2018, the Parker Solar Probe is designed to **study the Sun's corona up close**.
- In **December 2021**, the probe approached the corona at a distance of 8.2 million miles, providing unprecedented data.

Magnetic Fields and Coronal Features

- The **Sun's magnetic fields** shape the corona's appearance.
- **Coronal loops, streamers, and other features** arise due to interactions between magnetic fields and charged particles.

Solar Atmosphere Layers Photosphere: Innermost Visible Layer

- The photosphere emits sunlight and is the **lowest layer of the solar atmosphere**. It ranges in temperature from **6,125 to 4,125 degrees Celsius**.

- **Sunspots and granules** are prominent features in the photosphere.

Chromosphere: Emission of Reddish Glow

- The chromosphere emits **super-heated hydrogen**, seen as a **reddish glow**. Visible as a **red rim during a total solar eclipse**. It may play a role in **conducting heat to the corona**.

Corona: Outermost Layer

- The corona is the outermost layer, visible during total solar eclipses or with specialized instruments.
- White streamers or plumes of ionized gas flow outward into space. Temperatures in the corona can reach up to **2 million degrees Celsius**.

Topic 5. PRAGYAN CONFIRMS SULPHUR NEAR SOUTH POLE OF MOON; SEARCH ON FOR HYDROGEN

Important for the subject :Science and technology

Pragyan Rover's Discoveries on Moon's Surface The Chandrayaan-3 mission's rover, **Pragyan**, has confirmed the presence of **sulphur** on the moon's surface, for the first time specifically **near its south pole**.

Apart from sulphur, preliminary analyses identified elements like **aluminum, calcium, iron, chromium, titanium, manganese, silicon, and oxygen** on the lunar surface. In-situ measurements were conducted by the **Laser-Induced Breakdown Spectroscopy (LIBS)** instrument aboard the rover.

- Unlike the orbiters, which couldn't provide such information, the rover's direct measurements have established the unambiguous presence of sulfur.
- The ISRO is currently conducting a search for **hydrogen (H)**, another element of interest.

Laser-Induced Breakdown Spectroscopy (LIBS) Explained

Introduction:

- LIBS is a **rapid chemical analysis technology** that employs **short laser pulses to create micro-plasma on a sample's surface**.

Advantages of LIBS:

- Requires **no sample preparation**.
- Offers rapid measurements, often within a **few seconds**.
- Covers a **wide range of elements**, including lighter ones.
- Supports **versatile sampling protocols**, including surface rastering and depth profiling.

Process of Laser-Induced Breakdown:

- A **short-pulse laser** is focused on the sample, causing **ablation** (removal of sample mass).
- Ablated mass interacts with the trailing laser pulse, forming a high-energy plasma.

Plasma Formation and Cooling:

- Plasma temperature can exceed **30,000K** in its early phase.
- Plasma cools, **causing electrons to fall to ground states and emit light with discrete spectral peaks.**

Emission of Spectral Peaks:

- Unique spectral peaks correspond to different elements in the periodic table.
- By identifying these peaks, the chemical composition of the sample can be determined.

Additional Information:

- The Union Cabinet commemorates Chandrayaan-3's success and designates **August 23 as National Space Day.**

Topic 6. INDIA PROTESTS CHINA'S LATEST MAP

Important for the subject: Science and technology

China released the **2023 edition** of its so-called “**standard map**” incorporating **disputed areas and including its claims over Arunachal Pradesh and the Aksai Chin region.**

- China released the **2023 edition** of its standard map based on the drawing method of national boundaries of China and various countries in the world.
- The map showed **Arunachal Pradesh, which China claims as South Tibet, and Aksai Chin occupied by it in the 1962 war.**
- The map also **incorporated Taiwan, which China claims as part of its territory though the island sees itself as a sovereign nation, and the nine-dash line, claiming a large part of the South China Sea.**
- **Union External Affairs Minister S Jaishankar** refuted the Chinese claim.

Topic 7. US NAME FIRST 10 DRUGS FOR PRICE NEGOTIATIONS

Important for the subject: Science and technology

The Biden administration has released its list of 10 prescription medicines that will be Important for the subject to the first-ever price negotiations by the U.S. Medicare health program

The Biden administration has announced that it will start negotiating the prices of 10 prescription medicines through the U.S. Medicare health program.

- This is the first time such negotiations will take place for Medicare, which provides healthcare coverage to around 66 million individuals.

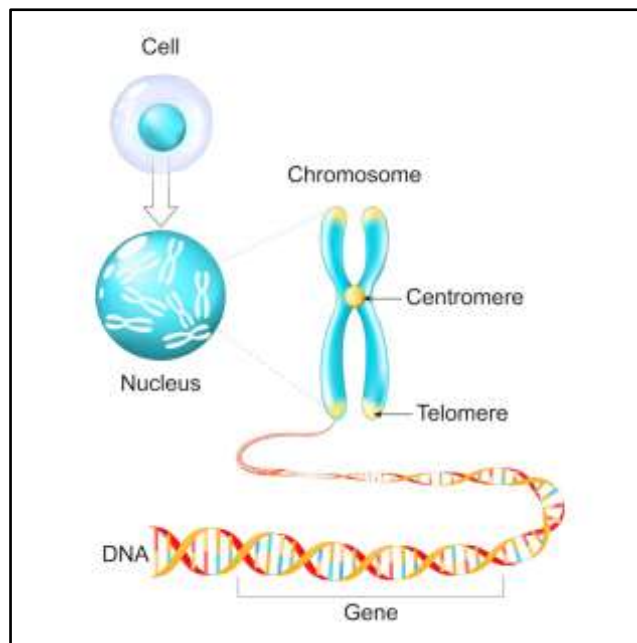
- Medicines on the list include Merck & Co's diabetes drug Januvia, Eliquis rival Xarelto from Johnson & Johnson, and AbbVie's leukemia treatment Imbruvica.
- Other drugs on the list include Amgen's rheumatoid arthritis drug Enbrel, Boehringer Ingelheim and Eli Lilly's diabetes drug Jardiance, J&J's arthritis and Crohn's disease medicine Stelara and insulin from Novo Nordisk .
- The 10 initial drugs were chosen based on certain criteria set out by Medicare.

What is Inflation Reduction Act 2022:

- The Inflation Reduction Act of 2022 (IRA) is a landmark United States federal law which aims to curb inflation by reducing the deficit, lowering prescription drug prices, and investing into domestic energy production while promoting clean energy.
- It is a reduced version of the Biden administration's proposed Build Back Better Act.
- At the end of a decade, according to Democrats, the U.S. will realize a deficit reduction of more than \$300 billion while lowering inflation, investing in energy production, and reducing healthcare costs.
- Of the \$737 billion in revenue raised, the legislation calls for \$222 billion from a 15% corporate minimum tax.
- The legislation stands to be the single largest investment in climate and energy in the U.S. to date.

Topic 8. THE 'WEIRD' MALE Y CHROMOSOME HAS FINALLY BEEN FULLY SEQUENCED. CAN WE NOW UNDERSTAND HOW IT WORKS, AND HOW IT EVOLVED?

Important for the subject: Science and technology



The Y chromosome bears genes that determine maleness and make sperm. It's also small,

carries **few genes** and is **full of junk DNA** that makes it horrendous to sequence.

The new “**long-read**” sequencing techniques have finally provided a **reliable sequence from one end of the Y to the other.**

The findings provide a solid base to explore:

- How genes for sex and sperm work, How the Y chromosome evolved, and Whether it will disappear in a few million years.

Determination of gender of fetus:

- **Females** have a **pair of X chromosomes**, whereas **males** have a **single X and a much smaller Y chromosome.**
- The **Y chromosome** is **male-determining** because it bears a **gene** called **SRY**, which directs the development of a ridge of cells into a **testis** in the embryo.
- The **embryonic testes** **make male hormones**, and these hormones direct the development of male features in a baby boy.
- **Without a Y chromosome and a SRY gene**, the same ridge of cells develops into an **ovary** in **XX embryos**. Female hormones then direct the development of female features in the baby girl.

A DNA junkyard:

- **The Y chromosome** is **smaller** and **bears few genes (only 27 compared to about 1,000 on the X).**
- Many **Y genes** (including the **sperm genes RBMY** and **DAZ**) are present in multiple copies, occurring in weird loops in which the sequence is inverted.
- This “**junk DNA**” consists of **highly repetitive sequences** that derive from bits and pieces of **old viruses, dead genes** and **very simple runs of a few bases repeated over and over.**
- This last **DNA class** occupies big chunks of the **Y** that literally **glow in the dark** because it preferentially binds fluorescent dyes.

Why the Y is weird:

- Around **150 million years** ago **X** and **Y** were just a pair of ordinary chromosomes. As they still are in **birds** and **platypuses.**
- Then **SRY evolved** on one of these two chromosomes, defining a **new proto-Y**. This **proto-Y** was forever confined to a **testis** and Important for the subject to mutations.
- The **proto-Y degenerated fast**, losing about **10 active genes per million years**, reducing the number from its **original 1,000** to just **27.**
- A small “**pseudoautosomal**” region at one end retains its original form and is identical to its erstwhile partner, the **X.**
- At this rate of degeneration the **whole human Y** would **disappear in a few million years**

(as it already has in some rodents).

Sequencing Y was a tough task:

- The first draft of the human genome was completed in **1999**.
- They've done this using **short-read sequencing**, which involves **chopping the DNA into little bits of a hundred or so bases** and reassembling them like a jigsaw.
- The new technology has allowed sequencing of bases along **individual long DNA molecules**, producing **long-reads of thousands of bases**.
- These longer reads are easier to distinguish and can therefore be assembled more easily, handling the confusing repetitions and loops of the Y chromosome.
- The **Y** is the **last human chromosome** to have been sequenced end-to-end, or **T2T (telomere-to-telomere)**.

So what's new on the Y?

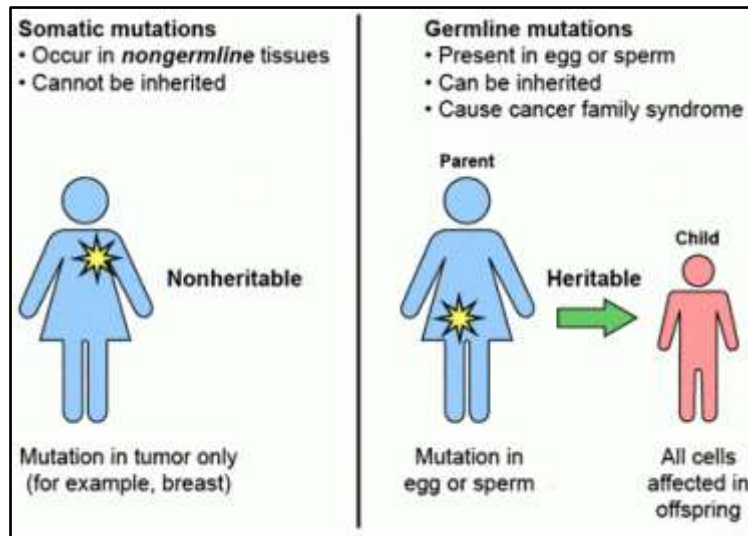
- A few new genes have been discovered, but these are **extra copies of genes** that were already known to exist in multiple copies.
- We now know the structure of the **centromere** (a region of the chromosome that pulls copies apart when the cell divides), and have a complete readout of the **complex mixture of repetitive sequences in the fluorescent end of the Y**.

The sequencing of Y chromosome will help scientists in:

- Looking for sequences that might control how **SRY** and the **sperm genes** are expressed, and to see whether genes that have X partners have retained the same functions or evolved new ones.
- Examining the **repeated sequences** to determine **where and how they originated**, and **why they were amplified**.
- Analyzing the **Y chromosomes of men** from different corners of the world to detect signs of degeneration, or recent evolution of function.

Topic 9. SOMATIC GENETIC VARIANTS: A GENOMIC REVOLUTION HIDING INSIDE OUR CELLS

Important for the subject : Science and technology



Introduction

The **human genome**'s blueprint is encoded in **23 pairs of chromosomes** inherited from parents.

The genome is carried by the **ovum and sperm**, resulting in the formation of trillions of cells in the human body after **fertilization**.

Somatic Mutations:

- Somatic genetic mutations **occur during cell division after birth**, driven by **genome replication**.
- **Increased mutations with age** and tissues with **high turnover** due to 'copy-pasting' of genetic material.
- **Turnover** refers to the replacement of old cells with new ones in a tissue. Somatic mutations can lead to **cell fitness changes** and **tumor** development (*driver* mutations).
- The human body is a mosaic of genetically diverse cells, sharing similarities but with distinctive genetic variants.

Role of Somatic Variants in Health and Disease

- **Genetic variants** contribute to **protein-encoding and regulation**, making each cell **unique**.
- Somatic variants are important in **physiological processes**, such as **immune cell diversification**.
- Immune cells undergo somatic changes to create a varied **library of antibodies for pathogen recognition**.
- The recent explosion in data and knowledge due to **advanced sequencing technologies**.

- Ability to sequence individual cells' genetic material using **microfluidics and high throughput sequencers**.

Implications of Somatic Variants in Disease and Research

- Somatic genetic variants play a vital role in **cancer development and progression**.
- Cancers can both cause and be influenced by somatic changes.
- **Detection** of specific genetic variations or mutational signatures for early cancer diagnosis.
- **Genetic diseases** can arise from somatic genetic variants occurring during development.
- The **severity and distribution of diseases** depend on the **timing of mutation** occurrence.

Revertant Mosaicism:

- **Revertant mosaicism:** Somatic changes can reverse or alleviate the effects of genetic disease.
- Beneficial somatic changes occur spontaneously, resulting in a “**reversion**” to a normal state.

Example: Wiskott-Aldrich syndrome cases with revertant mosaicism.

- Revertant cells **compete with original mutated cells, potentially improving overall function**. Offers insights into **potential gene therapies or treatments** for genetic disorders.

The SMaHT Network:

- **U.S. National Institutes of Health program** exploring somatic mosaicism.
- Aims to discover somatic variants, develop tools, and enhance analysis for clinical contexts.
- **\$140 million investment** in characterizing somatic variants using post-mortem samples.

Topic 10. WHY APPLE'S CHANGE OF HEART ON RIGHT TO REPAIR MOVEMENT A BIG POLICY SHIFT?

Important for the subject : Science and technology

Apple, that was against the ‘**right to repair**’ movement just a few years ago, became its newest convert.

Earlier Apple said that giving users unauthorised repair access would make the state a hub for hackers.

- Now, Apple is backing a legislation that will **hand consumers and third-party firms the right to fix damaged electronic products**. It says the law would benefit users and protect their privacy and security.

A shift in worldview:

- The U.S. lawmakers enacted the **Digital Millennium Copyright Act, or DMCA**, in the late 90s to **stem intellectual property theft**.
- In **the U.S.**, large tech firms had made it **illegal for consumers and third party repairers to fix devices that are powered by software codes** under **DMCA** to ensure products they sold are only repaired by service centres under their control.
- The **DMCA** offered **protection to original equipment manufacturers (OEM)** under **Section 1201 of the Act** by barring third-party repairers from breaking software protection codes.

Copyright Office intervenes:

- Recently, **the U.S. Copyright Office has allowed users to fix devices**, including automobiles.
- In **2021**, the office added new exemptions to the Section by allowing broad protection to consumer devices that rely on software codes.
- **Massachusetts, Minnesota, New York, and a dozen other U.S. states** have passed right to repair laws in different variations. **California** is looking to enact its right to repair law.
- The **SB 244 bill**, combined with the **Song-Beverly Act**, provides specific guidelines on how long **OEMs** must provide parts and repair support.
- The bill also covers a wide range of consumer products that can be repaired without taking it to a company-authorized service centre.
- It enables the state to bring civil action suits against manufacturers that violate the law with a fine of upto \$5,000 per day. **Gaming consoles** and **alarm systems** are **not** covered under the bill due to security concerns.
- To assuage concerns from companies over the use of intellectual property, **this legislation does not require OEMs to share trade secrets or require them to distribute a product's source code**.
- Two years ago, **Apple** had launched a **self-service repair programme** that allowed users to purchase parts and rent tools to fix their gadgets.

Right to Repair- Indian scenario:

- The **right to repair** for consumer goods refers to the concept of allowing end users, consumers as well as businesses, to repair devices they own or service without any manufacturer or technical restrictions.
- The **Right to Repair India portal** of the **Department of Consumer Affairs** under the **Ministry of Consumer Affairs, Food & Public Distribution** – Government of India provides warranty and post-sales information, provided by the consumer brands, to consumers in India.

Committee on Right to Repair:

- The **Ministry of Consumer Affairs (MCA)** has set up a **committee** to come up with a

Right to Repair framework.

- The framework is significant as it will give consumers a chance to repair their products at an optimal cost instead of buying new products altogether.
- The important sectors for the initial focus of the framework are farming equipment, mobile phones & tablets, consumer durables, automobiles & automobile equipment.
- Under this framework, it would be **mandatory for manufacturers to share their product details with customers** so that they can either repair them by self or by third parties, rather than only depending on original manufacturers.
- The framework also **aims** to help harmonize the trade between the **Original Equipment Manufacturers (OEMs), third-party buyers and sellers** – thus also creating new jobs.
- It will help **reduce the vast mountain of electrical waste (e-waste)** that piles up each year on the continent and boost business for small repair shops, which are an important part of local economies.
- It will **save consumers' money and contribute to circular economy objectives by improving the life span, maintenance, re-use, upgrade, recyclability, and waste handling of appliances.**

Topic 11. ISRO RELEASES GRAPH OF TEMPERATURE VARIATION ON LUNAR SURFACE

Important for the subject : Science and technology

ISRO on August 27 released a **graph of the temperature variation on lunar surface** with increase in depth measured by the **ChaSTE payload** onboard **Chandrayaan-3's Vikram lander module**.

ChaSTE payload:

- The payload was developed by a team led by the **Space Physics Laboratory (SPL)** of ISRO's Vikram Sarabhai Space Centre (VSSC) in collaboration with **Physical Research Laboratory (PRL), Ahmedabad**.
- **Chandra's Surface Thermophysical Experiment (ChaSTE)** measured the **temperature profile of the lunar topsoil** around the south pole, to understand the **thermal behavior of the Moon's surface**.
- The **payload** has a **temperature probe** equipped with a **controlled penetration mechanism** capable of reaching a depth of **10 cm** beneath the surface.
- The **probe** is fitted with **10 individual temperature sensors**.
- The presented graph illustrates the temperature variations of the lunar surface/near surface at various depths, as recorded during the probe's penetration.
- This is the first such profile for the lunar south pole.

Topic 12. AS PRAGYAN DIGS DEEP INTO MOON, SCIENTISTS AT VIKRAM SARABHAI SPACE CENTRE LAB TURN THEIR GAZE TO SOLAR WIND

Important for the subject : Science and technology

Scientists at the **Space Physics Laboratory (SPL)** under the **Vikram Sarabhai Space Centre (VSSC)** here are getting ready to unravel the secrets of the **solar wind** as the **Aditya-L1 mission**, meant to study the sun, lifts off in September.

PAPA Payload of Aditya L-1 mission:

- The **Plasma Analyser Package for Aditya (PAPA) payload** aboard **Aditya L1**, one of seven scientific payloads aboard the challenging mission, was developed by the **SPL** to gain deeper insights into the phenomenon of the '**solar wind**' (the constant stream of charged particles from the sun).
- The **SPL's PAPA payload** will study the composition of the solar wind. It will look at the energy of electrons and the energy and mass of protons and ions in it. The study will also cover the angular variations.

Weight of the Payload: 8kg.

Aditya L1 mission:

- ISRO describes Aditya-L1 as the "first space-based Indian mission to study the sun" from a halo orbit around the Lagrangian point 1 (L1) of the sun-earth system.
- The payloads onboard **Aditya L1** are designed "**to study the chromosphere, the photosphere and the outermost layers of the sun using electromagnetic and particle detectors**".
- **ISRO** will use an **XL** variant of the **Polar Satellite Launch Vehicle (PSLV)** to place the **Aditya-L1 spacecraft** in a low earth orbit. Once launched, it will take 125 days to travel to its destination at L1.

Important terms related to Sun:

- The solar interior, from the inside out, is made up of the core, radiative zone and convective zone. The solar atmosphere consists of the photosphere, chromosphere, and the corona (solar wind is an outflow of gas from the corona).

Photosphere

- The photosphere is an extremely uneven bright outer layer of the Sun that emits most of the radiation. The effective temperature on the outer side of the photosphere is 6000°C.

Chromosphere

- Above the photosphere is the chromosphere. It is a thin layer of burning gasses. It is a bit

cooler — 4,320 °C.

Corona

- A corona is a distinctive atmosphere of plasma that surrounds the Sun and other celestial bodies. The Sun’s corona extends millions of kilometers into space and is most easily seen during a total solar eclipse.

Solar wind:

- The **solar wind** is made of plasma (ionised atoms), a stream of energized, charged particles, primarily electrons and protons, flowing outward from the Sun at speeds as high as 900 km/s and at a temperature of 1 million °C.

Solar Flares

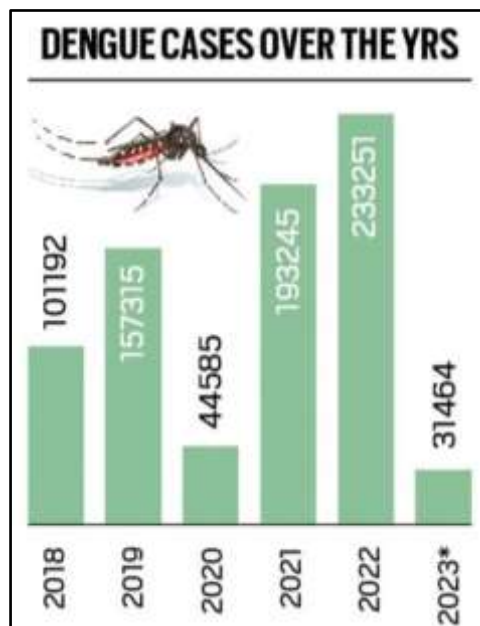
- Solar are magnetic storms which appear to be very bright spots with a gaseous surface eruption. As solar flares are pushed through the corona, they heat its gas to anywhere from 10 to 20 million °C.

Solar Prominence

- An arc of gas that erupts from the surface of the Sun is called solar prominence. Prominences can loop hundreds of thousands of miles into space. They are held above the Sun’s surface by strong magnetic fields and can last for many months.

Topic 13. DENGUE VACCINES IN INDIA: A LOOK AT THE ONGOING TRIALS AND DEVELOPMENT

Important for the subject : Science and technology



With the expanding geography of dengue infections — in India as well as the world — an

increasing need has been felt for an **effective vaccine that can protect against all four serotypes**. Nearly half the population of the world lives at risk of the disease at present.

Dengue cases all across India:

- The disease in **India** has spread from just **eight states and union territories in 2001 to all states by 2022** — **Ladakh** is the latest among states/UTs to report dengue cases.
- Efforts are ongoing within the country to **develop an effective vaccine against the mosquito-borne disease that can lead to internal bleeding, circulatory shock, and death**.

Vaccine in human trials

- At present, there are **three vaccine candidates** that are being tested in humans in India.
- A **vaccine** developed by **Panacea Biotec** based on **live weakened versions of the four dengue serotypes** developed by the **National Institute of Allergy and Infectious Diseases** in the **United States**.
- They deleted parts of the genetic code of **DENV1, DENV3, and DENV4** serotypes of the virus and then **genetically engineered DENV2 backbone** using parts from **weakened DENV 4** on which the others were tacked on.
- These were grown in **cell culture** by **Panacea Biotec** to develop the vaccine.
- A **second vaccine candidate** was developed by the **Serum Institute of India** with the same **weakened virus** from the United States.
- The same technology has also been used by **Indian Immunologicals Limited** to develop the **vaccine**.

Challenges in vaccine development:

- One of the **main challenges** is **antibody-dependent enhancement (ADE)** — a person with low levels of antibodies against one serotype of dengue, may end up getting a more severe infection with another serotype of dengue.
- This was what led to controversy surrounding the **first dengue vaccine to be approved**.
- Only after a **vaccination programme** had been rolled out in the **Philippines**, it was found that the **vaccine could actually increase the risk of severe disease in people who had not been infected before**.

Solution to this problem:

- To do away with this problem, both the Indian research teams selected a specific part of the **envelope protein known to not cause ADE**.
- The team from the **International Centre for Genetic Engineering and Biotechnology (ICGEB)** created a **Virus-Like Particle** using these parts of the virus.
- The vaccine was developed in collaboration with **Sun Pharmaceuticals**.
- The other team from **Tata Institute of Fundamental Research** and **Rajiv Gandhi Centre for Biotechnology** among other institutes again used the same **envelope parts of**

the four dengue viruses along with another part called **non-structural-1** and constructed a **genetic sequence** out of it.

- This resulted in a **DNA vaccine with all four serotypes**.
- Although DNA vaccines can be manufactured at lower safety levels, at a lesser cost, and can be stored even at room temperatures, they don't always produce a very good immune response.
- The researchers are currently optimizing the vaccine using **nano-plasmids**.

Topic 14. SPACEX LAUNCHES CREW-7 MISSION

Important for the subject : Science and technology

SpaceX launched **four people to the International Space Station** from Florida

NASA and SpaceX's **Dragon spacecraft** have blasted off carrying **four astronauts to the International Space Station (ISS)**.

Known as **Crew-7**, the mission **includes four astronauts from four countries – the US, Denmark, Japan, and Russia**.

- This was the **first US take-off in which all the astronauts atop the spacecraft belonged to a different country**. Until now, NASA had always **included two or three of its own on its SpaceX flights**.

More details about the mission:

- The Crew-7 is the **eighth flight** operated by NASA and SpaceX as part of the **agency's commercial crew program**, which has been taking astronauts to the ISS since **SpaceX's first crewed mission in 2020**.
- During their stay at the space station, the **Crew-7 astronauts will conduct more than 200 science experiments** and technology demonstrations to **prepare for missions to the Moon, Mars, and beyond**.
- The research will include a **collection of microbial samples from the exterior of the space station**.
- The team will also **analyse how sleeping in the microgravity environment** differs from Earth by **examining astronauts' brain waves while they sleep**.
- Another experiment will look at the **formation of biofilms in wastewater** on the space station, which could be key to finding better ways to recycle water for drinking and hygiene while in space.

What is International Space Station (ISS):

- The International Space Station (ISS) is a space station, or a **habitable artificial satellite, in Low Earth Orbit approximately 250 miles above Earth**.
- The first piece of the International Space Station was launched in 1998, and was completed in 2011.

- The major partners of ISS include **NASA (United States), Roscosmos (Russia), ESA (European Space Agency), JAXA (Japan Aerospace Exploration Agency), and CSA (Canadian Space Agency).**
- ISS travels at **17,500 mph** that means **it orbits Earth every 90 minutes.** The ownership and use of the space station is established by **intergovernmental treaties and agreements.**
- The station is divided into two sections, the **Russian Orbital Segment (ROS)** and the **United States Orbital Segment (USOS),** which is shared by many nations.
- ISS is the **ninth space station** to be inhabited by crews, following the **Soviet and later Russian Salyut, Almaz, and Mir stations as well as Skylab from the US.**

Topic 15. AFTER CHANDRAYAAN3, WHAT ARE ISRO'S PLANS?

Important for the subject: Science and technology

Gaganyaan – Human Spaceflight Mission:

ISRO is working on Gaganyaan, a human spaceflight mission. Astronauts are being **trained** for this mission.

The **modified Launch Vehicle Mark-3 (LVM-3)** rocket is being tested for safety to carry humans.

Reusable Launch Vehicle Technology Demonstrator (RLV-TD):

- ISRO is testing a reusable launch vehicle that can be used for **multiple missions, unlike traditional rockets.**
- The design resembles the **NASA Space Shuttle,** with a winged body that can glide through the air or use **engines** for propulsion.

SCE-200 Engine:

- SCE-200 is a powerful **rocket engine developed by ISRO.** It uses **refined kerosene (known as “Isrosene”)** as fuel and **liquid oxygen** as oxidizer.

Small Satellite Launch Vehicle (SSLV):

- SSLV is a **smaller** rocket designed to carry lighter satellites into **low-earth orbit.** It aims to have a **shorter turnaround time between launches** compared to larger rockets like PSLV.

Methalox Propellant and Electric Propulsion:

- ISRO is working on developing new rocket propellants like **methalox (methane plus liquid oxygen)** for improved efficiency.
- ISRO is also developing **electric propulsion systems** for satellites, which are lighter and potentially extend satellite lifespan.

Topic 16. MISSED CHILDHOOD TB CASES IMPEDE ACHIEVING 2025 GOAL

Important for the subject: Science and technology

With **childhood TB** continuing to remain a “**staggering problem**” in **India**, “**eliminating**” **TB by 2025** might be extremely challenging.

Cases of TB:

Globally, **TB** is now regarded as the **leading cause of death from infectious diseases for children of all ages**.

- The **estimated mortality** of children with TB who fail to receive treatment is about **22%**.
- The **case fatality ratio** in children less than five years is **43%**.

Critical gaps in TB case detection:

- According to the **WHO**, there are **critical gaps in detecting TB cases** among children.
- Globally, at least 1.2 million children aged less than 15 years fall ill with TB every year, and around 67 million children get infected.
- 56% of the 1.2 million children who develop TB annually are not detected. As per the **2022 WHO global TB report**, last year, **children aged less than 15 years across the world** accounted for **11%** of the total estimated incident TB cases.

Cases in India:

- **India** contributes nearly **one-third** to the global childhood TB caseload. **Nearly 0.34 million children aged less than 15 years** are estimated to get **TB disease every year**; children in this age group in India are estimated to contribute about **13%** of the TB caseload.
- But in **2022**, only **1,35,734** children were notified. Thus over **2,00,000 (about 60%)** children with TB were likely missed last year alone.
- Though children are required to be tested using **highly sensitive molecular tests** at the first point of contact, **smear microscopy** is often used.
- In **2022**, of the **3,00,000 molecular tests** performed on children, just **37,000 (12%)** were bacteriologically confirmed.
- While the number of TB cases notified in India has **increased** since **2015**, notifications of **childhood TB** have **remained constant at 6%** each year.
- Even as the bulk of the cases in children is **pulmonary TB**, which is easier to detect, up to **32%** of **TB cases** are **extrapulmonary**, which makes TB detection more challenging.
- There is a reduction in **BCG vaccination of children** during the pandemic.

Topic 17. CHANDRAYAAN-3'S LANDING ON THE MOON'S NEAR SIDE

Important for the subject: Science and technology

Chandrayaan-3's Vikram lander executed a controlled descent, achieving one of the **closest**

approaches to the moon's South Pole, enhancing its scientific potential.

Moon's Near and Far Sides:

- The moon's **near side (60% visible)** always faces Earth because the moon takes the same time to rotate about its axis as it does to circle around the Earth.
- The “**dark side**” is **not permanently dark**; it receives sunlight during the “**new moon**” phase. The far side was revealed by **Luna 3 in 1959** and seen by **Apollo 8 astronauts in 1968**.

Near vs. Far Side Differences:

- The **near side is smoother** with **volcanic plains (“maria”)**. The **far side** features **large craters from asteroid impacts**. The **thinner crust on the near side allowed volcanic lava to fill craters**, creating flat plains ideal for landers.
- **Chang’e 4** is the only mission to **land on the far side**. **Von Karman crater**, situated within a larger 2,500 km wide crater called the **South Pole Aitken basin**

Aspect Near Side Far Side Visibility from Earth

- Visible from Earth, “front” side Not visible from Earth, “back” side

Crater Distribution

- Relatively smoother, maria present
- More rugged, higher density of craters

Thickness of Crust

- Generally thinner crust Thicker crust

Highland vs. Maria

- More lunar maria More lunar highlands

Radio Signals

- Direct communication possible
- Requires relay satellites for coverage

Impact Basins

- Several large basins present
- Also contains significant impact basins

Geological Variations

- Varied geology due to maria and highlands

- Focused on highland terrains and older, densely cratered areas

Exploration

- Explored by humans (Apollo) and robots – Chandrayan-3 & Orbitors
- Primarily explored by robotic missions – Chang’e 4 Mission (China) & Orbitors

Chandrayaan-3’s Special Landing:

- Chandrayaan-3’s Vikram landed **close to the lunar South Pole (69.36 S, 32.34 E)**, about **600 km** away from the South Pole.
- Aimed for a **“permanently shadowed region”** rich in potential **water-ice and resources**.
- **Balanced proximity to the pole** for scientific exploration with the need for sunlight to power the lander and rover.

Reasons for Near Side Landing:

- Choosing the near side allowed **continuous line-of-sight communication with Earth, crucial for real-time updates**.
- Landing on **the far side** would require **relay systems, causing delays and reorienting the Chandrayaan-2 orbiter’s orbit**. Mission objectives guided the landing site selection.

Topic 18. NOD FOR GAME-CHANGER JET ENGINE TECHNOLOGY TRANSFER EXPECTED SOON: U.S. AMBASSADOR ERIC GARCETTI

Important for the subject: Science and technology

U.S. Congressional approval for the **GE-HAL jet engine deal** involving the first ever such technology transfer between India and the U.S. is expected to come through in days.

Jet engine tech transfer:

- Both the countries have announced to sign a MoU for the co-production in India of **‘GE 414 Jet Engines’** for the **Tejas Mk2 light combat aircraft**.
- The deal is about manufacturing jet engines in India for Light Combat Aircraft ‘Tejas’Mk2 and later for AMCA.
- The deal was between the **US engine manufacturer General Electric** and state owned **Hindustan Aeronautics Limited (HAL)**.

The GE-414 engine:

- The turbo engine has been in use by the **US Navy** for more than 30 years. The engines are in the **thrust class of 22,000 lb or 98 kN** and feature advanced technology such as **Full Authority Digital Electronic Control (FADEC)**– the latest aircraft ignition and engine control system that controls engine performance digitally- according to GE.
- The use of advanced material and cooling techniques improves performance and extends component life.

F414-powered jets:

- **Eight nations have F414-powered aircraft in operation. F414-GE-400 engines power the US Navy's Boeing F/A- 18E/F Super Hornet and EA18G Growler electric attack aircraft. Saab's Gripen E/F fighters use the F414G, the single-engine variant of the F414- GE-400. As per the company, it can also power emerging platforms like Korean KF-X.**

Significance of the deal:

- **Only US, Russia, the UK and France** have mastered the technology of this engine.
- It is a major push for **self-reliance in manufacturing several critical technologies**, including **cryogenic rockets engine**.
- Earlier the **DRDO** developed the **Gas Turbine Research Establishment (GTRE)**, which developed the **GTX-37 engine** for the **LCA**. Later the **Kaveri engine project** was sanctioned in late **1989** but found unsuitable for fighter aircraft.

Indo-Pacific Economic Framework (IPEF):

- It is a **US-led initiative** that **aims** to strengthen **economic partnership** among participating countries to enhance **resilience, sustainability, inclusiveness, economic growth, fairness, and competitiveness** in the **Indo-Pacific region**.
- The **IPEF** was launched in **2021** with a dozen initial partners who together represent **40% of the world GDP**.
- The **IPEF** is **not a Free Trade Agreement (FTA)** but allows members to negotiate the parts they want to. The negotiations will be along **four main "pillars"**. Supply-chain resilience Clean energy, decarbonisation & infrastructure Taxation & anti-corruption, Fair & resilient trade.
- Currently, **India and 13 countries** located in the **Pacific Ocean** are its **members**, Australia, Brunei, Fiji, India, Indonesia, Japan, South Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, United States, and Vietnam.
- **India** agreed to **three out of four pillars**, which are **Supply Chains, Tax & Anti Corruption** and **Clean Energy**, while **India** decided to **stay away** from the **Fair & resilient trade Pillar**.

Topic 19. ALMOST HALF OF MOON MISSIONS FAIL. WHY IS SPACE STILL SO HARD?

Important for the subject: Science and technology

The **Chandrayaan-3 lander** successfully touching down near the south pole of Earth's rocky neighbour.

An exclusive club:

- The Moon is the only celestial location humans have visited so far. **Only four countries** have achieved **successful "soft landings"** – landings in which the spacecraft survives –

on the lunar surface.

The USSR (Luna-9 mission, February 1966), The USA (Surveyor-1 mission, June 1966), China (Chang'e 3 mission, 2013) and India (Chandrayaan-3 mission, 2023).

- **Missions from Japan, the United Arab Emirates, Israel, Russia, the European Space Agency, Luxembourg, South Korea and Italy** have also had some measure of lunar success with fly-bys, orbiters and impacts.

Crashes are not uncommon:

- Communication with the Luna 25 spacecraft was interrupted on 19 August 2023. In **April 2019**, the **Israeli Beresheet lander** crash-landed after a gyroscope failed during the braking procedure, and the ground control crew was unable to reset the component due to a loss of communications. In **September 2019**, **India** sent its own **Vikram lander** down to the **surface of the Moon** – but it did not survive the landing.

Despite challenges, why ISRO chose the south pole for soft-landing?

- There is strong evidence that the lunar south pole has the presence of ice molecules in it.
- The **ancient water ice present** could also provide a **record of lunar volcanoes and origins of oceans**.
- The **water**, if it exists in sufficient quantities, could be a **source of drinking water** for explorers and keep equipment cool.
- The **water** could be broken down to produce **hydrogen and oxygen**, which would be monumental in space exploration missions and Mars missions.
- Moreover, the **south pole could hold volatiles** such as **ammonia and methane**. This extremely-cold – in fact, frozen – region could have **potentially preserved clues to the earlier days of the Solar System**.

Space is still risky:

- Just over **50% of lunar missions succeed**. Even **small satellite missions to Earth's orbit** don't have a perfect track record, with a **success rate** somewhere between **40% and 70%**. Crewed missions are more successful (around 98% success rate). Due to: Ground staff working to support a crewed mission will be more focused, Management will invest more resources, and Delays will be accepted to prioritise the safety of the crew.

Challenges in space travel:

- Better radiation shielding
- Self-sustaining ecosystems
- Autonomous robots
- Extracting air and water from raw resources, and Zero-gravity manufacturing.
- Faster-than-light travel, Instantaneous communication, and Artificial gravity.

Topic 20. CHANDRAYAAN-3'S LANDING SPOT ON MOON TO BE KNOWN AS SHIV SHAKTI POINT

Important for the subject: Science and technology

PM Modi addressed the ISRO scientists at the **ISRO Telemetry Tracking and Command Network (ISTRAC)** in Bengaluru.

Prime Minister Narendra Modi announced that the **point where the Moon lander of Chandrayaan-3 touched down** will now be known as **Shiv Shakti** and the point where the **Chandrayaan-2 left its footprints** will now be called **Tiranga**.

- In **Shiv**, there is resolution for the **welfare of humanity** and **Shakti** gives us **strength to fulfill those resolutions**.
- This **Shiv Shakti point** of the moon also gives a sense of connection with the **Himalaya to Kanyakumari**.
- The point '**Tiranga**' will serve as an **inspiration for every effort that India makes** and remind us that failure is not the end.

National Space Day:

- **August 23**, the day the **Chandrayaan-3's lander** made a **historic soft-landing on the Moon** will be commemorated as **National Space Day**.
- **National Space Day** will celebrate the spirit of Science, Technology and Innovation, and inspire us for an eternity.
- **India** has become the **fifth-largest economy** in the world and it is now among the **first-world countries**.

A National hackathons and quiz on CHandrayaan mission:

- Mr. Modi also asked **ISRO to organise national hackathons on space technology** in governance in collaboration with various departments of the Centre and the State governments.
- He also called upon students across the country to take part in a **huge quiz competition on the Chandrayaan mission** organised by **MyGov** from September 1.

Topic 21. THE EYES AND EARS OF PRAGYAN THAT HELP ROVER FIND ITS WAY ON MOON

Important for the subject: Science and technology

With the **Chandrayaan-3's lander module Vikram** successfully making a touchdown on the moon and the **rover Pragyan** ramping down, one camera developed by **Laboratory for Electro-Optics Systems (LEOS)** in Bengaluru has already made an impact while another would be guiding the **Pragyan** as it traverses the moon's surface.

About Pragyán rover:

Weight: 26 kg

Speed: 1 cm per second

- **Landing Location:** Between the craters **Manzinus C** and **Simpelius N**. **Rover Pragyán** cannot move more than 500m away from the **lander Vikram**, to ensure that they are able to send signals between each other. The rover can communicate **only** with the lander.

What will it do?

- It will move around the moon's surface in low gravity and a thin atmosphere in a semi-autonomous way and avoiding hazards. Its instruments will study what the materials on the moon's surface near the landing site are made of.

Other features:

- Its solar panel produces 50W of power. Has rocker- bogie suspension The rover has six wheels. The wheel treads will imprint **ISRO logo** and **Ashoka lions emblem** on the ground.

Why does it have a short life-Span?

- When the sun sets on the moon, an area will become dark and very cold. This can damage the battery and other electronic components. When the sun rises again after 14 days, the rover can return to life if the components have survived. This is unlikely.

Lander Horizontal Velocity Camera (LHVC):

- **LHVC**, which was initially developed for the **Chandrayaan-2 mission**, has also been adopted for the **Chandrayaan-3 mission**.
- **LHVC** has an important role of **measuring horizontal velocity** during the **Lander descent phase**.
- It does a **complex algorithm calculating the velocity** in which the lander is travelling.

Navigation Camera (NAVCAM):

- The **second camera** is the **Navigation camera (NAVCAM)** and two of them will be the **eyes** of the **Rover**, guiding it as it traverses the moon's surface.
- **Both NAVCAMs** are fitted in the **front of the rover** for **path planning** and **obstacle avoidance** for the rover. Both the cameras were developed for the Chandrayaan-2 lander and rover.

Laser-Induced Breakdown Spectroscopy (LIBS):

- Its weight is 1.5kg and consumes 5W of power.
- A powerful laser is shined on a target sample, until it blow off a few atoms and causes the

sample to emit some radiation. Detectors study this radiation to understand what the same is made of.

Alpha Particle X-Ray Spectrometer (APXS):

- Its weight is 0.7 kg and consumes 4W. Blasts a target sample with X-rays emitted by radioactive material (curium-244). Atoms in the sample absorb the X-rays and then release them at a different frequency. Based on this frequency, scientists can say which elements the sample contains.

Topic 22. BATTLING A DELIBERATELY-ACQUIRED INFECTION TO HELP FIND A CURE

Important for the subject: Science and technology

Researchers at the University of Maryland had conducted a “**controlled human infection study**” (CHIS), also called a **human challenge study** to test a new vaccine that one day may hopefully prevent **Shigellosis**.

- A **CHIS** is a relatively quick and efficient way to assess if a vaccine might work. **India** is likewise considering introducing **CHIS**.

ICMR’s proposal for CHIS:

- **CHIS** is a research model that intentionally exposes healthy volunteers to pathogens under controlled conditions. The **CHIS** is proposed by the **Indian Council of Medical Research’s (ICMR) Bioethics Unit**.
- Outside of India, this relatively new research model which **involves intentionally exposing healthy volunteers to pathogens in a controlled environment**, has been used to study **malaria, typhoid, dengue, etc**.
- The deterrents include technical, clinical, ethical and legal contentions, amid unique socio-cultural context.

Concerns include:

- India has so far stayed away from CHIS, because regardless of the potential scientific benefits, these studies are ethically sensitive and raise concerns about contentious research **ethics issues like:** deliberate harm, possible disproportionate payment and hence inducements, third-party risk, withdrawal from the study and research with vulnerable participants.

Need for the CHIS:

- **India** carries a **high burden of morbidity and mortality** from infectious diseases. They contribute about **30%** of the disease burden in the country.
- Finding **novel, efficient, and cost-effective alternatives** to existing methods of research in these diseases and their **prevention is imperative to reduce this burden**.

- CHIS helps provide **unique insights into disease pathogenesis** and can **accelerate the development of novel medical interventions**.
- CHIS offers **accelerated, cost-effective, and efficient outcomes** using smaller sample sizes in comparison to large clinical trials.

Its social value includes:

- potential contributions to public health response to diseases of concern, healthcare decision-making, policies and economic benefits, improved pandemic preparedness, and community empowerment.
- ICMR has also cautioned that **CHIS is a highly complex area and may require collaborations at different levels** between researchers, institutions, organisations and/or between different countries.
- **What is the fundamental difference between human clinical trials and human challenge studies?**

Sr.No. Human Clinical trials Human Challenge Trials or CHIS

- Participants are strongly advised to adopt and adhere to safety measures to avoid getting infected and any exposure to the microbes and infection arising in the participants from such an exposure is left to chance.
- Volunteers are deliberately exposed to disease-causing pathogens.
- Undertaken to study the safety and efficacy of drugs and vaccines Carried out to understand the various facets of infection and disease pathogenesis besides selecting the best candidate drug or vaccine. Adverse effects of the candidate drugs or vaccines are not known.
- Though adverse effects of the candidate drugs or vaccines are not known, volunteers face an additional risk when deliberately exposed to the pathogen
- Undertaken to study all kinds of diseases. Often undertaken to study “less deadly diseases” such as influenza, dengue, typhoid, cholera and malaria.

Topic 23. UK’S FIRST SUCCESSFUL WOMB TRANSPLANT

Important for the subject :Science and technology

The **first successful UK womb transplant** has been performed at the **Churchill Hospital in Oxford, United Kingdom**.

The recipient is a **34-year-old woman born without a womb**, and the **donor is her elder sister**, who already has children of her own.

- The patient was born with **Mayer-Rokitansky-Küster-Hauser syndrome (MRKH)**, a rare condition affecting about **one in every 5,000 women**.
- With **MRKH**, women have an **underdeveloped or missing womb**. However, their ovaries are intact and still function to produce eggs and female hormones, making conceiving via fertility treatment a possibility.

- The operation was funded by **Womb Transplant UK, a charity trust**. The **first successful womb transplantation** was performed in **2012** in **Gothenburg in Sweden**, since then **Sweden** and the **US** have been particularly successful in pioneering the technique.
- More than **90 womb transplants** have been carried out internationally, including in **Sweden, the US, Saudi Arabia, Turkey, China, Czech Republic, Brazil, Germany, Serbia and India**, with most involving a living donor. About 50 babies have been born as a result.

What is the procedure involved?

- One team of surgeons removes the womb from the donor and a second team transplants it into the recipient.
- Donor and recipient undergo extensive counseling before the transplant to ensure psychological suitability, and the recipient must take drugs that suppress the immune system afterwards to prevent her body from rejecting the new organ.
- Once the recipient has finished “using” the womb she has further surgery to remove it, so that the immunosuppressant drugs can be discontinued.

Concerns involved:

- The procedure is medically safe for donor and recipient.
- Alarming reports of organ black markets and vulnerable people being trafficked for their organs.

India:

- The **first uterine transplant** performed in **India** took place on **18 May 2017** at the **Galaxy Care Hospital in Pune, Maharashtra**.
- **India's first uterine transplant baby**, weighing **1.45 kg**, was delivered through a **Caesarean section** at **Galaxy Care Hospital in Pune**.

Topic 24. START-UP AR4 TECH, SODIUM TIE UP TO MAKE SODIUM-ION BATTERY PACKS

Important for the subject: Science and technology

Coimbatore's AR4 Tech partners with Singapore's Sodian Energy to build a sodium-ion battery factory, targeting vehicle electrification.

Sodium-Ion Batteries: Overview and Components

- **Sodium-ion batteries** (Na-ion batteries or NIBs) are an emerging battery technology that utilizes **sodium ions (Na⁺) as charge carriers**.
- They share similarities with lithium-ion batteries but offer the advantage of using more abundant and cost-effective sodium.

Components of Sodium-Ion Batteries:

Anode:

- Typically employs **carbon-based materials** like **hard carbon or graphite**.
- Sodium ions are absorbed during charging and released during discharging.

Cathode:

- Consists of **transition metal oxides** such as **NaFePO₄ or NaMnO₂**.
- Sodium ions **intercalate** into the cathode material during discharging and **deintercalate** during charging.

Electrolyte:

- Facilitates the movement of sodium ions between the anode and cathode. Requires stability and good ionic conductivity. It can be in **liquid or solid-state form**.

Separator:

- **Prevents direct contact** between the anode and cathode. It **permits the flow of sodium ions while preventing short circuits**.

Advantages and Considerations:

Advantages:

- **Abundance:** Sodium is more abundant and **widely available than lithium**.
- Sodium is **the sixth most abundant element** worldwide. 500 times more abundant than lithium.
- **Cost-Effectiveness:** Sodium-ion batteries have the potential to be **more affordable due to sodium's lower cost**. Costs 1-2% of lithium's price.
- **Environmental Impact:** Reduced dependence on lithium can mitigate ecological concerns related to its extraction.
- **Safety:** Lower risk of thermal runaway.
- **Thermal runaway** refers to a self-reinforcing and uncontrolled increase in temperature within a system
- **Sustainability and Eco-Friendliness:** Sodium-ion batteries don't rely on rare metals like cobalt or nickel.

Considerations:

- **Energy Density:** Sodium-ion batteries generally have **lower energy densities** than lithium-ion batteries, affecting applications where compactness matters.
- **Cycle Life:** Cathode materials can degrade over numerous charge-discharge cycles, impacting long-term performance. **Electrolyte Challenges:** Developing stable and highly conductive electrolytes for sodium ions is essential.

Topic 25. GREEN COURT DIRECTS BORDER ROADS ORGANISATION TO PLANT 10000 TREES IN UTTARAKHAND

Important for the subject: Environment

The **National Green Tribunal** has directed the **Border Roads Organisation (BRO)** to plant **at least 10,000 trees** within a month in Uttarakhand as part of **compensatory tree plantation** to make up for hundreds of trees felled during construction of a road from **Simli** to **Gwaldam**.

- NGT formed a joint committee comprising the representatives of the **Ministry of Environment, Forest and Climate Change (MoEFCC)**, **BRO**, **Uttarakhand State Pollution Control Board (PCB)** along with the **District Magistrate** and **Divisional Forest Officer (DFO)** of **Chamoli** who have been directed to “verify the factual position and take appropriate remedial action in the violation of environmental norms”.

No illegal felling:

- The committee report said there was no illegal felling of trees during the construction.
- There had been **17 landslides** on the road from **Simli** to **Gwaldam**. A **joint mechanism** needed to be developed between the **BRO** and **forest department** to: monitor landslides, assessing damage to vegetation and Treat sites with appropriate measures.

Responsibilities vested to the district authorities:

- The **DFO Chamoli** was directed to **monitor survival of the plantation for three months** and **report to the NGT**.
- The **DFO** will also ensure that the plantation is done in a manner which will prevent landslides.
- The **District Magistrate** will ensure that the **BRO** takes appropriate steps to prevent landslides by **constructing protective structures** and will **submit a report on the number of landslides** during the intervening period and action taken to prevent it.

Laws related to tree felling in India:

- In India, aspects related to trees are covered under the Indian Forest Act, 1927
- It is broadly under this Act that each state has laid down rules and regulations against tree felling.

Along with that various states have come up their own laws for the same purpose like

- Maharashtra (Urban Areas) Preservation of Trees Act 1975
- Delhi Preservation of Trees Act (1994)
- Karnataka Preservation of Trees Act 1976
- West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006 Also,

various cities like Gurugram, Chennai etc. come up with their own notifications regarding felling of trees

Cutting OF RESERVED TREES and FORESTS:

- Under Indian **Forest Act, 1927, Section 30**– The State Government may, by notification in the Official Gazette,
- declare any trees or class of trees in a protected forest to be reserved from a date fixed by, the notification;
- declare that any portion of such forest specified in the notification shall be closed for such term, not exceeding thirty years, as the State Government thinks fit, and that the rights of private persons, if any, over such portion shall be suspended during such terms

Section 33 Indian Forest Act

- Penalties for acts in contravention of notification under section 30

Any person who

- fells any tree reserved under section 30, or strips off the bark or leaves from, or otherwise damages, any such tree; permits cattle to damage any such tree; shall be punishable with imprisonment for a term which may extend to six months, or with fine which may extend to five hundred rupees, or with both.

Is it punishable to cut trees even at my own premises?

- Yes, according to Indian Forest Act, the penalty for cutting down a tree is Rs.10,000 or 3 months imprisonment.
- This punishment may extend up to one year under various state acts. But in some cases like where a tree is blocking your way, whose branches are spreading to your house or blocking hoardings, you need to take a clearance from the Forest department, before cutting that tree.

Border Road Organisation (BRO):

- The **BRO** was formed on **7 May 1960** to secure India's borders and develop infrastructure in remote areas of the north and north-east states of the country.
- The **BRO** is a road construction executive force in **India** that provides support to Indian Armed Forces.
- **BRO** develops and maintains **road networks** in **India's border areas** and **friendly neighboring countries**.
- This includes infrastructure operations in **19 states and three union territories** (including Andaman and Nicobar Islands) and **neighboring countries** such as **Afghanistan, Bhutan, Myanmar, Tajikistan and Sri Lanka**.
- As of **2021**, **BRO** had constructed over **60,000 kilometres** (37,282 mi) of roads, over **450 permanent** bridges with a total length of over **60,000 metres** (37 mi) length and 19

airfields in strategic locations.

- **BRO** is also tasked with maintaining this infrastructure including operations such as **snow clearance**.
- BRO is instrumental in significantly upgrading and building new India-China Border Roads.
- **Motto:** Shramena Sarvam Sadhyam (everything is achievable through hardwork).

Topic 26. FUNGA: UN WANTS US ALL TO SAY IT ALONG WITH ‘FLORA & FAUNA’

Important for the subject: Environment



The **United Nations Biodiversity** has urged people globally to use the word ‘**funga**’ whenever they say ‘**flora and fauna**’, in order to highlight the importance of **fungi**.

Fungi:

- **Fungi**, along with Animalia (animals), Plantae (plants), Protista, Archaea/Archaeobacteria, and Bacteria or Eubacteria form the **six ‘kingdoms’ of biology**.
- A fungus is any member of the group of **eukaryotic organisms** that includes **microorganisms** such as **yeasts** and **molds**, as well as the more familiar **mushrooms**. These organisms are classified as a kingdom, separately from the other eukaryotic kingdoms, which, by one traditional classification, includes Plantae, Animalia, Protozoa, and Chromista.
- A characteristic that places fungi in a different kingdom from plants, bacteria, and some protists is **chitin** in their **cell walls**.
- **Fungi** have no roots, stems, flowers and seeds- structures.

Fungi, like animals, are **heterotrophs**:

- They acquire their food by absorbing dissolved molecules, typically by secreting

digestive enzymes into their environment.

- **Fungi do not photosynthesize. Fungi are the principal decomposers in ecological systems.** The study of fungi is known as **mycology**.

UN Biodiversity call to protect funga:

- **UN Biodiversity** urges that, whenever referring to the **macroscopic diversity** of life on Earth, we should use “**flora, fauna and FUNGA**”, and “**animal, plants and FUNGI**”.
- The **Species Survival Commission (SSC)** of the **International Union for Conservation of Nature (IUCN)** announced that it would use “**mycologically inclusive**” (referring to fungi) **language** in its internal and public-facing communications (“fauna, flora and funga” and “animals, fungi and plants”) and to incorporate **fungi** in conservation strategies with rare and endangered plants and animals.

Significance of fungi:

- There would be no life on Earth without fungi: the yeasts, molds and mushrooms that are critical to decomposition and forest regeneration, mammalian digestion, carbon sequestration, the global nutrient cycle, antibiotic medication, and the bread, beer and chocolate we consume.
- Trees would not be able to live on land without fungi.
- Together with bacteria, **fungi are responsible for breaking down organic matter** and releasing **carbon, oxygen, nitrogen, and phosphorus** into the **soil** and the atmosphere.
- **Fungi** are essential to many household and industrial processes, notably the making of **bread, wine, beer, and certain cheeses**.
- They play an important role in **medicine** by **yielding antibiotics**. They help in **controlling the population of pests**.

What is the Species Survival Commission (SSC)?

- The **IUCN Species Survival Commission (SSC)** is a **science-based network** of more than **9,000 volunteer experts** from almost every country of the world, all working together towards achieving the vision of, “A just world that values and conserves nature through positive action to reduce the loss of diversity of life on earth”.
- **SSC’s major role** is to provide information to **IUCN** on biodiversity conservation, the inherent value of species, their role in ecosystem health and functioning, the provision of ecosystem services, and their support to human livelihoods.

Topic 27. DECLINING BIRD POPULATIONS ARE A ‘GRIM’ REMINDER OF RAPID BIODIVERSITY LOSS, SAYS NEW REPORT

Important for the subject: Environment

Around **60 percent of birds in India** have experienced **population decline** over the **long term of 30 years**, says **2023 State of India’s Birds report**.

- **Birds occupying open natural ecosystems**, such as grasslands, have seen **steep declines in numbers**. In terms of **diet**, **birds that feed on vertebrates and carrion** have **declined** the most, followed by **birds that feed on insects**.
- **Targeted, systematic, periodic monitoring of bird populations** and using consistent methods can help species management.

Ecosystem services provided by birds:

- Aiding in seed dispersal and pollination, Acting as predators and scavengers.
- Indicator of surrounding environments
- Balance the species population by feeding them like: Rodents, insects etc.

Consequences of declining bird population:

- The decline in raptors could result in increased populations of rodent communities.
- The great Indian bustard is on the brink of extinction because of land use changes and habitat loss.
- Birds that feed on vertebrates and carrion have declined the most, suggesting that this food resource either contains harmful pollutants or is declining in availability, or both.
- Agrochemicals lower survival rates in some raptors.

Threats:

- **India** has **Protected Areas** and **laws** like the **Wildlife Protection Act**, but these measures are not sufficient to stop the declining populations of birds in India.
- The report locates **declining bird populations within eight broad threats**: environmental pollutants, forest degradation, Urbanisation, avian disease, illegal hunting and trade and climate change.
- The **spread of monocultures** through commercial plantations or afforestation programmes have reduced biodiversity. Expansion of renewable energy infrastructure

Recommendations:

- Not planting trees in monocultures, but rather ecological restoration of multiple habitats including non- forest habitats like grasslands.
- Mitigate the considerable negative effects of small-scale infrastructure such as wind energy.
- Targeted, systematic, periodic monitoring of bird populations, using consistent methods, over long periods of time.
- Monitoring changes in factors such as disturbance, climate, and land-use

Steps taken to conserve these bird species:

- In **2020**, the **Indian government** announced a **10 year Visionary Protection Plan (VPP)** for the **conservation of avian diversity, ecosystems, habitats and landscapes**.
- The Plan outlined steps to be taken in the near, middle, and long term to effectively

monitor and raise awareness about bird conservation.

- The **Salim Ali Centre for Ornithology and Natural History (SACON)** is one of the **focal institutes** supporting the **VPP**.
- **17 states and union territories** have initiated work on their own **VPPs**, while **five** — **Uttarakhand, Delhi, Telangana, Andhra Pradesh, and Meghalaya** — have completed the process.
- By **2030**, we expect states to pay more attention to bird conservation issues and work to mitigate priority areas.
- The **amended Wildlife Protection Act** took into consideration some of the findings from the **SoIB 2020 report**.

Indian Bird Conservation Network (IBCN):

The **Indian Bird Conservation Network** is a collaboration of:

- The **Bombay Natural History Society, BirdLife International, Royal Society for Protection of Birds, Salim Ali Centre for Ornithology & History, Indian Institute of Public Administration, Wildlife Institute of India** and other **NGO's** on the ground.
- It **aims** at conservation actions through sound research. It is **open to all who believe that conservation of birds can contribute to the conservation of all biodiversity**, and in return, be beneficial in the spiritual and material well-being of human life.

Bird Sensitivity Mapping Tool:

- The **Union environment ministry** has approved a **three-year study** called the '**Bird Sensitivity Mapping Tool**' to chart the **pathways of migratory birds** under the **Central Asian Flyway (CAF) across India**.
- Globally, migratory flyways have been identified under the **Convention of Migratory Species (CMS)**.
- The study was announced on the sidelines of the **International Conference on Wetlands and Migratory Waterbirds of the Asian Flyways** in **Lonavala, Maharashtra, India**.

Threatened bird species

Initiative to conserve

Vultures

- **Vulture Action Plan 2020-25**
- **Vulture Conservation and Breeding Centre (VCBC)** was set up at **Pinjore, Haryana** in **2001**.

Great Indian Bustard

- **National Bustard Recovery Plans**
- **MoEF & CC, Rajasthan government** and **Wildlife Institute of India (WII)** have

established a conservation breeding facility in Desert National Park at Jaisalmer in June 2019.

- Project Great Indian Bustard was launched by Rajasthan government
- Task Force for suggesting eco-friendly measures to mitigate impacts of power transmission lines and other power transmission infrastructures on wildlife including the Great Indian Bustard.21/25

Hornbill

- Protected at the highest level under **Schedule I** of the **Wildlife Protection Act, 1972**.
- A conservation programme promoting the use of fibre-glass beaks for headgear instead of real hornbill casques has helped reduce some threat to it.
- ‘**Protect Hornbills**’ project by the **Nyishi tribe** of **Arunachal Pradesh**

Topic 28. INVASIVE ALIEN SPECIES IN FOCUS AT 10TH PLENARY OF IPBES

Important for the subject: Environment

The **140+** members of the **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)** have gathered at **Bonn, Germany** for the body’s **10th plenary**.

- On agenda is the **scientific assessment report** on “**Invasive Alien Species and their Control**”.
- **Invasive alien species** are a **key driver of biodiversity loss** and they are part of the targets set under the **Kunming-Montreal Global Biodiversity Framework (GBF)** to be achieved by **2030**.
- **Target 6**– by **2030**, the impacts of **invasive alien species on biodiversity and ecosystem services** would be **eliminated, minimised, reduced** and **mitigated**.
- The **aim** is to prevent and reduce the rate of introduction and establishment of invasive alien species by **at least 50 per cent by 2030**.
- **IPBES10** is the first meeting of this global body since the adoption of **GBF**. The **organization** is currently working on **three more assessments**, that will be **completed by 2030**:
 - The assessment of the interlinkages among biodiversity, water, food and health (nexus assessment)
 - The assessment of the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 Vision for Biodiversity (transformative change assessment)
 - The methodological assessment of the impact and dependence of business on biodiversity and nature’s contributions to people (business and biodiversity assessment).

What is IPBES?

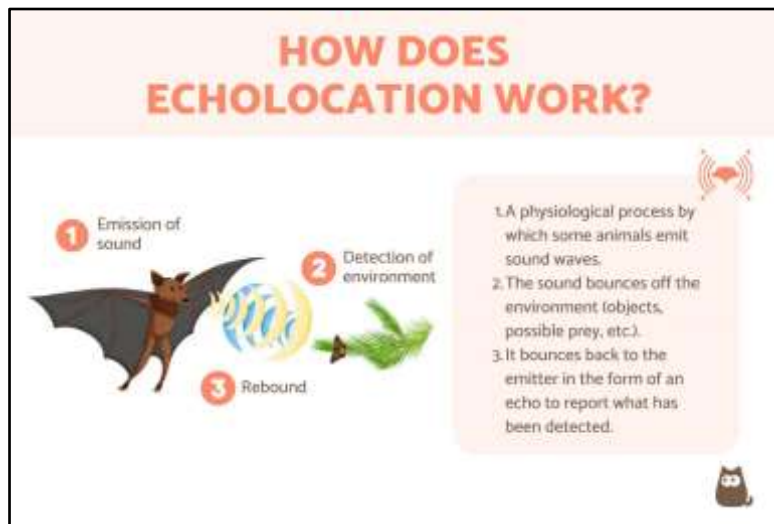
- It is an independent intergovernmental body, established by member States in 2012, with

the objective to strengthen the research, evidence-based policy making for the conservation and sustainable use of biodiversity.

- The work of IPBES works include: – Assessments, Policy Support, Building Capacity & Knowledge Secretariat: **Bonn, Germany.**

Topic 29. ECHOLOCATION: WHAT GOES AROUND COMES AROUND

Important for the subject : Environment



Bats, dolphins and submarines all use the same technique to get a sense of their surroundings: Echolocation.

What is echolocation?

- Nature's own sonar system, **echolocation**, occurs when an animal or an object emits a sound wave that bounces off an object, returning an echo that provides information about the object's distance and size.

Which species can echolocate?

- **Over a thousand species echolocate**, including most **bats**, **all toothed whales**, and **small mammals**.
- Many are **nocturnal, burrowing, and ocean-dwelling animals** that rely on echolocation to **find food** in an environment with little to no light.
- Animals have several methods for echolocation, from **vibrating their throats** to **flapping their wings**.
- **Nocturnal oilbirds** and some **swiftlets**, some of which hunt in dark cave environments, produce short clicks with their syrinx, the vocal organ of birds.
- Some people can also echolocate by clicking their tongues, a behavior shared by only a few other animals, including tenrecs, a shrew-like animal from Madagascar, and the Vietnamese pygmy dormouse, which is effectively blind.

Defense against echolocation:

- Some moths have evolved their own defenses against echolocating bats. The tiger moth flexes the tymbal organ on either side of its thorax to produce clicks, which jams bat sonar and keeps the predators at bay.

Applications of Echolocation technique:

- Humans have harnessed the principles of this ingenious technique to create devices like **sonar** and **Radar**.
- **SONAR** is an acronym of ‘**Sound navigation and ranging**’.
- It is widely used for underwater navigation, communications, and to find fish.
- **RADAR**: an acronym for ‘**Radio detection and ranging**’.
- It is used in aviation, weather forecasting, and military applications to detect and track objects by bouncing radio waves off them.
- More recently engineer’s have used **echolocation** to develop **smartphone apps** that can create a map of a room to help people with visual impairments navigate their environs better.

Topic 30. BIRD SPECIES PLUMMETING IN INDIA, SAYS NEW REPORT: WHAT ARE THE MAJOR THREATS TO THEM?

Important for the subject : Environment

A large number of bird species in India are either currently declining or projected to decline in the long term, according to a report based on data from about 30,000 birdwatchers.

Report title: The State of Birds in India 2023

- Out of the **942** bird species that were assessed, **142** are diminishing and **only 28 are increasing**.
- While raptors, migratory shorebirds, and ducks have declined the most, birds living in habitats like open ecosystems, rivers, and coasts are among the worst affected.
- The **key factors responsible for the decline** are **urbanisation, infrastructural development, environmental pollutants, and climate change**.

What are the major threats to birds in India?

Climate change:

- **Climate change affects bird reproduction and survival** through the disruption of species interactions by **phenological mismatches** — it occurs when the timing of annual events like **breeding, nesting and migration become out of sync**.
- **Mismatches in seasonal timing** (of migration, breeding, emergence) between birds and their prey can **reduce survival and reproduction** and also **lead to fatal competition with other species**.
- **Soaring temperatures** force **sedentary birds** to go through **rapid adaptive changes**.

- For instance, **Amazonian birds** over 50 years lost body weight to lose heat more efficiently.
- Sapping heat compels birds to **change their behavior**. They tend to spend more time looking for shade instead of searching for food. This can have an **adverse effect** on their **survival** and **reproduction**.
- **Climate change** leads to new and dangerous interactions between different species. In **Hawaii**, due to rising temperature, mosquitoes have colonized higher altitudes.
- This has given rise to malaria among mountain birds.

Urbanization

- The **most urbanized** regions in India have: the **least number of bird species**, the least number of rare species, and the fewest insectivorous species.

Consequences of unplanned rapid urbanization:

- **Loss of natural habitat for birds** exposes them to **more air pollution** and **high temperatures**. **Noise pollution** forces birds to sing louder, or at different frequencies, or, in the worst case, to abandon otherwise suitable habitat.
- **Light pollution** may **confuse** and **disorient** them, causing them to collide with buildings.
- **Lack of food supplies in urban areas** leads to the **homogenisation of bird communities** as only behaviourally dominant species such as **House Crows** and **feral Rock Pigeons** are able to survive.

Monocultures:

- Monoculture is the practice of growing one type of seed in a field at a time. In **India**, **commercial monoculture plantations** of **rubber, coffee, and tea** have been rapidly expanding in recent years.
- Tea plantations have grown from **5,214 sq km** to **6,366 sq km** from **2003** to **2020**.
- **Oil palm plantations** have also increased across the country with expanding hotspots located in **Andaman and Nicobar Islands**, and the **northeastern Himalaya**.
- **Commercial monocultures** are known to harbor fewer bird species than natural forests within the same biome.
- **Oil palm plantations** in **Mizoram** support **only 14%** of the bird species found in comparable rainforests.
- In **Uttarakhand**, **teak plantations** can shelter just **50%** of the total woodpecker species seen in the state's sal forests.

Energy infrastructure

- A wide range of species are known to have been **killed due to collisions with wind turbines**.
- Several of them have migrated to regions where there aren't such giant devices.
- The **transmission lines** have also led to the **death of many large-bodies species** because

of **collision** and numerous small-bodies species have been **electrocuted**. Over 60 species from 33 families of birds are affected by collisions and electrocution at power lines in India.

Topic 31. INDIA AND ASIAN DEVELOPMENT BANK TO SET UP CLIMATE CHANGE AND HEALTH HUB IN DELHI

Important for the subject: Environment

Having bagged the **first WHO Centre for Global Traditional Medicine**, to be set up in **Gujarat, India** is now all set to open a **climate change and health hub** in the **national capital** in partnership with the **Asian Development Bank (ADB)**.

WHO Centre for Global Traditional Medicine:

- The **World Health Organisation (WHO)** outpost in **Jamnagar (Gujrat)** will **aim** to provide:
- Leadership on global health matters pertaining to traditional medicine;
- Ensure the quality, safety, efficacy, accessibility, and rational use of traditional medicine;
- Develop norms, standards, and guidelines in relevant technical areas; and Develop tools and methodologies for data collection and analytics.

WHO hub for climate change and health:

- The **new hub for climate change and health** will facilitate knowledge sharing, promote partnerships and innovations, and also help countries beyond the G-20, especially developing countries.

Health system resilience is a priority:

- The **G20 outcome document** commit to: prioritizing climate-resilient health systems development, building sustainable and **low-carbon/low greenhouse gas (GHG) emission health systems** and healthcare supply chains that deliver high-quality healthcare, mobilize resources for resilient, low-carbon sustainable health systems, and facilitate collaboration, including initiatives such as the **WHO-led Alliance for Transformative Action on Climate and Health (ATACH)**.

Emerging infectious diseases:

- There is a concern about the **rising cases of zoonotic spillovers**, and consequently **emerging and re-emerging diseases** at the **G20 Health Ministers meet**.
- **G-20 countries** have also welcomed the work of the **International Pathogen Surveillance Network**, and the opportunity to work closely with the **WHO Hub for Pandemic and Epidemic Intelligence** and its endeavor to **globally expand communities of practice and establish knowledge exchange programmes** that disseminate and share good practices.

Alliance for Transformative Action on Climate and Health (ATACH):

- **ATACH** is a **WHO initiative**, an **informal voluntary network** for Participants to exchange views, share information, and enhance technical and political cooperation.
- It is **not a distinct legal entity**, and it **derives its legal status from WHO**. Thus, it shall be **administered by WHO**, which **provides its Secretariat**.
- **ATACH** works to realize the ambition set at **COP26** to build climate resilient and sustainable health systems, using the collective power of **WHO Member States** and other stakeholders to drive this agenda forward at pace and scale; and promote the integration of climate change and health nexus into respective national, regional, and global plans.

Four thematic working groups will work to address common issues:

- Financing the Health Commitments on Climate Resilient and Sustainable Low Carbon Health Systems.
- Climate Resilient Health Systems.
- Low Carbon Sustainable Health Systems.
- Supply chains.

International Pathogen Surveillance Network (IPSN):

- **IPSN** is a **global network of pathogen genomic actors**, brought together by the **WHO Hub for Pandemic and Epidemic Intelligence**, to accelerate progress in pathogen genomics, and improve public health decision-making.

Vision and Mission:

- A world where every country has equitable access to sustained capacity for genomic sequencing and analytics as part of its public health surveillance system.

WHO Hub for Pandemic and Epidemic Intelligence (PEI):

- The **World Health Organization (WHO) Hub for Pandemic and Epidemic Intelligence** is working towards a world where collaborative surveillance empowers countries and communities to minimise the impact of pandemic and epidemic threats.
- **Collaborative surveillance**, a key concept within **WHO's framework to strengthen the global architecture for health emergency prevention, preparedness, response and resilience (HEPR)**, facilitates the systematic strengthening of capacity and collaboration among diverse stakeholders globally, both within and beyond the health sector, to enhance public health intelligence and improve evidence for decision-making.

Topic 32. WHAT TERAI TIGERS EAT AND WHAT IT TELLS ABOUT THE HABITAT

Important for the subject: Environment

The poop of tigers has helped a team of scientists at the **Wildlife Institute of India (WII)** understand the **prey selection patterns of the striped feline** in the **Indian part of the Terai-Arc Landscape, or TAL.**

About the Report:

- Report title: **The assessment of the food habits of the tiger (Panthera tigris)** Scientists have gather information about the **hotspots of conflicts related to livestock predation** across **15,000 sq. km** of the animal's habitat along the foothills of the Himalayas.

Terai Arc Landscape (TAL):

- **TAL** is composed of **14 Indian and Nepalese trans-border protected ecosystems** of the **Terai and nearby foothills of the Himalayas.**
- The area includes **Nepal's Bagmati River** to the **east** and **India's Yamuna River** to the **west.**
- The **TAL** is home to many endangered mammals including the **Bengal tiger** (of which it has one of the world's highest densities), **the Indian rhinoceros**, the gaur, **the wild Asian elephant**, the hispid hare, the sloth bear, **the South Asian river dolphin** and the chital, as well as over **500 species of birds**, many endangered.
- Examples of birds are the **endangered Bengal florican, the sarus crane, and the black stork.**
- The scientists chose the **900 km linear stretch** of **TAL**, recognised as one of the most productive habitats in the subcontinent.
- The globally important tiger conservation landscape is characterised by a mosaic of forests and grasslands covering both **protected areas (PAs)** and **non-PAs.**

TAL represents **three major habitat types:**

- **Shivalik** covering parts of the lower Himalayas, **Bhabar** covering the foothills of the lower Himalayas marked by pebbles and boulders, and **Terai** comprises the lowland region below the Himalayan foothills and north of the Indo-Gangetic plains covering entire Uttar Pradesh, southern parts of Uttarakhand, and Bihar. About **22% of the wild tiger population in India** is found across the **TAL.**

Data-loaded dump:

- The dump of an animal yields information about its **lineage, genetic relatedness, diet preference, population status,** and the **use of the landscape.**
- Field sampling was conducted across: **six tiger reserves** (Rajaji, Corbett, Amargarh, Pilibhit, Dudhwa, and Valmiki), **two wildlife sanctuaries** (Nandhaur and Sohagibarwa), **two conservation reserves,** and **11 non-PAs;** including **nine forest divisions** and **two**

social forestry divisions across Bihar, Uttarakhand, and Uttar Pradesh.

What does the data reveal about dietary patterns?

- **Large-bodied species** – sambar, swamp deer, nilgai, chital, wild pig, and livestock – **comprised about 94% of the diet**, with sambar, chital, and livestock having the highest relative proportions.
- **Habitat-specific** (Shivalik-Bhabar and Terai) analyses indicate that **prey selection is driven by prey abundance and body weight but not determined by protection status** (PAs versus non-PAs).
- **PAs and non-PAs in the Terai region were more prone to livestock predation-related conflict.**
- **Large carnivores have significant role in maintaining ecological diversity and interactions** within their respective **biological communities.**

Recommendations:

- Prey abundance estimation outside the PAs, Reduction of grazing pressures, and Detailed records of tiger mortalities with causal investigations to ensure future conflict-free tiger persistence across the TAL.

Topic 33. TROPICAL FORESTS MAY BE GETTING TOO HOT FOR PHOTOSYNTHESIS

Important for the subject: Environment

A small percentage of leaves on trees in tropical forests may be approaching the maximum temperature threshold for photosynthesis to work, suggests a study.

Study findings:

- The study indicated a resilience of tropical forests to how warming impacts carbon uptake and long-term drought.
- **Tropical forests** serve as **critical carbon stores** and host most of the world's biodiversity and may be particularly sensitive to increasing temperatures.

The critical temperature acts as an absolute upper limit.

- The **critical temperature** beyond which **photosynthetic machinery** in tropical trees begins to fail averages at about **46.7 degrees C**. Modeling suggests that **tropical forests can withstand up to a 3.9 degree C increase over current air temperatures before a potential tipping point.**
- An estimated **0.01%** of all leaves currently **surpass this critical temperature** but there are uncertainties in the range of potentially critical temperatures in tropical trees.
- In addition to **temperature increase caused by global warming, deforestation and fragmentation** can amplify local temperature changes.

- The combination of ambitious climate change mitigation goals and reduced deforestation can ensure that these important realms of carbon, water and biodiversity stay below thermally critical thresholds.

Tropical rainforests:

- Tropical rainforests are rainforests that occur in areas of **tropical rainforest climate** in which there is **no dry season** – all months have an **average precipitation of at least 60 mm** – and may also be referred to as **lowland equatorial evergreen rainforest**.
- **True rainforests** are **typically found between 10 degrees north and south of the equator**.
- They are a subset of the **tropical forest biome** that occurs roughly within the **28-degree latitudes** (in the equatorial zone between the Tropic of Cancer and Tropic of Capricorn). Within the **World Wildlife Fund's biome classification**, tropical rainforests are a type of **tropical moist broadleaf forest** (or tropical wet forest) that also includes the more extensive seasonal tropical forests.

Topic 34. 7TH GEF ASSEMBLY: GLOBAL BIODIVERSITY FRAMEWORK FUND RATIFIED

Important for the subject: Environment

The **Global Biodiversity Framework Fund (GBFF)** was finally **ratified** and launched at the **Seventh Assembly of the Global Environment Facility (GEF)** in **Vancouver, Canada**.

Ratification of the GBF Fund:

- **Governments, non-profits and the private sector** can now contribute their funds here to ensure that the world meets the goals and targets of the **KunmingMontreal Global Biodiversity Framework (GBF)** formulated by the **Convention on Biological Diversity (CBD)** by **2030**.
- **Canada** and the **United Kingdom** have already donated **200 million Canadian dollars and 10 million pounds** respectively to the **GBFF**.
- It will prioritise support for **Small Island Developing States** and **Least Developed Countries**, which will receive **more than a third** of the fund's resources.
- This is the first time there would be funds channeled to non-state actors like the indigenous communities.
- Under **Target 19** of **GBF**, at least **\$200 billion per year** will need to be raised by **2030**. The **first GBFF Council** meeting will be held in **January 2024**.

Topic 35. DHOLPUR-KARALI TO BE RAJASTHAN'S 5TH TIGER RESERVE & INDIA'S 54TH

Important for the subject: Environment

The **National Tiger Conservation Authority (NTCA)** approved **Dholpur-Karali** in

Rajasthan as a new tiger reserve bringing the count of **tiger reserves** in the country to **54**.

The ministry also gave in-principle approval to declare **Kumbhalgarh** as a **tiger reserve** in **Rajasthan**.

- **Dholpur-Karauli** the **fifth tiger reserve** in **Rajasthan**. The **other four tiger reserves** in **Rajasthan** are:
- **Ranthambore Tiger Reserve** in **Sawai Madhopur**, **Sariska Tiger Reserve** in **Alwar**, **Mukundra Hills Tiger Reserve** in **Kota** and **Ramgarh Vishdhari Tiger Reserve** in **Bundi**.
- Notably **Rajasthan** has witnessed an **increase in tiger population** from **32** in **2006** to **88** in **2022**.

Topic 36. STATE OF BIRDS: MOST SPECIES DIP, INDIA PEAFOWL AMONG THOSE FLOURISHING

Important for the subject: Environment

There is a general decline in numbers in most bird species in the country – some recording current decline and others projected to decline in the long term, according to a report based on data from about **30,000 birdwatchers**.

About the Report:

- Report title: **The State of India's Birds 2023** Released after **three years**.
- The report is an **assessment of distribution range, trends in abundance and conservation status of 942 of India's 1,200 bird species**.
- The survey has been carried out by **13 partner organisations**, including the **Wildlife Institute of India (WII)** and **Zoological Survey of India (ZSI)**.

The assessments rely on **three indices**.

- Two of them are related to change in abundance — **long-term trend** (change over 30 years) and **current annual trend** (change over past seven years) — and the **third** is a **measure of distribution range size in India**.
- According to the report, **long-term trends** as well as **current annual trends** could not be established for many of the **942 species**.

Key findings of the Report:

- **Raptors, migratory shorebirds and ducks** have declined the most. Of the **338 species**, for which **long-term trends** have been identified:
- **204** or **60%** have **declined in the long term**, **98 species** are **stable** **36** have **increased**.

Current annual trends could be determined for 359 species, of which:

- **142 species** or **39%** are **declining**, **64** are in **rapid decline**, **189** are **stable** and **28 bird species** are **increasing**.

- The **range size**, or measurement of a **bird species' territory and home range**, was assessed for all **942 bird species**.
- The range size of **39% bird species** is **moderate**, **33%** is **very large** **28%** species inhabit a “**restricted and very restricted**” area.

Birds that are declined are:

- Specialist birds (having narrow range), Shorebirds (migratory birds), Raptors (due to agro-chemicals), Vultures (White-rumped Vulture, Indian Vulture, and Red-headed Vulture), Birds that feed on invertebrates and insects, Woodpecker, Birds endemic to western ghats and Sri-Lanka biodiversity hotspots, Bustard species of birds (Great Indian Bustard, Lesser Florican and Bengal Florican).

Birds with stable population:

- Resident birds, Birds that feed on fruits and nectars, Generalist birds (having wide ranging habitats).

Birds with increasing populations:

- Several bird species such as the **Indian Peafowl, Rock Pigeon, Asian Koel** and **House Crow** are **not healthy** in both abundance and distribution, but showing “**increasing trend**”.

Indian Peafowl:

- The **Peafowl, India's national bird**, is one of the **most rapidly increasing species in the country** today.
- It is expanding into habitats where it has never occurred previously. In the last 20 years, **Indian Peafowl** has expanded into **high Himalaya** and the **rainforests of the Western Ghats**.
- It now occurs in **every district in Kerala**, a state where it was once **extremely rare**. Apart from expanding its range, it also appears to be **increasing in population density** in areas where it occurred earlier.
- The **Asian Koel** has shown a **rapid increase in abundance of 75%**, with an **annual current increase of 2.7% per year**.
- Similar increase is seen in the populations of **House Crow, Rock Pigeon** and the **Alexandrine Parakeet**.

Topic 37. COLLEGE OF MILITARY ENGINEERING PUNE: THE FIRST CARBON NEGATIVE GARRISON OF INDIA

Important for the subject : Environment

The College of Military Engineering (CME), Pune has achieved the status of India's first carbon-negative military unit by adding a 5 MW solar plant, increasing its total solar capacity

to 7 MW.

College of Military Engineering (CME)

- Founded in **1948**, CME stands as a prominent training institution catering to the Indian Army, Navy, Air Force, and Friendly Foreign Countries. CME specializes in providing **technical and tactical training**, equipping personnel to adeptly respond to changing warfare tactics and strategies.

Carbon Footprint Reduction at CME

- **The Military Engineering Services**, through the office of GE(CME) Khadki, initiated various projects at CME to combat climate change and reduce carbon footprint.
- Implementation of a **7 MW Solar Power Plant** in **two phases**.
- **Solar steam cooking plants** for community cooking for troops. **Retrofitting Emission Control Devices (RECDs)** on **DG Sets**.

Indian Armed Forces' Environmental Responsibility

- **Global Greenhouse Gas Emissions:** Worldwide, **militaries contribute 5.5% of global greenhouse gas emissions** (**Conflict and Environment Observatory Report, 2022**).
- **Indian Armed Forces' Initiatives:** The Indian armed forces are actively reducing their carbon footprint, showcasing their commitment to the motto **"Service before Self"**.

CARBON NEGATIVE:

- Being carbon negative means we offset or remove more carbon from the atmosphere than we emit.

National Solar Mission

- Also known as **Jawaharlal Nehru National Solar Mission (JNNSM)**, is a joint initiative by the **Central and State Governments** of India.
- It focuses on advancing solar power within the nation and is part of the **National Action Plan on Climate Change (NAPCC)** strategy.
- Introduced in **January 2010**, the mission has undergone **two revisions**. The ambitious goal is to achieve **100 GW of solar PV capacity by 2022**.

The 100GW solar power capacity has been divided into the following 4 parts:

- The **rooftop solar energy generation** of **40 GW**.
- Large and medium-scale **grid-connected solar projects** of **60 GW**. To achieve 15 million square meters of **solar thermal collector** area by 2017 and 20 million by 2022. To deploy 20 million **solar lighting systems** for rural areas by 2022.

Other initiatives:

Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM) Scheme:

- Distribution of **off-grid solar pumps, installation of solar panels on barren land, and DISCOMS purchasing excess solar energy.**

International Solar Alliance (ISA):

- A joint initiative of **India and France** to promote solar energy globally.

One Sun, One World, One Grid (OSOWOG):

- Proposed global electricity grid to distribute solar power worldwide.

Rooftop Solar Scheme:

- Ministry's program promoting rooftop solar installations. Offers subsidies for solar panels, cost-sharing with residential customers, and vendor incentives.
- Sustainable Rooftop Implementation of Solar Transfiguration of India (**SRISTI**) initiative

Solar Park Scheme:

- Aims to establish solar parks with **around 500 MW capacity** in various states. Focuses on aggregating solar power generation through large-scale parks.

Topic 38. RUSSIA SAYS UKRAINE DRONES STRUCK DEEP INTO ITS TERRITORY***Important for the subject: International Relations***

Ukrainian drones strike deep in Russian territory. Ukraine sent waves of drones deep into western Russia in nighttime attacks that struck military assets

The **drones hit an airport near Russia's border with Estonia and Latvia**, causing a **huge blaze and damaging** four Il-76 military transport planes,

- The **airport in the Pskov region** suffered the most damage in the overnight attacks. Other regions hit were Oryol, Ryazan, Bryansk and Kaluga,

Some details about Russia:

- Russia is a country spanning **Eastern Europe and Northern Asia**. It is the **largest country in the world by area**, extends across **eleven time zones**, and shares **land boundaries with fourteen countries** Azerbaijan, Belarus,
 - **China, Estonia, Finland, Georgia, Kazakhstan, North Korea, Latvia, Lithuania, Mongolia, Norway, Poland, and Ukraine**
 - It is the **world's ninth-most populous country** and **Europe's most populous country**. It has the **world's fourth-longest coastline**, of over 37,653 km
-

Topic 39. US INK NEW PACT WITH PALAU OVER MARITIME SECURITY

Important for the subject: International relations

The United States has signed a new agreement with Palau, The United States has **signed a new agreement with Palau**, which gives **American ships the authorisation to unilaterally enforce maritime regulations** in the tiny Pacific Island nation's exclusive economic zone.

- In the agreement, **the US Coast Guard ships can enforce regulations inside Palau's exclusive economic zone** on behalf of the nation **without a Palauan officer present**.
- This agreement **helps Palau monitor its exclusive economic zone, protect against illegal, unreported, and unregulated fishing, and deter uninvited vessels from conducting questionable maneuvers** within its water.
- The partnership **will help toward achieving the common goal of peace and prosperity in the region**.
- The agreement comes as both the U.S. and China are seeking to expand their influence in the Pacific, and follows pleas from Palau's president for Washington's help to deter Beijing's "unwanted activities" in its coastal waters.

Some facts about Palau:

- Palau is an **island country** in the **Micronesia sub-region of Oceania** in the western Pacific.
- The republic consists of approximately **340 islands and has a total area of 466 sq kms**, making it one of the smallest countries in the world.
- The Capital of Palau is **Ngerulmud**.
- Having voted in a **referendum against joining the Federated States of Micronesia in 1978**, the **islands gained full sovereignty in 1994** under a **Compact of Free Association with the United States**.
- Politically, Palau is a **presidential republic in free association** with the United States, which **provides defense, funding, and access to social services**.

Topic 40. ANOTHER COUP IN GABON

Important for the subject: International Relations

Soldiers in Gabon had seized power and appointed the republican guard chief as head of state.

- Gen. Brice Clotaire Oligui Nguema had been "unanimously" designated president of a transitional committee to lead the country.
- Another coup was attempted in Gabon in 2019, but it was overpowered.

Some facts about Gabon:

- The **Republic of Gabon** is **positioned at the Equator** in West-Central Africa, with its **borders extending to the Atlantic Ocean**. The capital city **Gabon is Libreville**.
- Its **neighboring countries** encompass **Equatorial Guinea and Cameroon** to the north,

and the **Republic of the Congo** to the east and south.

- Gabon was a **former French Colony** and **gained independence from France on August 17, 1960**. Languages spoken in Gabon are **French (official)** and a **variety of Bantu languages**.
- Gabon employs the **Central African CFA franc (XAF)** as its currency, In terms of religion, the **majority of Gabon's populace identifies as Christian**, while a **minority adheres to Islam**, and a smaller segment follows traditional beliefs.
- The **Ogooué river** is the **largest watercourse in Gabon**. Gabon is blessed with mineral resources such as petroleum, manganese and iron, as well as high-quality forest resources.
- In 2010, the petroleum industry accounted for 46.4 percent of the GDP, giving Gabon one of the highest income levels among African countries.
- However, it is predicted that the petroleum will be depleted in the mid-term, and so the government is aiming to create an economy free of dependence on petroleum.

Topic 41. INDIA AND EU DIFFER ON ICAO'S GREEN FUEL FRAMEWORK

Important for the subject :International relations

International Civil Aviation Organisation (ICAO) is developing a global framework to mandate the use of green fuel in international flights.

ICAO is in the process of drafting a global framework that **proposes quantifiable targets** for adoption of **sustainable aviation fuel (SAF)** and lays down pathways to promote its use. The move follows ICAO's adoption of long term aspirational goal of net **zero carbon emission by 2050**.

- The global framework that is now under consideration is expected to come up for approval at a high level **civil aviation ministerial conference** in Dubai in November.
- According to a draft proposal, the global framework will comprise **four building blocks**:
- policy and planning, regulatory mechanism, implementation support and financing for development and deployment of SAF.
- While **Europe is in favour** of an ambitious policy, **India** and a few other countries such as Ethiopia, Nigeria and Saudi Arabia are **questioning the idea of quantifiable targets** without corresponding access to funds and technology to produce SAF.
- In India the government has considered **one per cent blending of SAF** with jet fuel by **2025**.
- But currently SAF production in India is **in planning stages only**. The government is worried that any ambitious target laid down by ICAO could thus hurt our carriers and lead to an increase in costs and airfares.
- **SAF** is a **waste-derived aviation fuel** made from various sources such as used **cooking oil, agricultural waste, fats or non-food crops**. It can be blended with conventional jet fuel to reduce carbon emissions.

International Civil Aviation Organisation (ICAO)

- The International Civil Aviation Organization is a **specialized agency of the United Nations** tasked with the planning and development of safe international air transport.
- The International Civil Aviation Organization (ICAO) **creates regulations** for aviation safety, security, efficiency and regularity and environmental protection.
- The organization also regulates **operating practices and procedures** covering the technical field of aviation. This collection ensures smooth air transportation and border crossing procedures.
- ICAO assists the member states of the **Chicago Convention (Convention on International Civil Aviation, 1944)** as they cooperate here to adopt standards, practices, and policies for international civilian flight.

Topic 42. CULTURE CORRIDOR AT G20 LEADERS' SUMMIT IN DELHI

Important for the subject: International Relations

A culture corridor showcasing the **art, craft and heritage of all the G20 nations and guest countries** would be shown at the G20 leaders' summit to be held in New Delhi.

The corridor would have **both physical and digital components**.

- The **digital repository would include 3D replicas** of national treasures nominated by **each of the G20 countries**,
- Each of the G20 member States had **nominated one artefact** showcasing their culture for a digital exhibition which would be showcased at the culmination.

More about Bharat Mandapam:

- The Bharat Mandapam is the **international exhibition-cum-convention centre (IECC)** complex. It is **developed as a national project**.
- It is the new **convention complex** that will help **showcase and promote India as a global business destination**.
- The **term Bharat Mandapam** derives its **root from Lord Basaveshwara's idea of Anubhav Mandapam**, which was a pavilion for public ceremonies.
- The IECC complex has been developed as **India's largest MICE** (meetings, incentives, conferences, and exhibitions) destination.
- The **shape of the building is derived from the Shankha (conch shell)**. The **different walls and facades** of the centre depict **several elements of India's traditional art and culture including 'Surya Shakti', 'Zero to ISRO' and Pancha Mahabhuta**.

What is G20 Summit:

- **G-20** was a **group of finance ministers and central bank governors from 19 individual countries and the European Union**.
- It was **established in 1999** and was **elevated to a forum of Heads of Government in 2008** to effectively **respond to the global financial crisis of 2008**.
- G-20 is a forum, **not a legislative body** and its **agreements and decisions have no legal**

impact, but they do influence countries' policies and global cooperation.

- The G20 membership accounts for **Two-thirds** of the **world's population**, **85%** of global **gross domestic product**, **80%** of **global investment** **75%** of **global trade**.
- Contribute **79%** of the **world carbon emissions** G20 **does not have any permanent secretariat** or headquarters. The **G20 Summit** is formally known as the “**Summit on Financial Markets and the World Economy**”.

Topic 43. BRICS EXPANDS FROM 5 TO 11

Important for the subject: International Relations

Leaders of the BRICS decided to expand the grouping and **admit six new members**.

- BRICS member countries declared expansion of the grouping by welcoming six new countries into the fold.
- **Saudi Arabia, Iran, UAE, Egypt, Ethiopia and Argentina** will become part of BRICS with effect from **January 1, 2024**.

More about 15th BRICS Summit:

- The 15th BRICS Summit was **scheduled to be held in Johannesburg, South Africa**.
- The **theme of the Summit** was “**BRICS and Africa: Partnership for Mutually Accelerated Growth, Sustainable Development, and Inclusive Multilateralism**”
- This was the **first in-person summit since 2019**, the COVID19 pandemic and Russian invasion of Ukraine.

What's the big item on the agenda:

- The main items on the agenda were to attract attention for their potential for a greater **geopolitical consolidation** of the grouping, and a **plan to expand the membership of BRICS**.
- **Over 40 countries** have expressed **interest in joining BRICS**, and at least **19** have **formally applied** for membership such as **Argentina, Mexico from Latin America; Nigeria, Algeria, from Africa; Saudi Arabia, UAE, from West Asia; Kazakhstan from Central Asia; Bangladesh and Afghanistan from South Asia**.
- The leaders also took forward the earlier talks on **intra BRICS trading in national currencies**,

What is BRICS:

- BRICS is an **acronym** for the **grouping of the world's leading emerging economies**, namely **Brazil, Russia, India, China, and South Africa**.
- In **2001**, the British Economist **Jim O'Neill** coined the **term BRIC** to describe the **four emerging economies of Brazil, Russia, India, and China**.
- The grouping was **formalized** during the **first meeting of BRIC Foreign Ministers'** in **South Africa** was invited to join BRIC in **December 2010**, after which the group adopted

the acronym BRICS

Some Facts about BRICS:

- BRICS is an important grouping bringing together the major emerging economies from the world, comprising:
- **41% of the world population.**
- **24% of the world GDP Over 16% share in world trade.**
- **Total combined area of 29.3% of the total land surface of the world**

What are Few Initiatives of the BRICS:

New Development Bank:

- During the **Sixth BRICS Summit in Fortaleza (Brazil) in 2014**, the leaders **agreed** to set up NDB.
- The NDB became **fully operational in 2016** with **headquarters** established in **Shanghai**.
- Each member holds an **equal amount of shares 20%** in the NDB.

Contingent Reserve Arrangement:

- In **2014**, the BRICS governments had signed a treaty on the setting up of the **contingent reserve arrangement**
- The arrangement is aimed at **forestalling short-term balance of payments pressures, providing mutual support and strengthening financial stability** of the BRICS nations.

BRICS Payment System:

- BRICS countries are trying to create a **payment system** as an **alternative** to the **SWIFT payment system**.
- This has taken on a new urgency as **post Ukraine war**, Russia has been frozen out of SWIFT.

Customs Agreements:

- Customs agreement were **signed to coordinate and ease** trade transport between BRICS countries

Launched of Remote Sensing Satellite:

- A Remote Sensing constellation of satellites has been launched – with **6 satellites including 2 from India, 2 from China, 1 from Russia, and 1 Brazil-China collaboration**

Topic 44. UNDERSTANDING CURBS ON RICE EXPORTS

Important for the subject: Economy

Introduction

In an effort to stabilize domestic rice prices and ensure food security, the Indian government has introduced measures that **restrict rice exports**.

Rice Production Estimate

- During the **Rabi season of 2022-2023**, rice production witnessed a **decline of 13.8%**, resulting in a **total production of 158.95 lakh tonnes**.
- The Kharif sowing area expanded to **cover 384.05 lakh hectares**, although concerns arise about potential delays in **Tamil Nadu** due to a **deficient southwest monsoon**.
- The looming **possibility of El Niño** introduces the potential for increased paddy prices, which have already risen from ₹27 to ₹33 per kg over the past year.

Rice Export Scenario

- India stands as the **dominant player in global rice exports**, contributing a **substantial 45% of the total market share**.
- Notably, **exports during April-May 2023** have **surged** by a remarkable 21.1% year-on-year.
- The **Basmati rice segment** experienced a 10.86% **increase** in exports for May, while non-Basmati rice also saw a substantial rise of 7.5%.
- Remarkably, these export figures **remained strong despite the imposition of a 20% duty on exports** and the **prohibition of broken rice exports** since the previous September.

Impact on Indian Farmers

- The government's move to **raise the Minimum Support Price (MSP)** serves to provide a more favorable income for rice farmers.
- Additionally, the curbs on exports work towards stabilizing domestic rice prices, assuring a **sustained availability of this essential commodity**.

Views of Exporters

- Despite the implementation of a 20% export duty, **Indian par-boiled rice** retains its competitive edge in the global market.
- Some rice-exporting nations, such as **Indonesia**, have **shifted** from being **exporters to importers** due to **heightened international demand**.
- Exporters advocate for a more **nuanced export classification** that **accommodates both common and specialty rice varieties**.
- They also recommend **safeguarding unique rice strains** recognized under **Geographical**

Indication (GI) (12 in total) from market interventions.

Significance of Broken Rice

- It is often used in the manufacture of **feed for very young animals and for pets**. Further, it is used for all types of livestock and is particularly suitable **due to its rich caloric value and low fiber content**.
- It is also used in the **brewing industry**, where it is mixed with barley and the production of **arak (aniseed alcoholic drink, distilled, colorless drink)**.
- It is a raw material for **rice flour, used in baby food, breakfast cereals, rice wine, rice liqueur, sake, and prepackaged and canned foods**.

Agricultural and Processed Food Products Export Development Authority (APEDA)

- Established in December **1985** under the **Agricultural and Processed Food Products Export Development Authority Act (APEDA Act, 1986)**, replacing the **Processed Food Export Promotion Council (PFEPCC)**. Works under the **Ministry of Commerce & Industry**.

Functions assigned by the APEDA Act:

- Develop industries for **the export** of scheduled products through financial assistance, surveys, joint ventures, and subsidies. Register exporters of scheduled products.
- Set **standards and specifications** for export products. Inspect meat and meat products to ensure quality. Improve packaging for scheduled products.
- Promote export-oriented production and development of **scheduled products**. Collect statistics from factories, establishments, etc. Provide training in various aspects of related industries.

Monitored Products

APEDA oversees export promotion and development for a range of products, including:

- Fruits, Vegetables, and their Products
- Meat, Poultry, and their Products
- Dairy Products
- Confectionery, Biscuits, and Bakery Products
- Honey, Jaggery, and Sugar Products
- Cocoa and its Products, Chocolates
- Alcoholic and Non-Alcoholic Beverages
- Cereal and Cereal Products
- Groundnuts, Peanuts, and Walnuts
- Pickles, Papads, and Chutneys
- Guar Gum
- Floriculture and Floriculture Products

- Herbal and Medicinal Plants
- De-oiled Rice Bran, Green Pepper in Brine
- Cashew Nuts and Derivatives
- **Basmati Rice**
- Also monitors the **import of sugar**.

Additional Roles

- Manages the **National Accreditation Board (NAB)** for certifying organic products under the **National Programme for Organic Production (NPOP)** standards.
- Additional responsibilities for **Cashew Kernels, Cashewnut Shell Liquid, and Cardanol** were added as per DGFT Notification No. 6/2015-2020 (effective June 14, 2021).

Topic 45. RBI FLAGS CONCERNS OVER A FEW URBAN COOPERATIVE BANKS

Important for the subject :Economy

RBI Governor notes concerns and vulnerabilities for some urban cooperative banks.

RBI Governor noted that while the Urban **Cooperative Bank (UCB)** sector has shown improved financial performance at an aggregate level in recent times, concerns and vulnerabilities were seen for certain individual entities.

The major observations were as follows:

- There is a need for the UCBs to **strengthen financial and operational resilience** to contribute to the overall financial and banking sector stability. **Quality of governance** is the most important aspect in ensuring stability of individual banks.
- Directors of UCBs should strengthen governance practices, especially the three supporting pillars of **Compliance, Risk Management, and Internal Audit**.
- The board's involvement in upholding **rigorous credit risk management** is very important.

This includes:

- Robust **underwriting standards**, effective **post-sanction monitoring**, timely **recognition and mitigation of incipient stress**, rigorous **follow up of large NPA borrowers** for effective recovery, and maintaining **adequate provisioning**.
- Recently **RBI has started engaging with the directors of its regulated entities(RIs)** functioning in different segments of the financial system. Two separate conferences with Directors on Boards of Public Sector Banks and Private Sector Banks have been held this year.

Urban Cooperative banks (UCB)

- The term Urban Cooperative Banks (UCBs) is not formally defined but refers to primary

cooperative banks located in urban and semi-urban areas.

- Cooperatives Banks are established on a cooperative basis to deal with the ordinary banking business.
- They are registered under the Cooperative Societies Act of the State concerned or the Multi-State Cooperative Societies Act, 2002.

The Co-operative banks are governed by:

- Banking Regulations Act, 1949
- Banking Laws (Co-operative Societies) Act, 1955.
- Since 2020 RBI has brought the revised **Supervisory action Framework (SAF)** for UCBs.
- It entails initiation of corrective action by UCBs and/or supervisory action by the Reserve Bank on breach of the specified thresholds (triggers) in respect of the specified financial parameters/indicators, namely:
- If Capital to Risk-weighted Assets ratio (CRAR) falls below **9 per cent**. If net non-performing assets (NNPAs) exceed **6 per cent** of its net advances.
- In June 2020, the Central government approved an Ordinance to bring all urban and multi-state cooperative banks **under the direct supervision of RBI**.

In 2022 RBI has announced 4 tier regulatory framework for categorization of UCBs:

- Tier 1: UCBs having deposits up to Rs 100 crore.
- Tier 2: UCBs of deposits between Rs 100 crore and Rs 1,000 crore
- Tier 3: UCBs of deposits between Rs 1,000 crore and Rs 10,000 crore
- Tier 4: UCBs of deposits more than Rs 10,000 crore.

Topic 46. SEBI NEW DISCLOSURE NORMS MAY IMPACT OVER 200 FPIs

Important for the subject : Economy

Over 200 foreign portfolio investors will be impacted by the Securities and Exchange Board of India's new disclosure norms that are set to become operational from November 1 2023.

- Securities and Exchange Board of India (Sebi) has **mandated additional disclosures** for foreign portfolio investors (**FPIs**) **that hold a significant part** of their Indian equity holdings in a **single** corporate group. The new rules were formulated following the Hindenburg-Adani case.

Additional norms related to disclosure of beneficial owners for:

- FPIs holding more than **50 per cent of their Indian equity assets** under management (AUM) in a **single** Indian corporate group or Those that individually, or along with their investor group, hold **more than ₹25,000 crore** worth of Indian stocks.

Exemptions:

- FPIs having a **broad based, pooled structure with widespread investor base**, ownership interest by **government or government related investors**, may not pose significant systemic risk and hence **have been exempted** from the additional disclosure norms.
- Exempt entities include **sovereign wealth funds, public retail investment groups, and exchange-traded fund (ETF). Exchange-Traded Fund (ETF)**
- An **Exchange-Traded Fund (ETF)** is a type of investment fund that is traded on stock exchanges, **aiming to replicate the performance of a specific index**, commodity, or asset class. They are by definition broad based, as their allocation will be similar to the index composition, hence they do not pose systemic risk.

Sovereign wealth fund (SWF)

- A **sovereign wealth fund (SWF)** is a state-owned investment fund that manages a country's reserves, typically consisting of foreign exchange reserves, surplus funds from trade, and revenue generated from commodities like oil or minerals.
- Sovereign wealth funds are designed to preserve and grow a country's wealth for future generations or to support various economic objectives. SWFs typically invest in a **diverse range of assets**, including stocks, bonds, real estate, infrastructure projects, and alternative investments.

Public retail investment groups

- **Public retail investment groups** are organizations or companies that provide investment products and services to individual retail investors.
- These groups offer a range of investment options that are accessible to the general public and often include various types of financial instruments such as stocks, bonds, mutual funds, exchange-traded funds (ETFs), real estate investment trusts (REITs), and more.
- Examples of well-known public retail investment groups include brokerage firms, mutual fund companies, and online investment platforms.

Affected FPIs:

- There are 227 FPIs with over 50 per cent of their equity investments in a single stock or group of NSE listed companies.
- FPIs holding over 50 per cent of their equity AUM in a single Indian corporate group have 10 trading days to bring down their holdings.
- Those with over ₹25,000 crore of equity AUM in Indian equities have 90 calendar days to do so.

Disclosures:

- Investors need to make additional disclosures regarding persons having any **ownership, economic interest, or control**.
- The key aspects to look at would be **if these FPIs are set up in FATF compliant**

jurisdictions, if the funds are coming through banking channels, and whether these investors have complied with the SEBI requirements and the internal restricted countries lists.

Why did SEBI bring these changes?

- SEBI has apprehensions about circumvention of **FDI and listing norms, takeover code, insider trading and round tripping norms.**
- Adani Hindenburg case brought to focus areas needing regulatory overhaul. Hindenburg's research report alleged that Adani engaged in stock manipulation and accounting fraud by using FPI's as company fronts.
- Certain FPIs have been observed to hold a concentrated portion of their equity portfolio in a single investee company/corporate group.
- Such concentrated investments raise the concern and possibility that promoters of such investee companies/corporate groups, or other investors acting in concert, could be using the FPI route for circumventing regulatory requirements.

Topic 47. PMJDY ACCOUNTS SURPASS 50 CRORE, DEPOSITS TOUCH ₹2 LAKH CR

Important for the subject: Economy

PMJDY Achievements and Deposits

PM Jan Dhan Yojana (PMJDY) celebrates **nine years**, crossing **50 crore bank accounts**.

Launched on **August 28, 2014**, with the aim of **financial inclusion for all**. Total deposits in PMJDY accounts exceed **₹2 lakh crore**. The scheme focuses on providing access to **banking facilities, credit, insurance, and pension to the excluded sections**.

Six Pillars of the Scheme

- **Universal access to banking services:** Branch and Banking Correspondent's.
- **Overdraft Facility:** Basic savings bank accounts with an overdraft facility of Rs. 10,000/- to every eligible adult.
- **Financial Literacy Programme:** Promoting savings, use of ATMs, getting ready for credit, availing insurance and pensions, and using basic mobile phones for banking.
- **Creation of Credit Guarantee Fund:** To provide banks with some guarantee against defaults.
- **Insurance:** Accident cover up to Rs. 1,00,000 and life cover of Rs. 30,000 on account opened between 15 Aug 2014 to 31 January 2015. **Pension scheme** for Unorganized sector.

Promoting Micro Insurance and Financial Literacy

- The **Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)** and **Pradhan Mantri Suraksha Bima Yojana** are key micro insurance schemes.

- Focus on **persuasion**, not compulsion, through financial literacy camps and awareness drives.
- Coordination with field-level ministries, such as **Anganwadi and Asha workers**, for better outreach.
- Exploration of databases like the **E-Shram portal** to identify uncovered individuals for scheme benefits.

Enhancing Financial Services Access and Digital Payments

- Significant drop in **zero balance accounts** from **58% (March 2015) to 8%**, indicating **increased usage**.
- Efforts to enhance infrastructure for digital payments through **Rupay cards and UPI**.
- Over 34 crore account holders issued Rupay cards for digital transactions. **Overdraft Facility and Demographic Breakdown 32 lakh account holders utilized overdraft facilities**, amounting to **₹370 crore**.
- **The overdraft limit was raised from ₹5,000 to ₹10,000** in August 2018, providing more financial flexibility.
- **The age limit** for overdraft was extended from **60 to 65 years**, benefiting a broader demographic.
- **Demographic breakdown: 56% women account holders, 67% accounts in rural and semi-urban areas**, bringing financial services to underserved regions.

Topic 48. FUNDS CRUNCH: BANKS AND NBFCS RUSH TO THE MONEY MARKET

Important for the subject: Economy

Banks raising short term finance due to liquidity crunch caused by the incremental CRR (I-CRR) norm.

- Liquidity tightening in the banking system following the introduction of the incremental CRR (I-CRR) has prompted banks and NBFCS to raise short-term funds from money markets to manage their immediate fund requirements.
- Apart from liquidity shortage in the banking system caused by ICRR and GST collections, robust credit growth is further making it necessary to secure short term funds.
- Funds are being raised via certificates of deposit (CDs) and bulk deposits. CD rates have gone up by about 10-15 bps in the last fortnight. Banks will be paying much more than CD rates for high value bulk deposits.
- The situation is expected to last till the end of September when government spending kicks in.

Certificate of Deposit (CD)

- A Certificate of Deposit (CD) is a financial instrument issued by banks and financial institutions **to raise funds from the public**.
- It's a **fixed-term deposit** that offers a higher interest rate compared to regular savings

accounts. CDs **cannot be withdrawn before maturity** without incurring a penalty.

- They **are tradable and can be sold in the secondary market** before maturity. The minimum deposit amount and the tenure of CDs can vary among banks.
- Certificate of Deposits (CDs) typically offer higher returns than savings deposits due to several factors:
- Fixed Term and Illiquidity: CDs have a fixed term or maturity period, during which the deposited amount remains locked. Since the **funds are illiquid until the maturity date, banks can offer higher interest rates** as they can use these funds for longer-term lending or investment activities.
- Lower Liquidity Risk: Since customers can't easily withdraw funds from a CD before maturity without incurring penalties, **banks have more certainty about the availability of funds for a longer period**. This reduced liquidity risk allows banks to offer higher interest rates.
- Market Rates: Interest rates on CDs are **more influenced by market conditions and the prevailing interest rate environment**. When market interest rates are higher, banks may offer higher rates on CDs to attract funds.
- Investment Options: Banks often **invest the funds obtained through CDs in longer-term assets**, such as loans, mortgages, or bonds. These investments can **potentially generate higher returns**, which banks can then pass on to CD holders in the form of higher interest rates.

Topic 49. CYCLONE FREQUENCY MAY RISE OVER INDIAN COAST FROM THE WARMING OF PACIFIC: STUDY

Important for the subject: Geography

Tropical cyclones that originate near the **Equator**, while being devastating, have been unusually subdued in recent decades.

The last major cyclone of this kind in the Indian neighborhood was the **2017 Cyclone Okchi** which devastated **Kerala, Tamil Nadu and Sri Lanka**.

Rising cyclone frequency near equator:

- A combination of **global warming** and a **cyclical event** called the **Pacific Decadal Oscillation (PDO)** that repeats every **20-30 years**, could make such cyclones more frequent in the coming years, according to a study.
- The number of such **equatorial-origin cyclones** was **43% fewer in 1981-2010** compared with **1951-1980**.
- This was because the **PDO** was in a **'warmer' or positive phase**. In **2019**, the **PDO** entered a **cooler, negative phase** and if it remains so, could mean **more tropical cyclones** in the **post-monsoon months** that **originate near the equator**.
- It's usually rare for cyclones to form near the Equator but when the waters are warm, they can gain more moisture and rise in intensity. An **El Nino** is currently developing in the **Pacific**, the effects of which are already manifested in central and southern India, which

have recorded rainfall deficits of 7% and 17% respectively.

- **ENSO** with a **positive PDO** is generally **not good**, but when linked with a **negative PDO**, brings more rain to India.

What is Pacific Decadal Oscillation (PDO):

- The **PDO** is often described as a **long-lived El Niño-like pattern** of **Pacific climate variability**.
- When **Sea Surface Temperatures (SSTs)** are **anomalously cool** in the **interior North Pacific** and **warm** along the **Pacific Coast**, and when **sea level pressures** are **below average** over the **North Pacific**, the **PDO** has a **positive value**.
- When the climate anomaly patterns are reversed, with **warm SST anomalies** in the **interior** and **cool SST anomalies** along the **North American coast**, or above average sea level pressures over the **North Pacific**, the **PDO** has a **negative value**.

Difference between ENSO cycle and Pacific Decadal Oscillation (PDO) ENSO PDO

- A warming of the **Central Equatorial Pacific**, called an **El Nino**, frequently corresponds to **reduced rainfall over India** whereas **cooler-than-normal temperatures**, or a **La Nina**, is linked to **excessive rainfall**.
- This pattern collectively called the **El Nino Southern Oscillation (ENSO) phenomenon**, repeats in the **Pacific over two-seven years**.
- **PDO** is a **long-term ocean fluctuation of the Pacific Ocean**, which waxes and wanes approximately every 20 to 30 years.
- The **PDO** isn't an annual occurrence and, on average, corresponds to a **warmer than average Western Pacific Ocean** and relatively **cooler Eastern Pacific**, though this plays out over much longer time scales.
- The stage of ENSO cycle can be determined any year a '**positive**' or '**warmer phase**' of a **PDO** can be known only after several years of measuring ocean temperatures and their interaction with the atmosphere. ENSO cycles typically only last 6 to 18 months. The PDO can remain in the same phase for 20 to 30 years

Similarities between ENSO and PDO:

- Just like **El Nino/La Nina** in the **tropical Pacific**, **PDO** has a significant impact on the **sea surface temperatures** and its **interaction with the atmosphere**, which in turn affects the **northeast Indian summer monsoon**.
- The **PDO**, like **ENSO**, consists of a **warm and cool phase** which alters upper-level atmospheric winds. **PDO** can **intensify** or **diminish** the **impacts of ENSO** according to its phase.
- If both **ENSO** and the **PDO** are in the same phase, it is believed that **El Niño/La Nina impacts may be magnified**. Conversely, if **ENSO** and the **PDO** are **out of phase**, it has been proposed that they may **offset one another**, preventing "**true**" **ENSO impacts** from occurring.

Topic 50. MAHARASHTRA CONSIDERS ARTIFICIAL RAINS TO TACKLE DEFICIENT MONSOON

Important for the subject: Geography

The State government is considering **cloud seeding** to tackle **deficient rainfall** in parts of Maharashtra, hoping that **artificial rain could save kharif crops** and also **address depleted water levels in dams**.

The **government of India** had made it clear that **artificial rain making techniques involving cloud seeding cannot be used for bringing rain clouds to rainfall deficit/drought areas**.

- These techniques **can only induce potential pre-existing clouds**, already passing over a given place, to produce enhanced quantum of rain.

Artificial rains or Cloud seeding:

- Cloud seeding is a type of **weather modification** that **aims** to change the amount or type of precipitation that falls from clouds by dispersing substances into the air that serve as cloud condensation or ice nuclei, which alter the microphysical processes within the cloud.
- Its effectiveness is debated; some studies have suggested that it is difficult to show clearly that cloud seeding has a very large effect.
- The usual **objective** is to **increase precipitation (rain or snow)**, either for its own sake or to prevent precipitation from occurring in days afterward.

Mechanism:

- The most common **chemicals** used for **cloud seeding** include **silver iodide, potassium iodide and dry ice (solid carbon dioxide)**.
- **Liquid propane**, which expands into a gas, has also been used. This can produce **ice crystals at higher temperatures than silver iodide**.
- After promising research, the use of **hygroscopic materials**, such as **table salt**, is becoming more popular.
- When **cloud seeding, increased snowfall takes place** when **temperatures** within the clouds are between **-20 and -7 °C**.
- Introduction of a substance such as **silver iodide**, which has a **crystalline structure similar to that of ice**, will induce freezing nucleation.

Electric charges:

- Since 2021, the **United Arab Emirates** has been using a new technology: **drones equipped with a payload of electric-charge emission instruments and customised sensors** fly at low altitudes and deliver an electric charge to air molecules.

- This method produced a significant rainstorm in July 2021.

Infrared laser pulses:

- An **electronic mechanism** was tested in **2010**, when **infrared laser pulses** were directed to the air above **Berlin** by researchers from the **University of**

Geneva.

- The experimenters posited that the **pulses would encourage atmospheric sulfur dioxide** and **nitrogen dioxide** to form particles that would then act as seeds.

Applications of Cloud Seeding:

- **Creation of Rain:** Cloud seeding is the best way to consider improving rainfall quantity in case of inadequate rainfall. Arid areas usually have conditions that may be harsh in terms of food security and a conducive environment for living.
- Cloud seeding can bring rain, which makes the natural environment flourish and becomes more habitable.
- **Boosting of the Economy:** Agricultural production is important to the local economies of many regions around the world. Rain is important in achieving a proper harvest.
- **Weather Regulation:** Cloud seeding provides an avenue for controlling prevailing weather conditions in different areas.
- **Geographically oriented:** Cloud seeding is primarily done to create certain conditions in specific areas, also termed as microclimates. Places like airports, for instance, often use cloud seeding to create a stable condition for their runway. This is to ensure that planes are not restricted from taking off or landing.

Concerns:

- Some **chemicals are potentially harmful** to the natural environment and the plants which depend on the **contaminated rain to produce food**. Cloud seeding is a **very expensive process**.
- Cloud seeding could have many **dire consequences to the environment** if not well regulated.
- Dry areas are not usually well-positioned to handle certain weather conditions, and thus, may become easily flooded and cause more harm to the already struggling environment.
- For cloud seeding to be successful, **certain uncontrollable conditions have to be met**. for example:
 - Clouds have to be present, not just any cloud but clouds capable of producing rain.
 - The atmospheric conditions must also suit the process as certain conditions could lead to an unwarranted result like the rain falling in a different location or not falling at all.

Topic 51. INDIA AND THE NORTHERN SEA ROUTE

Important for the subject :Geography



Murmansk, popularly called the **capital of the Arctic region** and the beginning point of the Northern Sea Route (NSR), is witnessing the **rising trend of Indian involvement in cargo traffic.**

- In the first seven months of 2023, **India got the lion’s share with 35% of eight million tonnes of cargo handled by the Murmansk port**, which is about 2,000 km northwest of Moscow.

Why is the Arctic region significant to India ?

- **Arctic region:** above the Arctic Circle and includes the Arctic Ocean with the North Pole at its centre.
- The region constitutes the **largest unexplored prospective area for hydrocarbons** remaining on the earth. It is estimated that the **region may hold over 40 percent of the current global reserves of oil and gas.**

There may also be significant reserves of coal, zinc and silver.

- The **Indian government’s Arctic Policy of 2022** mentions that the **country’s approach to economic development** of the region is guided by **UN Sustainable Development Goals.**

How old is India’s engagement with the Arctic?

- **India’s engagement with the Arctic** can be traced to the signing of the **Svalbard Treaty in February 1920 in Paris.**

- India's engagement in the Arctic encompasses atmospheric, biological, marine, hydrological and glaciological studies.
- India has set up a research station Himadri at Ny-Ålesund, Svalbard, in 2008. In May 2013, India became an observer-state of the Arctic Council along with five others including China.
- India launched its inaugural multi-sensor moored observatory and northernmost atmospheric laboratory in 2014 and 2016 respectively.
- Till last year, thirteen expeditions to the Arctic were successfully conducted.

What is NSR?

- The Northern Sea Route (NSR), the shortest shipping route for freight transportation between Europe and countries of the Asia-Pacific region, straddles four seas of the Arctic Ocean.
- Running to 5,600 km, the Route begins at the boundary between the Barents and the Kara seas (Kara Strait) and ends in the Bering Strait (Provideniya Bay).
- The distance savings along the NSR can be as high as 50% compared to the currently used shipping lanes via Suez or Panama.

How is Russia making the NSR navigable ?

- As the seas of the Arctic Ocean remain icebound during most of the year, the icebreaking assistance is organized to ensure safe navigation along the NSR.
- Russia is the only country in the world with a nuclear-powered icebreaker fleet.
- In December 1959, the world's first nuclear icebreaker, "Lenin," was put into operation. It was decommissioned 30 years later. Today, FSUE Atomflot, a subsidiary of Rosatom, acts as the fleet operator of nuclear-powered icebreakers.

What are the driving factors for India to participate in the NSR development?

- The growth in cargo traffic along the NSR is on the constant rise and during 2018-2022, the growth rate was around 73%.
- The NSR, as a transit route, assumes importance, given India's geographical position and the major share of its trade associated with sea transportation.
- The Chennai-Vladivostok Maritime Corridor (CVMC) project, an outcome of the signing of the memorandum of intent between the two countries in September 2019.
- The 10,500 km-long CVMC, passing through the Sea of Japan, the South China Sea and Malacca Strait, will bring down transport time to 12 days, almost a third of what is taken under the existing St. Petersburg-Mumbai route of 16,000 km.
- A study commissioned by Chennai Port Trust reveals that coking coal [used by steel companies], crude oil, Liquefied Natural Gas (LNG) and fertilisers are some of the cargo that can be imported from Russia to India through CVMC.
- Experts are discussing the possibility of China and Russia gaining collective influence over the NSR.

Topic 52. WHAT IS ANORTHOSITE AND WHAT IS SO SPECIAL ABOUT IT?

Important for the subject: Geography

The lunar surface has ‘**Anorthosite**’ [a type of intrusive igneous rock] type of soil.

What is anorthosite?

- The term **anorthosite** was introduced by **T.S. Hunt (1863)**. **Anorthosites** are rocks dominated by **plagioclase feldspars**. Feldspars, together with quartz, are the most common rock forming minerals.

The family of feldspars has three “extreme” members:

- K-containing orthoclase or microcline (KAlSi_3O_8) Na-containing albite ($\text{NaAlSi}_3\text{O}_8$), and Ca-containing anorthite ($\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$) The mixture of albite with anorthite is creating the **family of plagioclase feldspars**. **Anorthosites** are **igneous rocks** consisting of **90%** or more **plagioclase feldspar**.

Categorized into six basic types:

- Archean megacrystic anorthosites, Proterozoic (massif-type) anorthosites, Anorthosites of layered mafic complexes, Anorthosites of oceanic settings, Anorthosite inclusion in other rock types, and Extra-terrestrial anorthosites.

Where is it found?

- Anorthosites dominate some planetary crusts such as that of the **moon** and **mercury**.

On Earth they are abundant in a few places like:

- The Grenville Province of the eastern Canadian Shield (Ashwall 2010), In Norway (Scanofennic Shield), In Greenland, In South Africa and In the center of big tectonic plates, where rocks are really old.
- The **two largest anorthosite complexes in Western Europe** are situated in **Western Norway**: the Inner Sogn-Voss province, and **the Rogaland province**.
- **In India**, this soil is available in abundance in places like **Sithampoondi** and **Kunnamalai villages** surrounding **Namakkal**, and also in some areas in **Andhra Pradesh** and **northern parts of the country**.

Why is it special?

Anorthosite formula: $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$.

- It contains **Aluminium, Silicon and Calcium**, minerals which are high in demand. Aluminum production from **Anorthosite** will **reduce cost, lessen the procedure and reduce CO2 emissions** compared to **Bayer’s process of aluminum extraction from Bauxite mineral**.

Topic 53. PRANAM SCHEME TO REDUCE FERTILISER SUBSIDY BILL***Important for the subject :Schemes***

PM-PRANAM (PM Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth) was launched in the **Union Budget 2023–24** to promote the **balanced use of chemical and alternative fertilisers**, generating awareness of **regenerative agriculture (RA)**.

What is regenerative agriculture (RA)?

- RA is an **outcome-based food production system** that **nurtures and restores soil health, protects the climate and water resources and biodiversity**, and enhances farms' productivity and profitability.
- It is worth noting that the subsidy burden on chemical fertilisers is about **₹2.25-lakh crore** for **FY 2022-23**, which is 39 per cent higher than FY 2021-22's figure (₹1.62- lakh crore).

How can PRANAM help in reducing subsidy?

- PRANAM will help the government reduce subsidy bills and fiscal deficits if it picks up, by reducing the extent of chemical fertiliser use.
- For change to happen the efficacy of alternative fertilisers to enhance crop yield or productivity needs to be proved.
- A **gradual phase-out of subsidies** on chemical fertilisers can stimulate alternative or bio-fertiliser adoption.
- The **retention pricing scheme**, which safeguards chemical fertiliser (urea) manufacturers, can be phased out to promote alternative fertiliser production.

Promoting PRANAM:

- Demonstrating alternative fertilisers on farmer fields is critical, **especially after the Sri Lankan food crisis**, to showcase higher productivity.
- A certification process for such products can help farmers or their organisations realise a remunerative price.
- 10,000 **Bio-Input Resource Centres** are being set up over the next three years, creating a **national-level distributed micro-fertiliser and pesticide manufacturing network**.

The Retention Pricing Scheme (RPS)

- RPS was introduced in November 1977 in the wake of the increase in crude oil prices in the early seventies when the prices of both imported fertilisers as well as fertiliser feedstock (naphtha) increased substantially.
- This led to a decline in the consumption of fertilisers and the government, in order to help build indigenous fertiliser capacity and boost fertiliser consumption set up a **committee under Mr. Marathe**. The outcome of the recommendations of the committee was the

RPS.

The scheme works as follows:

- The selling prices of the fertiliser are **fixed by the government** and so are the retention prices for the producers.
- The **difference** between the **higher retention price** for the producer and the **lower selling prices** are **paid to the producers** by the government.
- These are based on covering the variable cost and fixed costs and giving a **return of 12% on the net worth**. Not all producers are entitled to the same price however.
- The retention price paid varies between plant to plant and depends on the feedstock used (whether naphtha, fuel oil, gas or coal) and takes into account the conversion costs, selling costs, interest on debt, depreciation and capacity utilisation of the plant itself.

Bio-Input Resource Centres

- In order to involve more farmers and enhance the reach of natural farming on a larger scale, Government has formulated the **Natural Mission on Natural**
- **Farming (NMNF)** by up-scaling the **Bharatiya Prakritik Krishi Paddhati (BPKP)** to promote natural farming across the country.
- With NMNF Government proposes to touch 1 crore farmers along the Ganga belt and in other rainfed parts of the country.
- For making easy access to bio- resources like **Jeevamrit, Ghana Jeevamrit, neemastra** etc., Government intends to set up 15,000

Bhartiya Prakritik Kheti Bio-inputs Resources Centres (BRCs):

- To provide farmers adopting natural farming an easy access to bio resources like Jeevaamrit, Ghana Jeevamrit, neemastra etc. wherein cow dung and urine, neem and bio culture play an important role.
- The Bio-inputs Resources Centres (BRCs) to **prepare and supply bioinputs** to facilitate the adoption of natural farming **without individual farmers having to prepare them on their own**, as preparation of bioinputs is a time taking and labour- intensive activity.

Topic 54. GOVERNMENT BRINGS 44 MORE ESSENTIAL DRUGS UNDER PRICE CAP

Important for the subject: Schemes

National Pharmaceutical Pricing Authority (NPPA) has brought 44 new drugs under price control.

The **National Pharmaceutical Pricing Authority (NPPA)** has brought 44 new drugs under price control. These drugs are commonly used for pain management, depression, anxiety, gastro- related ailments, hypertension and several auto immune diseases.

- The move is set to make these drugs cheaper. Manufacturers failing to comply with the

price cap have to return the overcharged amount to the government.

- Drug makers have been asked to mandatorily issue a price list of the drugs to the drug regulator through the **Integrated Pharmaceutical Database Management System (IPDMS)** and submit a copy to state drug controllers and dealers.
- As per the order, the manufacturers **not complying with the regulations** shall be liable to **deposit the overcharged amount** as per the provisions of the **Drugs (Prices Control) Order, 2013** and **Essential Commodities Act 1955**.

NPPA and DPCO 2013:

- The mandate of NPPA is to ensure availability of essential medicines at reasonable prices. The authority has directed every retailer and dealer to display the prices at their business premises so that they are easily accessible to consumers.
- DPCO, 2013 is a **market-based pricing regime** unlike the **Drug Price Control Order, 1995**, which was based on costs.
- Under the DPCO, 2013 pricing regime, ceiling prices of essential medicines are calculated as per the marker price basis (see box).

Criticism of ceiling price?

- By giving unviable ceiling prices, it discourages the production of essential medicines
- As manufacturing medicines like this becomes less profitable, pharma companies are pushed to come up with versions of the medicines that are not covered under the NELM, such as **different strengths of medicines** or **fixed-dose combinations**.

What is the “Drugs (Prices Control) Order (DPCO)”?

- The **Drugs Prices Control Order, 1995** is an order issued by the Government of India under **Sec. 3 of Essential Commodities Act, 1955** to **regulate the prices of drugs**.
- It provides the list of price controlled drugs, procedures for fixation of prices of drugs, method of implementation of prices fixed by Govt., penalties for contravention of provisions etc.
- For the purpose of implementing provisions of DPCO, **powers of Govt. have been vested in National Pharmaceutical Pricing Authority (NPPA)**. Later, the Drugs (Prices Control) Order (DPCO) 2013 was notified.

Are all the drugs marketed in the country under price control?

- No. The **National List of Essential Medicines (NLEM) 2011** is adopted as the primary basis for determining essentiality, which constitutes the list of scheduled medicines for the purpose of price control.
- The DPCO 2013 contains **680 scheduled drug formulations** spread across 27 therapeutic groups. However, the prices of other drugs can be regulated, if warranted in public interest.

What is “Ceiling Price”?

- Ceiling price means a price fixed by the Government for Scheduled formulations in accordance with the provisions of DPCO 2013.
- The ceiling price of a scheduled drug is determined by first working out the **simple average of price to retailer (PTR)** in respect of **all branded-generic and generic versions** of that particular drug formulation having a **market share of 1 percent** and above, and then **adding a notional retailer margin of 16 percent** to it.

Topic 55. GOVT SLASHES LPG PRICES BY ₹200 AND EXPANDS PM UJJWALA YOJANA

Important for the subject: Schemes

In an effort to tame kitchen inflation Government has the lowering of the price of LPG gas by Rs. 200 and expands PM Ujjwala Yojana

The price of domestic LPG (Liquefied Petroleum Gas) has been reduced by 200 with immediate effect for all 33 crore connections.

- Further It has been decided to issue another 75 lakh connections under PM Ujjwala Yojana (PMUY).
- Since May 2020, there has not been a subsidy on LPG cylinders for connection holders except Ujjawala. Even for Ujjawala, ₹200 per cylinder subsidy was announced only in May 2021.
- So now under Ujjwala scheme total subsidy will be Rs. 400 per cylinder, bringing the cost to Rs. 700.
- Ujjawala consumers get subsidies through **Direct Benefit Transfer (DBT)**. This means first, they pay the entire price and a subsidy of ₹200 is transferred to their bank accounts. There is no change in this system. However, an additional ₹200 will be reflected in their price.
- For all other consumers, the cylinder cost will come down, and there is no DBT. For example, a non-subsidised LPG cylinder (14.2 kg) used to cost ₹1,103, now it will cost ₹903.
- Government will shortly start distribution of PMUY connections to 75-lakh women from poor households who do not have an LPG connection. This will increase the total number of beneficiaries under PMUY from **9.6 cr** to 10.35 cr.

PM Ujjwala Yojana:

- Launched in May 2016 to provide LPG (liquefied petroleum gas) connections to poor households.
- During Ujjwala 1.0 launched in 2016, a target was set to provide LPG connections to **5 crore (in 2018 revised to 8 crore) women** members of BPL households.
- In Ujjwala 2.0, **special focus was on migrants**, they will not be required to submit ration

cards or address proof. A self-declaration for both 'family declaration' and as a 'proof of address' will suffice.

What is the criteria for PMUY?

- Under Ujjwala initially the applicant had to be a woman belonging to the BPL household. The household of the applicant should not already own a LPG connection in anyone's name in the household. Subsequently, the **scheme was expanded in April 2018** to include women beneficiaries from **seven more categories (SC/ST, PMAY, AAY, Most backward classes, tea garden, forest dwellers, Islands)**.
- Monthly household income of the BPL family should not exceed a certain level as defined by the state governments and union territories.

Topic 56. THE SCHOLARSHIP SCHEMES FOR RELIGIOUS MINORITIES IN INDIA

Important for the subject : Schemes

The Significance of Education for Religious Minorities Niti Aayog's policy document emphasizes education's significance for religious minorities.

Government's commitment to **inclusive growth and improving implementation of programs.**

Role of education in the socio-economic development of a nation.

- **Scholarships for Religious Minorities' Introduction** Over **30 crore** people from **religious minority communities** in India.
- Focus on **Muslims, Christians, Sikhs, Buddhists, Jains, and Zoroastrians**. Under **Section 2(c) of the National Commission for Minorities Act, 1992** Economic, health, and education challenges faced by Muslims.
- Recognition of **Muslims as the largest religious minority**.

Rajinder Sachar Committee and Ministry of Minority Affairs

- The Rajinder Sachar Committee, commonly referred to as **the Sachar Committee**, examined the **social, economic, and educational standing of Muslims** in India.
- The committee's comprehensive 400-page report highlighted the deprivation and neglect faced by minorities in development dimensions.
- **Ministry of Minority Affairs** was established in **2006** to address issues affecting notified minorities.
- Ministry's **mandate includes policy formulation, coordination, evaluation, and development programs.**

Welfare Schemes

Pre-Matric Scholarship Scheme

- Earlier focus on minority students from classes 1 to 10, now for 9 & 10.

Post-Matric Scholarship Scheme

- **Merit-cum-Means based Scholarship Scheme:** Support for professional and technical courses at undergraduate and postgraduate levels.
- **Maulana Azad National Fellowship (MANF):** Financial assistance for research scholars pursuing M.Phil and Ph.D.
- **PadhoPardesh:** Interest subsidy on education loans for overseas studies.
- **Begum Hazrat Mahal National Scholarship:** Scholarship for meritorious girls' higher education.
- **Naya Savera:** Free coaching for minority students for entrance exams.
- **Nai Udaan:** Supported minority students preparing for competitive exams.

Scheme for Providing Education to Madarsas and Minorities (SPEMM):

- Financial assistance for introducing 'modern' Important for the subjects in madrasas.
- **Pradhan Mantri Jan Vikas Karyakram (PMJVK):** Infrastructure development in minority concentration areas.

Articles 29 and 30:

- **Article 29** protects the interests of minorities by allowing them to conserve their distinct language, script, or culture.
- **Article 30** grants religious and linguistic minorities the right to establish and administer educational institutions of their choice.

Topic 57. THE QUTUB COMPLEX

Important for the subject : History

The Qutub Complex comprises of the following monuments:

1. Qutb Minar
2. Alai Darwaza
3. Quwwat-ul-Islam Mosque
4. Alauddin Khilji's tomb and madrasa
5. Alai Minar

About Qutub Minar:

- Qutub Minar is a **soaring, 73 m-high tower of victory**. It was **built in 1193 by Qutab-ud-din Aibak** immediately after the **defeat of Delhi's last Hindu kingdom**.
- The tower has **five distinct storeys**, each marked by a projecting balcony and **tapers from a 15 m diameter at the base to just 2.5 m at the top**.
- The **first three storeys are made of red sandstone** and the **fourth and fifth storeys are of marble and sandstone**.

- At the foot of the tower is the **Quwwat-ul-Islam Mosque**, the first mosque to be built in India.
- A 7 m-high iron pillar stands in the courtyard of the mosque. **Qutab-ud-din Aibak**, the first Muslim ruler of Delhi, commenced the construction of the Qutab Minar in **1200 AD**, but could only finish the basement.
- His successor, **Iltutmush**, added three more storeys, and in **1368**, **Firoz Shah Tughlak** constructed the fifth and the last storey.
- Qutub Minar and its monuments were **declared a UNESCO World Heritage Site in 1993**.

About the Alai Darwaza

- Ala'i Darwaza is the **southern gateway** of the **Quwwat-ul-Islam Mosque** in Qutub complex,
- It was built by **Sultan Alauddin Khalji in 1311** and is **made of red sandstone**,
- It is a **square domed gatehouse** with **arched entrances** and **houses a single chamber**.
- It has a **special significance in Indo-Islamic architecture** as the **first Indian monument** to be **built using Islamic methods** of construction and ornamentation

About Archaeological Survey of India (ASI):

- It is an **attached office** under the **Department of Culture, Ministry of Tourism and Culture**.
- It was **founded in 1861** by **Alexander Cunningham**— the **first Director-General of ASI**.
- It is the **premier organization** for the archaeological research and protection of the cultural heritage of the nation.
- It **regulates all archaeological activities** in the country as per the provisions of the **Ancient Monuments and Archaeological Sites and Remains Act, 1958**. It also regulates the **Antiquities and Art Treasure Act, 1972**.

Topic 58. ARTISTS BREATHE NEW LIFE INTO SEETHAKALI: REVIVING A FADING FOLK ART

Important for the subject: History

Key Features of Seethakali

Folk Dance Drama: Seethakali is a traditional folk dance drama that was once performed during the festival days in erstwhile **Desinganad** (Kollam, Kerala), primarily during the **Onam festivities**.

Dalit Artists: The performance was carried out by **Dalit artists belonging to the Veda and Pulaya communities**, focusing on presenting **episodes from the Ramayana** from Sita's perspective.

- **Vanayatra to Andardhanam:** Seethakali portrays the journey from “vanayatra” (exile to

the forest) to “andardhanam” (descend into the earth) of Sita, featuring a blend of songs, storytelling, and fast movements.

- **Instruments:** The dance drama is accompanied by instruments such as **ganjira, manikatta, chiratta, and kaimani.**
- **Narrative through Songs:** Seethakali’s story is conveyed through songs, with 28 collected over three years, featuring a folk style influenced by **Vallappaattu, Kuthirappaattu, and Rakshasappattu.**
- **Oral Tradition:** Seethakali songs were orally transmitted from one generation to the next, which led to a pause in the tradition.
- **Basic Movements:** The dance involves basic steps, striving to preserve the original essence of the art form.
- **Character Ensemble:** The performance includes key characters such as **Sita, Ram, Lakshman, Ravan, and Hanuman.**

Revival Efforts by Perinad Seethakali Sangham

- **Fading Tradition:** Seethakali had gradually faded from public performance, with little to no activity around it for several decades.
- The **Veda** communities’ **displacement** due to the **Land Reform Act** in the ’70s led to the decline of the art form.
- **Revival Group:** The **Perinad Seethakali Sangham**, formed in 2017, played a crucial role in reviving Seethakali.
- **Diverse Artists:** The group consists of artists from various backgrounds, **breaking caste and communal barriers.**
- **Revival Effort:** The group of enthusiasts, led by **N. Shajimon**, came together to revive Seethakali, saving it from extinction.
- **Documentary:** Shajimon created a documentary titled *Seethakali – Desinganadinte Dalit Ramayanam*, tracing the evolution, popularity, and relevance of the art form.

Topic 59. NATARAJA BRONZE SCULPTURE FOR G20 SUMMIT VENUE

Important for the subject: History

Introduction:

A **28-foot Nataraja bronze sculpture**, considered the **world’s tallest of its kind**, is set to adorn the **G20 Leaders’ Summit venue in New Delhi.**

The statue hails from **Swamimalai**, a small town in Tamil Nadu’s **Thanjavur district** known for its **bronze sculptures. (GI Tag)** The **Union Culture Ministry** commissioned the sculpture on February 20, 2023.

Details of the Sculpture:

- The statue weighs **19 tonnes** and is made from **eight metals**, including **gold, silver, lead, copper, tin, mercury, iron, and zinc (Ashtadhatu).**

- Crafted by **Srikanta Stapathi** and his brothers **Radhakrishna Stapathi** and **Swaminatha Stapathi**, sons of the renowned sculptor **Devasenapathy Stapathi**.
- The sculpture follows the **Chola period's Nataraja models**, specifically those from **Chidambaram and Konerirajapuram**.

- It stands at **22 feet in height, with a 6-foot pedestal**, making the complete structure 28 feet tall.

Significance and Symbolism:

- The Nataraja statue symbolizes **Lord Shiva's dance and is an iconic representation of Tamil culture**.
- Chola bronzes, noted for their beauty and craftsmanship, hold a prestigious place in the art world.

Swamimalai Bronze Statues of Tamil Nadu: GITagged Craft

Origins:

- Swamimalai artisans (**sthapathi**) create bronze statues using the **ancient lost wax technique**.
- The tradition started during the **Chola dynasty** with **temple construction** fostering diverse crafts.

Crafting Tools:

- Traditional tools like **leaf strips** for measurements, **spatula** for wax shaping, and **knife** for carving.
- **Scraper** refines relief, **soldering iron** smooths wax, **hammer-chisel** removes excess metal.
- **Engraving tools, files, and forceps** for intricate carving.

Casting Process:

- Sculptors utilized the **'lost-wax' casting method**, a time-tested technique since the **Chola era**.
- **Beeswax-resin-groundnut oil mixture** is used to create a wax model based on **Agama Shastra**.
- The process involves creating a wax model encased in clay; the clay is sourced from the **alluvial soil near the Cauvery River** in Swamimalai.
- Model covered in **loam**, holes drilled for metal pouring, then cooled to harden.
- Molten bronze is poured into the hot mold, breaking it after cooling, and details are carved, with **emery paper polish**.

Evolution:

- The Chola dynasty's temple construction attracted artisans to Swamimalai. Sthapatis continued the bronze statue-making tradition over centuries.

Diverse Creations:

- **Initially religious statues**, primarily Hindu deities.
- Present demand extends to cultural figures, like **Ramayana and Mahabharata heroes**.

GI Tag:

- Swamimalai Bronzes was awarded a **Geographical Indicator (GI) tag**. Assures authenticity for consumers, especially for international buyers. Guarantees genuine, original craft from the region.

Topic 60. GUJARAT GOVERNMENT INCREASES OBC RESERVATIONS TO 27% IN PANCHAYATS AND ULBS

Important for the subject: Polity

Introduction

The Gujarat government recently made a significant decision to raise the reservation percentage for **Other Backward Classes (OBCs) from 10% to 27%** within the realms of panchayats and urban local bodies (ULBs).

Quota Expansion for Local Bodies

- The decision is grounded in the recommendations presented in the **Justice K.S. Jhaveri Commission report**.
- This adjustment aims to **facilitate the conduct of local body elections**, which had been deferred due to **unresolved quota-related matters**.
- The **Supreme Court's directive** mandating OBC reservation based on their population played a pivotal role in this policy change.

Specific Reservation Criteria

- Notably, in regions designated under the **Panchayats (Extension to Scheduled Areas) (PESA) Act**, where tribal communities are predominantly situated, the OBC reservation in local bodies **will continue at the previous rate of 10%**.
- The reservation provisions for **Scheduled Castes (SCs) and Scheduled Tribes (STs)** will remain unaffected.
- The state government emphasized that the established **50% reservation ceiling remains unbreached**.

Constitutional provisions for OBCs

Article Description Fundamental Rights

Article 15(4)

- The state is empowered to make any special provision for the advancement of **any socially and educationally backward classes** of citizens or for the scheduled castes or the scheduled tribes regarding their admission to educational institutions including private educational institutions, whether aided or unaided by the state, except the minority educational institutions.

Article 15(5)

- This article, adopted in the 93rd amendment in 2005, empowers the state to establish special arrangements for **backward classes**, SCs, or STs for admission to private educational institutions, whether aided or unaided.10/25

Article 16(4)

- This provision empowers the state to reserve openings in the public sector for **any backward classes** of the state that are underrepresented in the public sector.

Article 16(4- A)

- This empowers the state to adopt reservations for SCs and STs in matters of **promotion**.

Article 16(4- B)

- This permits the state to treat unfilled posts reserved for **backward classes** as a separate class of vacancies that are not Important for the subject to a 50% reservation restriction.

Directive Principles of State Policy**Article Description****Article 46**

- This article compels the state to ‘promote with great care the educational and economic interests of the **weaker parts of the population**, particularly the Scheduled Castes and Scheduled Tribes, and to safeguard them from social injustice and all types of exploitation.

Other provisions**Article Description****Article 338-B**

- The **National Commission for Backward Classes (NCBC)** is established by Article 338-B.
- The **102nd Amendment Act of 2018** conferred a **constitutional status on the Commission**.

- The scope of the Commission's activities is likewise expanded under the new system. This was done to more effectively protect the interests of the socially and educationally disadvantaged classes.

Article 340

- This article empowers the **President to form a committee to evaluate the conditions of the backward classes**, and the problems they encounter, and to provide suggestions on how to improve their situation. This was the article that established the **Mandal Commission**.

OBC Quota in Local Body Polls:

Local Self Government

- Management of local affairs by such local bodies who have been elected by the local people. Includes both **rural and urban** government.
- It is the **third level of the government**. There are 2 types of local government in operation – Panchayats in rural areas

Municipalities in urban areas

- **Triple Test Formula** The Triple-Test Formula, laid down by the **Supreme Court in 2010** required the states to appoint a **commission, collect quantifiable data** of the community, and allocate reservations to them in local bodies in such a manner that **the total reservation in each seat does not exceed 50%**.

The 2010 Supreme Court Judgement

- The **five-judge Constitution Bench** decision in **K. Krishnamurthy (Dr.) v. Union of India (2010)** wherein the Supreme Court had interpreted **Article 243D (6) and Article 243T(6)**, which **permit reservation by enactment of law for backward classes in panchayat and municipal bodies respectively**, to hold that barriers to political participation are not the same as that of the barriers that limit access to education and employment.
- However, **for creating a level playing field, the reservation may be desirable as mandated by the aforementioned Articles** which provide a separate constitutional basis for reservation, as distinct from what is conceived under **Article 15 (4) and Article 16 (4)** which form the basis for reservation in education and employment.
- Important for the subject to empirical findings of backwardness in relation to local bodies as fulfilled through **the triple tests**.

Topic 61. ARTICLE 370 AND CONSTITUTIONALITY OF CO 272, 273***Important for the subject :Polity***

The Supreme Court has heard the arguments challenging the abrogation of **Article 370**.

CO 272 was issued on **August 5, 2019** to amend **Article 367** of the **Indian Constitution**. This amendment changed the reference from the “**Constituent Assembly**” to the “**Legislative Assembly**” in **Article 370(3)**, which played a pivotal role in the subsequent steps leading to the abrogation of Article 370.

- **CO 273** was issued on **August 6, 2019** which **operationalized the recommendation made by the Rajya Sabha to abrogate Article 370**. This proclamation essentially sealed the abrogation of **Article 370** and the **reorganization of the state of Jammu and Kashmir into two union territories**.

What is the Constitutional Principles involved:

- The **core legal arguments** in these challenges revolve around the **principles of constitutional interpretation, separation of powers, and the procedure for amending or altering the Constitution**.
- The petitioners assert that the **use of Article 367 to effect substantive changes to Article 370 goes beyond the scope of interpretative powers and violates the constitutional procedure for amending the Constitution**.

What Supreme Court had said:

- The Supreme Court has **enquired center about the restoration of the statehood of Jammu and Kashmir**.
- The Chief Justice had **reminded the Centre that the “restoration of democracy is a vital component for our nation”**.

What was Article 370 and its features:

- **Article 370** was a provision in the Indian Constitution **that granted special autonomous status to the state of Jammu and Kashmir**.
- It was intended to **provide temporary provisions** for the governance of Jammu and Kashmir following its **accession to India in 1947**.
- The provision allowed Jammu and Kashmir to have **its own constitution, a separate flag, and a high degree of autonomy in matters of governance except defense, communication, and foreign affairs were not under the purview of the state and were controlled by the Indian government**

Topic 62. PIL STOKES DEBATE ON INMATES' RIGHT TO CONJUGAL VISITS

Important for the subject : Polity

Conjugal Visits

Conjugal visits allow prisoners **private time with spouses within jail premises** to benefit their psychological well-being, marital bonds, and the prison environment.

Legal Significance of Conjugal Visits:

- Advocates argue they're a **fundamental right for prisoners' spouses**, aligned with international agreements recognizing prisoner rights and family importance.
- Most prison Acts and Rules acknowledge the need to maintain family and social relations. Expert emphasizes the **role of family ties** in prisoners' **reformation**.

Legal Precedents and Examples:

- **Ludhiana's 'Parivar Mulakat' program**: face-to-face meetings with loved ones.
- **Madras HC's stance**: allowing conjugal relationships; landmark judgment on parole.
- **Delhi prison administration: challenges** due to overcrowding, limited infrastructure, and existing **alternatives** like parole.

Judicial Views:

- **Sunil Batra vs Delhi Administration (1979)**: Justice Iyer emphasizes family visits' humane role.
- **Jasvir Singh vs State of Punjab**: High Court recognizes conjugal relationship right under Article 21.
- **Meharaj vs State (2022)**: Madras HC allows conjugal visits for specific reasons, differentiating law-abiders and violators.

Parole and Furlough:

Parole:

- Prisoner release with **suspension** of the sentence.
- **Conditional**, Important for the subject to behavior and reporting to authorities for a fixed period. Not a right, granted for specific reasons (e.g., family events). Denial is possible if against societal interest, despite a strong case.

Furlough:

- Similar to parole but **for long-term imprisonment**. The furlough period counts as **sentence remission**. Treated as a prisoner's right, granted periodically. It aims to maintain family ties and counter the effects of prolonged incarceration.