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PIONEER ACADEMY'S
PATHFINDER
 CURRENT AFFAIRS FOR CIVIL SERVICES

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Topic 1. NEW DRUG TO TREAT CHRONIC KIDNEY DISEASE GETS APPROVAL

Important for the subject: Science and technology

The Central Drugs Standard Control Organisation (CDSCO) has approved Jardiance (empagliflozin) 10mg tablets for **end-stage kidney and cardiovascular diseases**.

- It will reduce the risk of sustained decline in patients with **end-stage kidney disease**, cardiovascular death, and hospitalization in adults with **chronic kidney disease (CKD) at risk of progression**.
- **Jardiance** is not recommended for the treatment of **CKD in patients with polycystic kidney disease**.
- According to **CDSCO**, this indication approval allows nephrologists and cardiologists to use **Jardiance 10mg tablets for the treatment of CKD in eligible patients**.

About Empagliflozin:

- It is used to **treat type 2 diabetes**.
- It works in the **kidneys to prevent absorption of glucose (blood sugar)**.
- This helps lower the blood sugar level.
- **Empagliflozin does not help patients** who have insulin-dependent or type 1 diabetes.

Topic 2. INSAT-3DS MISSION TO BE LAUNCHED FROM SRIHARIKOTA

Important for the subject: Science and technology

The GSLV-F14 carrying INSAT-3DS will launch from Sriharikota's Satish Dhawan Space Centre at 5:35 p.m. tomorrow, according to ISRO.

- It marks the 16th GSLV flight and the 10th with the indigenous cryo stage, with the seventh operational flight featuring the indigenous cryogenic stage.

About INSAT-3DR

- It is an advanced meteorological satellite of India configured with an imaging System and an Atmospheric Sounder.

The significant improvements incorporated in INSAT-3DR are:

- Imaging in Middle Infrared band to provide night time pictures of low clouds and fog
- Imaging in two Thermal Infrared bands for estimation of Sea Surface Temperature (SST) with better accuracy
- Higher Spatial Resolution in the Visible and Thermal Infrared bands

Payloads:

- INSAT-3DR carries a multi spectral Imager, 19 channel Sounder, Data Relay Transponder and Search and Rescue Transponder.

Objectives of INSAT-3DS Mission:

- INSAT-3DS will be placed in a geosynchronous transfer orbit for meteorological observations and disaster management.
- The satellite will aid in satellite-aided search and rescue services.

Key facts about INSAT-3DS:

- It's a collaborative project between ISRO and the India Meteorological Organisation (IMD).
- Part of a series of climate observatory satellites aimed at enhancing climate services, joining INSAT-3D and INSAT3DR.
- It will be launched using the GSLV-F14 rocket.

About GSLV-F14:

- GSLV-F14 is an advanced rocket utilizing liquid propellant.
- Distinguished by its higher capacity and use of cryogenic liquid propellants in all stages.
- It offers a substantially higher lift-off weight capacity.

Topic 3. GENETICALLY MODIFIED BANANAS APPROVED BY REGULATORS FOR THE FIRST TIME***Important for the subject: Science and technology***

For the **first time**, a **genetically modified strain** of the **Cavendish banana**, engineered to **resist a destructive fungal disease**, has been **authorized for farm cultivation** in **Australia and New Zealand**.

- The **Australian Office of the Gene Technology Regulator** granted a **commercial growth license**, followed by **Food Standards Australia New Zealand** approving it for consumption, affirming its **safety** and **nutritional equivalence** to **traditional bananas**.
- This development **aims to combat the global spread of a new Fusarium fungus strain, TR4**, threatening the **Cavendish variety**, which became the **primary banana type in Western countries** after the **Gros Michel variety** was decimated by an earlier **Fusarium strain, TR1**, in the **1950s**.

Cavendish banana:

- **Cavendish bananas** are the **fruits of one of several banana cultivars** belonging to the **Cavendish subgroup of the AAA banana cultivar group** (triploid cultivars of *Musa*

acuminata).

- They include commercially important cultivars like ‘**Dwarf Cavendish**’ (1888) and ‘**Grand Nain**’ (the “**Chiquita banana**”).
- Since the **1950s**, these **cultivars** have been the most internationally traded bananas.
- They replaced the **Gros Michel banana** (commonly known as **Kampala banana** in **Kenya** and **Bogoya** in **Uganda**) after it was devastated by **Panama disease**.
- They are **unable to reproduce sexually**, instead being propagated via **identical clones**. Due to this, the **genetic diversity** of the **Cavendish banana** is very low.
- This, combined with the fact the **Cavendish** is planted in **dense chunks** in a **monoculture without other natural species to serve as a buffer**, makes the **Cavendish** **extremely vulnerable to disease**, **fungal outbreaks**, and **genetic mutation**, possibly leading to **eventual commercial extinction**.

Panama disease:

- **Panama disease (or Fusarium wilt)** is a **plant disease** that infects **banana plants (Musa spp.)**.
- It is a **wilting disease** caused by the **fungus Fusarium oxysporum f. sp. cubense (Foc)**. The **pathogen** is **resistant to fungicides** and its control is limited to **phytosanitary measures**.
- During the **1950s**, an **outbreak of Panama disease** almost wiped out commercial **Gros Michel banana** production.
- The **Gros Michel banana** was the **dominant cultivar of bananas**, and **Fusarium wilt** inflicted enormous costs and forced producers to switch to other, disease-resistant cultivars.
- Since the **2010s**, a new outbreak of **Panama disease** caused by the **strain Tropical Race 4 (TR4)** has threatened the production of the **Cavendish banana**, today’s most popular cultivar.

Topic 4. WHAT OUR ANCESTORS’ GENOMES CAN TELL US ABOUT MODERN HEALTH

Important for the subject: Science and technology

Researchers recently use **sequences of ancestral DNA** to understand genetic diseases that affected ancient humans and onto the medicines and tools that early human communities used.

Ancient DNA (aDNA) studies along with cutting-edge genomic techniques can provide unprecedented insights into the **genetic makeup (profile)** of our ancestors by extraction and

analysis of **ancient skeletal remains' DNA.**

- **Ancestral DNA studies** provides information about the **genetic diversity** and **population dynamics** of ancient communities, their migration patterns, interactions, and adaptations to local environments and diseases confronted and how the afflictions shaped **human evolution.**
- Researchers can understand **pathogens** spreaded in the **distant past** and trace their **origins and evolutionary trajectories.**
- By reconstructing the genomes of lifeforms-emergence, spread, and adaptation of **infectious diseases** throughout human history can be traced.
- Such study **enrich our knowledge of evolutionary history** and have **implications for modern healthcare.**
- **Teach about the diseases** to which our genes have rendered us susceptible as well as how health disparities arose between different populations.

Examples:

- Common genetic diseases are the result of **chromosomal abnormalities** i.e. chromosome number changes (extra copies or deletions of entire chromosomes) – resulting in different clinical syndrome.
- Ex: **Down's syndrome** is caused by an extra chromosome 21. **Klinefelter's syndrome** due to an extra X chromosome.
- **Turner syndrome** by the loss of one of the two X chromosomes in women.

Ancestral DNA and a disease's history:

- **Chromosomal karyotyping** is a **method to visualise the complete set of chromosomes in a cell**, and is among the best techniques to diagnose such abnormalities. However, karyotyping requires **live cells**, a laborious method to culture and stain them.
- But due advances, scientist use **whole-genome sequencing data** from fragmented and/or degraded DNA to understand chromosomal abnormalities in **a DNA** as well.
- For example, **Francis Crick Institute in London** researchers published evidence of some of the earliest known instances of Turner syndrome, Kinefelter's syndrome, and Down's syndrome in **aDNA dating from the Iron age in Britain.**
- Similarly, a research group from **Italy, Germany, and the U.S** studied DNA isolated from 22 mummified individuals from a variety of geographical regions and time periods
- **-17 samples from 3600 BC ancient Egypt and others of (1500-1900) AD from Bolivia,**

Peru, Switzerland, and Australia, an interesting analysis of genetic variants associated with **atherosclerotic cardiovascular disease** in modern humans and their link with ancient humans were carried out.

- In all, the scientists said they **cardiovascular disease has been widespread in human populations for at least 5,000 years**. Thus, established link between ancient and modern health.

Linking ancestral DNA to diets

- Insights into the lifestyles of ancient humans can also be gleaned from their genetic remains.
- Microbes from **pitch of the birch tree** (ancient humans extensively used birch pitch to repair stone tools and possibly fix arrowheads) reveal information about **the oral health of the individuals who chewed it**.
- DNA analysis of chewed pitch by **scientists from Finland, Norway, Sweden, and Turkey** identified sort of imbalance of microbial species observed in people with inflamed gums (**periodontitis**).
- Scientist also matched DNA with a number of plant and animal species, **hinting at the ancient people's diet**.

What else can ancestral DNA reveal?

- Provide big clues about the **creation and development of stone tools**.
- Research: (In the 1930s, in a cave in Ranis, Germany – (around 50,000 years ago- when modern humans, **neanderthals, and Denisovans** coexisted) identified a number of ancient stone tools.)
- Archaeologists re-excavated the cave more recently and found several bones remains.
- Through **high-throughput sequencing**, DNA sequences unequivocally pointed in the direction of Homo sapiens. Also, by radiocarbon dating, the samples were found to be some 45,000 years old.

Neanderthals and Denisovans

- They are extinct groups of hominins that separated from each other more than 390,000 years ago.
- These two groups inhabited Eurasia — Neanderthals in the west and Denisovans in the east — until they were replaced by modern humans around 40,000 years ago.
- Now, scientists at the Max Planck Institute for Evolutionary Anthropology has sequenced the genome of Denisova 11, a 50,000-year-old individual from Denisova Cave in Siberia, and discovered that she had a Neanderthal mother and a Denisovan father.

Topic 5. WHY OPENAI'S NEW VIDEO GENERATOR, SORA, IS MAKING A SPLASH

Important for the subject: Science and technology

What is Sora:

Sora (Japanese) means sky, an imagery of 'limitless creative potential'.

OpenAI (CEO-Sam Altman) has created **the video creation artificial intelligence (AI) model (Sora)** that can create **near flawless one-minute-long videos based on text prompt.**

- Sora is trained on videos and images of various durations, resolutions, and aspect ratios to generate **crisp, clear, cinematic, high-resolution and photorealistic output.**
- This new diffusion-based AI model is built on the foundation of **transformer architecture, similar to large language models like ChatGPT.**

Comparison with others –

- Sora's achievement dwarfs **Meta's Make-a-Video** and Google's **Lumiere text-to-video**
- Unlike the output from Meta's, Google's, or other earlier AI video tools, **Sora provides studio-grade final product.**

What can it do?

- It can create **images and videos with near-accuracy** on a given Important for the subject.
- It can **construct a video from an image and fill gaps in existing video clips.**

What is Diffusion model?

- Diffusion models are named after **the physical diffusion process** in which molecules move from high concentration to low-concentration zones.
- Diffusion models are used to generate **high-quality images and videos.** In machine learning, these models **generate new data by reversing the diffusion process.**
- These add **noise to data** and then **reverse the visual data** back to its **original state by filtering out the noise.**

Working principle of Sora:

- According to OpenAI, Sora works by- "turning videos into **patches** by first **compressing** videos into a **lower-dimensional latent space** and subsequently **decomposing** the representation into **spacetime patches.**"
- When a user sends prompts to Sora, it creates a video by **stitching together** compressed

patches of visual data.

Patches vs Tokens:

- Patches is to Sora what tokens is to ChatGPT.
- **Tokens** unify diverse modalities of text like code, data, and natural languages.
- Similarly, **patches** unify videos by compressing them — a form of tokenisation for visual data.

How good is Sora's output?

- It is a top-class AI-based image generator and photorealistic can stun at first look. But a closer look reveals there is **work to be done in object tracking**.
- While OpenAI **claims** Sora can handle **occlusion** (a term in computer vision for objects disappearing when two or more of them come too close to each other).
- But **the text-to-video model** does suffer from this limitation to an extent.
- For instance, in one of the clips shared by the Microsoft-backed company, people in the background disappear when the focus moves past a couple walking.
- The AI model needs to understand space and time better.

Present status:

- **Sora is not available to the public yet.** OpenAI plans to start sharing the model with third-party testers to receive feedback to improve the model.
- Some experts are of the view that **more systemic glitches will surface as more people gain access** to the tool.

Can occlusion be remedied?

- While AI researchers are looking to solve **the object tracking problem**. Some **AI experts** predict it will be hard to set it right. They note that the fault stem from **how the system builds reality**.
- Sora's weird physics glitches are in some ways akin to LLM "hallucinations", **artefacts from decompression and lossy compression**.
- That means more data is not going to solve the problem, and generative AI-based models are not going to understand or function as per the physical laws of nature.

What about the training data?

- OpenAI's achievement through Sora is monumental and it will disrupt video creation and gaming industries.
- The video generation tool was **trained on data** from game engines, movies,

documentaries, YouTube videos, and possibly videos scraped from every corner of the web.

- But this data could possibly include **copyrighted work**. Unless OpenAI shares this information, it will be hard to know.
- The **unauthorised material** scraped from the web to train AI violates copyright law is **yet to be addressed by the courts**.
- Tech firms claim they are protected by **the copyright's fair use doctrine** and lawsuits against them will stifle a growing AI industry.

What about misinformation?

- Photorealistic video generation capabilities are **worrying** considering the burgeoning **misuse** of generative AI tools to spread misinformation.
- To counter this OpenAI took the **red-teaming route** ahead of its public launch.
- Sora already has a **filter** that will **block** prompt requests that **mention violent, sexual, or hateful language**, as well as **images of well-known personalities**.
- A **second filter** will check frames of generated videos and block content that violates **the company's safety guidelines**.

Topic 6. SPACEX LAUNCHES INTUITIVE MACHINES' PRIVATE 'ODYSSEUS' MOON LANDER

Important for the subject: Science and technology



SpaceX launched **Intuitive Machines' IM-1 mission**, which could be the first private moon lander to make a lunar soft landing if it succeeds.

It will become the **first American spacecraft** to gently set down the moon's surface

since **Apollo 17 moon landing in 1972.**

It will become the **first private effort to reach the surface of the moon in one piece.**

- Before it, three earlier events by an **American company , Japanese company , and an Israeli non profit have failed.**
- The launch of the Intuitive Machines mission comes just one month after another American company, **Astrobotic Technology of Pittsburgh, attempted to send Peregrine, its lander, to the moon.**

Why is it called Odysseus:

- This particular spacecraft was named **Odysseus after a contest among employees of Intuitive Machines of Houston- the company incharge of the mission.**
- Mario Romero, the engineer who proposed the name, said **the travels of the hero of the “Odyssey,” the ancient Greek epic poem, provided an apt analogy for the lunar mission.**

Significance of the mission:

- If private companies can pull off this feat, **at a much lower cost than its traditional NASA mission, it will open the door for much wider exploration of the moon and commercial endeavors.**
- **Intuitive Machines is aiming to become the first to land a commercially built spacecraft on the lunar surface.**

Intuitive Machines calls its spacecraft design Nova-C.

- It is a hexagonal cylinder with six landing legs, about 14 feet tall and 5 feet wide.
- **Intuitive Machines notes that the body of the lander is roughly the size of an old British police telephone booth.**
- If successful, it would also be the first moon landing for the U.S. in more than 50 years.
- **NASA is the primary customer for this mission, paying Intuitive Machines \$118 million to take its payloads,**
- which include a stereo camera to observe the plume of dust kicked up during landing and a radio receiver to measure the effects of charged particles on radio signals, to the moon's surface.
- **Odysseus is expected to touch down near the moon's south pole, a region that has long been intriguing for scientists because water ice is thought to be relatively abundant within craters.**
- **Both Odysseus and Peregrine are part of NASA's Commercial Lunar Payload Services program, or CLPS.**

- The object of the program is to use **commercial companies to send experiments to the moon rather than NASA building and operating its own moon landers.**
- **Astrobotic Technology and Intuitive Machines are part of NASA's Commercial Lunar Payload Services program**, which aims to spur development of moon landers by private-sector companies that NASA could eventually hire to transport cargo and scientific instruments to the lunar surface.
- NASA's **Commercial Lunar Payload Services program** is part of the **agency's Artemis program**, which seeks to return astronauts to the moon over the next few years.
- NASA recently announced delays in a **pair of coming Artemis missions, pushing a lunar fly-around that was to launch later this year to 2025 and postponing the first Artemis landing attempt** to the following year.

Topic 7. HUNDRED YEARS AGO, SATYENDRA NATH BOSE CHANGED PHYSICS FOREVER

Important for the subject: Science and technology

A fractured, disjointed picture of a new 'quantum theory' was emerging in the middle of the biggest upheaval in physics during 1924.

This year marks 100 years of Bose's discovery.

- Bose was born in Calcutta (now Kolkata) in 1894 having mathematical prowess and studied Physics at **Presidency College** and met another brilliant man Meghnad **Saha**
- Bose and Saha were appointed as **faculty** members in **Rajabazar Science College**.
- At that time physics was **changing rapidly** and Einstein gave new **space and time understanding with theory of relativity**.
- The work of **Max Planck, Niels Bohr and Einstein** had shown that the old physics was **incapable** of dealing with **the microscopic world — the world inside atoms**.
- Bose and Saha were **teachers of new physics** but a challenging period as all the **important papers were in German**.
- But this was not a roadblock for them and both became **early adapters** and together they published **the first English translation of Einstein's papers on general relativity**.
- Both of them immersed fully to find a way out.
- Bose's now became lecturer in **Dhaka University** and topic was **Planck's law of black-body radiation**. Bose could not explain it to students to his satisfaction.

Planck's law

- Planck's law, named after Max Planck, founded in 1900.

- It describes the **pattern** that told physicists **physics worked differently in the microscopic**. It is also probably **the most successful guess** in the history of physics.
- **Planck's law is about radiation**. All hot objects — from a bowl of hot soup to the Sun — emit radiation in a range of frequencies.
- Physicists typically simplify them to an **ideal**: as objects that can emit light but not reflect it, a.k.a. black bodies.

Earlier attempt by Planck:

- Planck looked closely at the data and simply guessed the right formula. It worked like magic. The only problem: it violated the rules of physics.

Origin of idea:

- Just like matter is a collection of discrete atoms, energy too had to be a collection of discrete packets or 'quanta'. This idea was the birthplace of quantum mechanics.
- Planck's law was correct, but its derivation was not as it didn't stand scrutiny. It had to wait until Bose.

Issues involved:

- Several attempts to derive Planck's law suffered from **conceptual issue** as results from **both quantum physics and pre-quantum (or classical) physics** was used, thus logically inconsistent.

Planck derivation:

- Planck's own original derivation was based on a model of the black body based on radiation mechanism and classical physics had part of it.

Earlier established theories:

- **Einstein had explained the photoelectric effect using the hypothesis that light carries energies in packets.**
- **The American physicist Arthur Compton had demonstrated that light carries discrete units of momentum.**

Issue solved by Bose derivation:

- According to Bose, Planck's law was **independent of the mechanism that produced it**.
- Bose **synthesized** Einstein and Compton hypothesis and eliminated classical physics, thus stripped off essence of problem.

- Bose found the most probable way of distributing energy among quanta of radiation.
- **Planck's law was therefore simply a statistical property of the quanta of radiation, a.k.a. photons.**
- The most important result implicit is that **total number of photons is not conserved-photons could appear out of thin air and disappear into nothingness**

Bose's paper pioneered the field of quantum statistics.

- The British physicist **Paul Dirac** while finalizing quantum theory obtained Bose's statistics that fundamental **particles** can be in one of **two categories** depending on their statistics (i.e. the set of rules to describe them properly): **bosons or fermions.**
- **Bosons:** Bosons are the fundamental particles that have spin in integer values (0, 1, 2, etc.).
- **Fermions:** These have spin in odd half integer values ($1/2$, $3/2$, and $5/2$, but not $2/2$ or $6/2$).

Evaluation of Bose:

- The lecturer, Satyendra Nath Bose, had discovered **the correct set of equations** to use to work out the behaviour of collections of photons (particles of light).
- A paper from Bose was **initially rejected** by a journal and Bose mailed paper to Albert Einstein and Einstein loved the paper, translated it to German and sent it to a journal himself.
- Despite a long career in physics, Bose published sparsely and **never produced another work of similar value.**
- He once described **himself as a comet** that only came once and never returned. **For a comet as bright, though, once can be quite enough.**

Topic 8. SATURN'S MOON MIMAS MAY HAVE OCEAN UNDER ITS CRUST

Important for the subject: Science and technology

What is Mima?

Mimas is **the smallest of the major moons of Saturn**-known as the "big seven" or the "inner moons".

- Nicknamed "Death Star" for the resemblance of its cratered surface to a space station in the Star Wars franchise.

Presence of ocean under crust:

- Mimas was an unlikely candidate to host an ocean because the presence of these water

bodies is generally marked by modifications of the surface by internal dynamics.

- Scientists analysed **Mimas's orbital motion** based on data from **NASA's Cassini spacecraft** and determined that **the moon's librations — or oscillations — indicate it either has an elongated silicate core or a global ocean.**

Possibility 1:

- If Mimas were solid, its librations would depend on **gravity coefficient** and changes in orbit on this and another factor called **J2**.
- By measuring its **librations and orbital changes**, scientists could determine the values for these numbers if Mimas is entirely solid.
- But calculations reached a **dead end**. Possibility of being elongated silicate layer is thus **omitted**.

Possibility 2: Mimas hosting a subsurface ocean.

- They used a **theoretical approach** to understand how an underground ocean would affect the moon's movement, depending on the **shape of three deformed layers, the gravity coefficients, and the number of librations**.
- **The outer Icy layer** is considered viscoelastic (i.e. both viscous and elastic) in the librational model. And **the interior interfaces** are assumed to be hydrostatic (i.e. at rest).
- The resulting calculations suggested **the ice sheet would have to be 20-30 km thick** to match observations. These figures agreed closely with the findings of a 2022 study as well.
- Further, **the amount of heat** released at the surface of Mimas was estimated to be around **25milliwattper sq. m**,
- which should **reduce the moon's eccentricity** — a measure of the extent to which its orbit's shape **deviates from a perfect circle** — by a factor of **two in 4-5 million years**.
- Based on these values, the **scientists ran simulations** and found that **its ocean may have formed 2-25 million years ago**.
- The predicted surface heat also matched observations of **Enceladus — a Saturn moon** that has a global ocean beneath its crust — indicating **Mimas may have a hydrothermally active core even if surface activity doesn't indicate that**.

Conclusion:

- **Mimas may have a liquid ocean around 20-30 km under its heavily cratered ice shell.**

Topic 9. THE BRIGHTEST OBJECT IN THE UNIVERSE IS A BLACK HOLE THAT EATS A STAR A DAY

Important for the subject: Science and technology



In a new paper in *Nature Astronomy*, described a black hole surrounded by the largest and brightest disc of captive matter ever discovered.

- The object, called **J0529-4351**, is therefore also the brightest object found so far in the universe.

About Supermassive black holes:

- Astronomers have already found around **one million fast-growing supermassive black holes across the universe**, the kind that sit at the centers of galaxies and are as massive as millions or billions of Suns.
- To grow rapidly, they pull **stars and gas clouds out of stable orbits and drag them into a ring of orbiting material called an accretion disc.**
- Once there, **very little material escapes.**
- The disc is a mere holding pattern for material that will soon be devoured by the black hole.
- The disc is heated by **friction as the material in it rubs together.**
- Pack in enough material and the glow of the heat gets so bright that it outshines thousands of galaxies and makes the black hole's feeding frenzy visible to us on Earth, more than 12 billion light years away.

The fastest-growing black hole in the universe

- The accretion disc of **J0529-4351** emits light that is **500 trillion times more intense than that of our Sun.**

- Such a staggering amount of **energy can only be released if the black hole eats about a Sun worth of material every day.**
- It must also have a **large mass already.**
- Our data indicate **J0529-4351 is 15 to 20 billion times the mass of our Sun.**
- There is no need to be afraid of **such black holes.**
- The light from this monster has taken more than 12 billion years to reach us, which means it would have stopped growing long ago. In the nearby universe, we see that supermassive black holes these days are mostly sleeping giants.

Black holes losing their grip

- The age of the black hole feeding frenzy is over because the gas floating around in galaxies has mostly been turned into stars.

And after billions of years the stars have sorted themselves into orderly patterns:

- **they are mostly on long, neat orbits around the black holes that sleep in the cores of their galaxies.**
- Even if a star dove suddenly down towards the black hole, it would most likely carry out a slingshot maneuver and escape again in a different direction.
- Space probes use slingshot maneuvers like this to get a **boost from Jupiter to access hard-to-reach parts of the Solar System.**
- However, if space were more crowded, and our probe ran into one coming the other way:
- The two would crash together and explode into a cloud of debris that would rapidly fall into Jupiter's atmosphere.
- Such collisions between stars were commonplace in the disorder of the young universe, and black holes were the early beneficiaries of the chaos.

Accretion discs — a no-go zone for space travelers

- Accretion discs are gateways to a place whence nothing returns. They are also profoundly unfriendly to life in themselves.
- They are like **giant storm cells, whose clouds glow at temperatures reaching several tens of thousands of degrees Celsius.**
- The clouds are moving faster and faster as we get closer to the hole, and speeds can reach 100,000 kilometers per second.
- They move as far in a **second as the Earth moves in an hour.** The disc around J0529-4351 is seven light years across.
- That is one and a half times the distance from the Sun to its nearest neighbor, Alpha

Centauri.

Why only now?

- The world's telescopes produce so much data that astronomers use sophisticated machine learning tools to sift through it all.
- Machine learning, by its nature, tends to find things that are similar to what has been found before.
- This makes machine learning excellent at **finding run-of-the-mill accretion discs around black holes** — roughly a million have been detected so far – but not so good at spotting rare outliers like J0529-4351.
- In 2015, a Chinese team almost missed a remarkably fast-growing black hole picked out by an algorithm because it seemed too extreme to be real.
- Our work also depended on Australia's current 10-year partnership with the European Southern Observatory, an organization funded by several European countries with a huge array of astronomical facilities.

Topic 10. TATAS, TOWER APPLY TO SET UP CHIP FOUNDRIES IN INDIA

Important for the subject: Science and technology

Minister of State for Electronics and IT Rajeev Chandrasekhar recently confirmed that the Tata Group and Israeli chip company Tower Semiconductor have applied to set up foundries in the country.

- **India is competing with some of its key allies – the US and Europe – to attract chipmakers.**
- It is offering a 50% capital expenditure subsidy to successful applicants at the central level under its \$10 billion incentive scheme, with state governments sweetening the deal further at their own end.
- The two fab proposals that have been received by India, and represent a total investment of about \$22 billion, are one from Tata and the other from Tower Semiconductor.
- Tower's proposal to set up a plant worth **\$8 billion where it aims to produce 65 nm, 40 nm and 28 nm chips.**
- The Tata Group is understood to be partnering with **Taiwan based United Microelectronics Corporation (UMC) or the Powerchip Semiconductor Manufacturing Corporation (PSMC).**

What are the proposals currently on the table?

India's chip incentive scheme broadly covers three aspects of the ecosystem –

- full-blown foundries that can manufacture chips;
- packaging plants called ATMP facilities; and assembly and testing projects called OSAT plants.
- So far, US-based **Micron Technology** has cleared its proposal to set up a \$2.75 billion ATMP plant, with the facility coming up in Gujarat.
- In the OSAT space, **CG Power and Industrial Solutions** has said it has entered into a joint venture (JV) agreement with **Renesas Electronics America** and,
- **Thailand-based Stars Microelectronics** to set up a semiconductor assembly and testing plant in India.
- **Kaynes Technology** has also sent a proposal to set up an OSAT plant.

What had happened to the earlier fab proposals?

- A joint venture between **Foxconn**, best known as the manufacturer of iPhones, and **Vedanta** to set up a \$19.5 billion chip plant came to an abrupt halt last year.
- Foxconn announced it was pulling out of the joint venture with Vedanta. While government sources maintain the two could apply separately, there has been no movement so far.

Why India's semiconductor manufacturing industry is yet to take off?

- The planned merger between Intel and Tower, announced in February 2022, passed an antitrust review in the United States and several other geographies.
- There was a third fab proposal by **Singapore-based IGSS Venture**, but it was not found up to the mark by the advisory committee of the government.

Why is India focusing on semiconductor manufacturing?

- **Prime Minister Narendra Modi** has made chip manufacturing a top priority for India's economic strategy as he wants to "usher in a new era in electronics manufacturing" by luring global companies.
- **Building semiconductors domestically is crucial for the government's vision** to develop a domestic electronics supply chain and eventually reduce its imports from foreign countries, especially China – which despite its own challenges remains to be the number one destination for such manufacturing.
- It is a pressing time for India to venture into electronics manufacturing, with chips being an important part of the puzzle –
- **all electronics items have semiconductor chips in them, and as more companies try to diversify their bases from China, India has an opportunity to emerge as a reliable destination.**

Topic 11. LAB-GROWN DIAMONDS PUT NATURAL GEMS INDUSTRY UNDER HUGE PRESSURE

Important for the subject: Science and technology

Introduction:

The Lab-grown diamonds **sparkle the same** as mined natural gems.

Mined natural gems are **more than a billion years old** and laboratory-made rocks are **new** and **cost** less than half the price of natural gems.

- “Lab-grown diamond (LGD)’s the **same product, same chemical and the same optical**”
- Machine-made diamonds, first developed in **the early 1950s**, later due to technological advancement commercially-able process is developed **less than a decade ago**.

Global share and export stats:

- **\$89 billion global diamond jewellery market** is being **reshaped by Manmade gems**, especially in the west Indian city of **Surat** where **90% of the world’s diamonds** are **cut and polished**.
- As per Industrial data- Lab-grown diamond **exports from India tripled** in value between 2019 and 2022, while **export volumes** rose by **25%** between April and October 2023 from 15% earlier.
- **The global market share by value** of lab-grown gems sharply increased from **5% in 2018 to 18.5% in 2023**, and will likely exceed **20%** this year.
- This **increased pressure** on natural gems industry already affected by **geopolitical turmoil and slumping demand**.

Humanitarian and environmental factors:

- “Conflict diamonds” from war zones are kept off the market through the **international Kimberley Process certification scheme**. It **leverages** Lab-grown diamond producers.
- -Natural gems uses **energy intensive** process having environment concerns and electricity derived from **carbon-heavy sources**, though gradual green energy shift like solar is occurring at low scale.
- Such **environmental and humanitarian claims** have helped make lab-grown stones a **popular choice for engagement rings**.

Justification:

- In February 2023, **17%** of diamond engagement rings sold in **the U.S. — the world’s biggest consumer of natural stones** — used lab-grown gems and now to **36%**.

Perfect storm:

- According to India's **Gem and Jewellery Export Promotion Council (GJEPC)** – Indian lab diamond makers **exported 4.04 million carats** between April and October 2023,
- **a 42% year-on-year increase, while** natural diamond companies in India reported **a more than 25% drop**, to 11.3 million carats, over the same period.
- During the **COVID-19 pandemic**, **natural gems** demand **surged** due to luxury purchases but after **reopening of economies** it dropped due to excess stock and different kind of lack of demand.

Factors for decline in natural gems are as follows:

- Competition from lab-grown rivals .Slowing economic growth in the all-important U.S. and China markets

Oversupply

- Sanctions against Russian rough-cut diamonds.
- Moreover, India's natural diamond industry was forced into **a rare voluntary import ban** on rough diamonds in October.

No monopoly:**Problems of lab-grown industry:**

- Supply has skyrocketed prices have dropped drastically, with wholesale prices down by 58% in 2023 alone.
- **Justification:** The price of a lower-quality one-carat polished stone had fallen from \$2,400 in 2022 to a little over \$1,000 in 2023.
- However, falling prices will spur demand and prices would come down, because there's no monopoly in this industry.

Topic 12. KEEP IT WHOLESOME***Important for the subject: Science and technology***

National cervical cancer control scheme must be made accessible to all.

Cervical Cancer:

- Cancer of the cervix (i.e. neck of the womb) is unique among cancers because **almost all the cases (99%, according to the World Health Organization)** are linked to infection with **the human papillomavirus (HPV), a common virus transmitted through sexual**

contact.

- While most HPV infections **resolve spontaneously** and women remain symptom-free. However **persistent infection** can lead to cervical cancer.

Present status of cervical cancer:

- It is **the second** leading cause of **cancer-related deaths** among women in India (over 77,000 annually), and is estimated to be the **second most frequent cancer** among Indian women between 15 and 44 years.

Approach needed:

- Health is **seldom uni-dimensional** and Government policy must fathom **the entirety of the issue** and assimilate **multiple aspects** in a field strategy, for optimum realisation of the intended goal.

Issues involved:

- The average national prevalence of cervical cancer **screening hovers at just under 2%** and outcomes depend on the stage of detection.

Solution of issue:

Early diagnosis:

- Cervical cancer can be easily diagnosed in a public health setting with minimal tools —
- The human eye, a dilution of white vinegar
- A dab of Lugol's iodine.
- These are known as **VIA and VILI tests**.

Benefits:

- Precancerous lesions and cancer can be seen much before an advanced stage of the disease along with cytology.

Next step:

- Simple, short procedure, cryotherapy can then be done to destroy the abnormal growth.
- But given that it is easy to prevent, identify and treat cervical cancer.
- It is unacceptable that so many women are dying of the disease

The availability of a vaccine as pre-cautionary measure.

Interim Budget announcement:

- The government plans to encourage vaccination against cervical cancer for girls **aged**

nine to 14, is a step in the right direction.

- It is **unlikely** that vaccination of young girls alone will have a far-reaching impact in the short and medium term.
- **Along with Vaccinating.** Govt must also mandate **screening right at the primary health centre**, and if **abnormalities** are identified, offer **cryotherapy** right then.

Need of the hour:

- A detailed programme is still awaited, **A wholesome programme** must include assimilate screening aspect.

Long-lasting solution (way ahead):

- The only way to prevent deaths is to deploy **the entire assembly of tools** as part of a national cervical cancer control programme, **accessible to all women, irrespective of age, education, affordability or social status.**

Topic 13. ISRO COMPLETES KEY TEST, CE20 CRYOGENIC ENGINE IS NOW HUMAN-RATED FOR GAGANYAAN MISSIONS

Important for the subject: Science and technology



Isro has accomplished the human rating of its cryogenic engine (CE20), which powers the cryogenic stage of the human-rated LVM3 launcher for India's first human space flight mission Gaganyaan.

- ISRO's CE20 cryogenic engine is now human-rated for Gaganyaan missions. Rigorous testing demonstrates the engine's mettle.
- The **CE20 engine identified for the first uncrewed flight LVM3 G1** also went through

acceptance tests.

- Human-rating refers to rating a system that is capable of safely transporting humans. The final test was carried out on February 13.
- It was the seventh in a series of vacuum ignition tests carried out at the **High Altitude Test Facility at ISRO Propulsion Complex, Mahendragiri, to simulate flight conditions.**

About CE20 cryogenic engine:

- **The CE-20 is an indigenous cryogenic engine ISRO developed to use with the GSLV Mk III, now called the LVM-3, launch vehicle.**
- **It represents an improvement on the CE-7.5 cryogenic engine** and is instrumental to ISRO successfully realizing its human spaceflight, a.k.a. Gaganyaan, mission.
- **The CE-20 engine uses the gas-generator cycle**, which discards the exhaust from the pre-burner instead of sending it to the combustion chamber.
- **This reduces fuel efficiency but, importantly for ISRO, makes the CE-20 engine easier to build and test.**
- The CE20 engine is a vital component, serving as the powerhouse of the **Cryogenic Upper Stage (CUS) responsible for propelling the upper stage (C25) of the LVM3 vehicle.**
- **While the CE-7.5 engine is lighter and sports higher fuel-use efficiency**, the **CE-20 engine** achieves a higher maximum thrust (~200 kilonewton v. 73.5 kilonewton) with a **shorter burn duration.**
- It has demonstrated its capability by successfully operating at a **thrust level of 19 tonnes in six successive LVM3 missions, including the Chandrayaan-2, Chandrayaan-3, and two commercial One Web missions.**
- The ground qualification tests for the human rating of the CE20 engine involved life demonstration tests, endurance tests,
- and performance assessment under nominal operating conditions **as well as off-nominal conditions w.r.t thrust**, mixture ratio, and propellant tank pressure.

Updates on first unmanned Gaganyaan (G1) mission:

- ISRO has also successfully completed the acceptance tests of the **flight engine identified for the first unmanned Gaganyaan (G1) mission**, tentatively scheduled for Q2 of 2024.
- This engine will power the upper stage of the **human-rated LVM3 vehicle and has a thrust capability of 19 to 22 tonnes with a specific impulse of 442.5 seconds.**
- This engine will power the upper stage of the human-rated LVM3 vehicle and has a thrust

capability of 19 to 22 tonnes with a specific impulse of 442.5 seconds.

About Gaganyaan Mission:

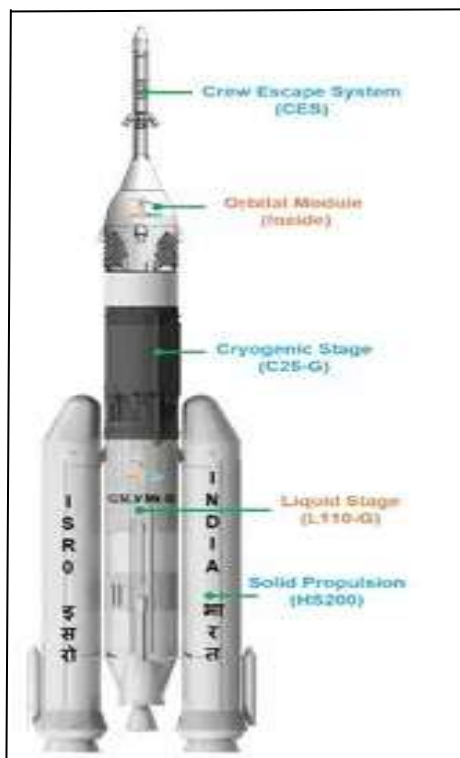
- Gaganyaan is a mission by the **Indian Space Research Organization (ISRO)**.

Under the Gaganyaan schedule:

- Three flights will be sent into orbit.**
- There will be two **unmanned flights and one human spaceflight.**
- The Gaganyaan system module, called the **Orbital Module will have three Indian astronauts, including a woman.**
- It will circle Earth at a low-earth-orbit at an altitude of 300-400 km from earth for 5-7 days.

Payloads:

- Crew module** –spacecraft carrying human beings.
- Service module** –powered by two liquid propellant engines.
- It will be equipped with emergency escape and emergency mission abort.
- GSLV Mk III, also called the LVM-3 (Launch Vehicle Mark-3), the three-stage heavy lift launch vehicle, will be used to launch Gaganyaan as it has the necessary payload capability.**



Topic 14. HOW A CHINESE ROCKET FAILURE BOOSTED ELON MUSK'S SPACEX IN INDONESIA

Important for the subject: Science and technology



How a Chinese rocket failure boosted **Elon Musk's SpaceX** in Indonesia

Since the incident, SpaceX has successfully launched **two Indonesian satellites, with a third scheduled for the coming Tuesday, while China has handled none.**

- The global space industry is witnessing fierce competition for dominance, with the satellite market alone valued at **\$281 billion in 2022.**

About Nusantara Satu:

- **Nusantara Satu (formerly known as PSN VI or PSN-6)** is an Indonesian communications satellite.
- It is a large high-throughput satellite (HTS) providing voice and data communications, and Internet access throughout the Indonesian archipelago and Southeast Asia.
- **Nusantara Satu** is a communications satellite developed and designed by SSL for **PT PasifikSatelit Nusantara (PSN)**, the first private company in the telecommunications and information services sector in Indonesia.
- Nusantara-2 was the second satellite launch awarded by Indonesia to CGWIC, matching the two carried out by SpaceX at that time.

About Space Race:

- China launched a record **67 rockets last year, out of 223 globally.**
- **China is only behind the United States**, which had 109 launches, 90% of which were done by SpaceX

About Kessler Syndrome:

- The Kessler Syndrome Is a theoretical scenario in which Earth's orbit is overpopulated with objects and debris, preventing the use of satellites in certain sections of Earth's orbit.

- **Space debris** are defunct human-made objects in space – principally in Earth orbit – **which no longer serve a useful function.**
- These include derelict spacecraft, mission-related debris, and particularly-numerous in-Earth orbit fragmentation debris from the breakup of **derelict rocket bodies and spacecraft.**

Topic 15. ASTRONOMERS FOUND THE SMALL AND HOT HELIUM STARS THEY WERE LOOKING FOR

Important for the subject: Science and technology

Research details:

Led by assistant professor Maria Drout of the University of Toronto, the research team found these stars after spending seven years of hard work.

Outcome of Research : (Looking for):

- A unique class of stars (are cosmic engines) hot and relatively small orbs covered in helium.
- **Importance of Research:**
- To understanding Stars's **diverse influences on the universe**, from the creation of heavy elements to the release of gravitational waves.

Why Sun doesn't collapse onto itself?

- **Newton's law of gravity** says all objects with mass attract each other.
- Applying this – the Sun's outer and inner layers should be attracted to each other, the Sun should continuously fall inwards and eventually simply collapse.
- **Yet the Sun rises every day, as it did yesterday and will tomorrow.**

Reason: Nuclear fusion prevents the Sun from shrinking.

- **Nuclear Fusion:** In the heart of the star, **chemical reactions** merge the nuclei of **two light elements** —
- such as hydrogen or helium — to form a **heavier nucleus**, such as of silicon. In the

process releases an **enormous amount of heat**.

- This energy endows all particles in **the star with random motion, or pressure**, which then fights **against the pull of gravity and maintains the star in a state of equilibrium**.

Conclusion:

- **The fusion energy pushes the star out while gravity pulls it in**, and they hold **the balance for billions of years**. Such stars are said to be in **the main sequence**.
- **Main sequence:** On plotting stars' **colours** against their **brightness**, many stars occupied a **prominent band in the middle of the graph**, referred as 'main sequence'.

Other possibilities and associated features:

Supernova:

- When a star (heavy enough) **no longer fuses material** and gravity overtakes, then heavy enough star blows up in an explosion, called a **supernova**.
- By making scientific studies of light from supernovae it is observed that light contain signatures of elements that it passed.
- Also, some supernovae have no hydrogen. And yet it is well understood that hydrogen (lightest element) makes up outer layer of main-sequence stars .

Explanation of this:

- The outer layers of some stars are stripped away before the supernova explosion.

Reason behind this(No hydrogen/outer layer stripped off):

- If the star is part of a **binary system** — i.e. as one of two stars that are orbiting each other. (**Most stars heavier than the Sun are in such binaries.**)
- Then the gravitational attraction of one star can peel away the hydrogen layer off the other, leaving an exposed surface of helium.
- **This would leave a small, hot helium star with strong surface gravity.**

Stars part of Binary system:

- Most stars with more than eight solar masses are expected to be part of binary systems, so we should reasonably expect numerous binary-stripped helium stars in the universe.

Present availability of Binary system:

- **Till date**, astronomers have found **exactly one binary system** in the mass range of **eight**

to 25 solar masses (prior to stripping), and have been looking for the others.

Recent findings- Main companion star and bright outliers analysis:

- **Drout & co.** have now reported a **population of these stars**.
- **Many binary systems start out with two main sequence stars.** One of them rips the hydrogen layer off the other-resulting in **one helium star** and **one main sequence companion**.
- to team, the companion would outshine the stripped star in the frequencies of light (both human eyes as well as optical telescopes are sensitive to it)
- **Different frequencies** roughly correspond to **different colours** of light.
- **The hotter** an object is, **the more energy** it has, **the higher the frequency** of emitted light, and the **bluer it glows**.
- **Helium stars** are expected to be **so hot** that they emit more of their energy as **ultraviolet radiation**, which lies beyond the visible range.
- So, the research catalogued around half a million stars in **two nearby galaxies — the Large and the Small Magellanic Clouds** — using data from a telescope that could ‘see’ ultraviolet light.
- **Most** of the stars were **main sequence stars**, but also **some bright outliers**.

Speed analysis findings:

- If a star were isolated, it would be seen moving either towards or away from the earth **at a constant rate**.
- But **some of the outliers** had **different speeds over time** – hinting at **the presence of a companion** that restricted their free movement.

When the researchers examined the spectra of the 25 stars- they found–

- **Class 1:** Several with a strong presence of helium and an absence of hydrogen.
- **Class 2 and Class 3:** Some possessed hydrogen as well.

Based on this, the team made two conclusions:

- Class 1 stars have no hydrogen and are rich in helium
- their companions are either **low-mass not-as-bright** main sequence stars or **compact**

objects (neutron stars or blackholes) that don't emit ultraviolet light strongly.

On various researches it is concluded:

- The surface temperature of Class 1 stars to be **roughly 20-times that of the Sun** and the **surface gravity about 1,000-times that of the earth.**
- Hence, **Class 1 are hot, strongly gravitating, helium-rich, and hydrogen-depleted stars and part of binary systems.**

Final outcome:

- The team discovered the long-awaited **intermediate-mass hydrogen-stripped helium stars** in binaries after seven years.
- And, These stars will end their lives as **hydrogen-poor supernovae** that **leave behind ultra-dense balls called neutron stars.**
- And these **neutron stars may ultimately** smash into each other in powerful **kilonova explosions**, releasing **gravitational waves.**

Topic 16. RHINOS CAN'T SWEAT, MAKING THEM VULNERABLE TO OVERHEATING: GLOBAL WARMING COULD WIPE THEM OUT IN SOUTHERN AFRICA

Important for the subject: Environment

The first study on the **impact of climate change on rhinos in southern Africa** predicts that, under the worst-case scenario of climate change, the **region's national parks could lose all their rhinos by 2085.**

- **Home to 22,137 of the world's 23,432 white and black African rhinos, southern Africa is facing significant threats due to climate change.**

Why are rhinos in danger of being wiped out?

- **Rhinos cannot sweat.**
- If they want to **cool their large bodies down in the heat**, they need to **consume a lot of water.**
- They also rely on **wallowing in water holes and resting in the shade.**
- As Earth heats up, rhinos will only survive if they have more opportunities to cool down.

Why rhino will not survive the worst scenario?	<ul style="list-style-type: none"> If the world enters the 8.5 Representative Concentration Pathway, there is zero probability of rhinos surviving in southern Africa.
Solution	<ul style="list-style-type: none"> National parks will have to be built in many new water sources so that the rhinos can cool off at much more frequent intervals. The parks will also need to establish undisturbed tree cover: large patches of trees with no moving traffic or crop harvesting nearby. Those are important cooling-off areas. Setting up of Rhino corridors.
Challenges	<ul style="list-style-type: none"> High cost of establishing and maintaining these parks Trophy hunting Urban land encroachment
Could it really be over for Rhinos by 2085?	<ul style="list-style-type: none"> Researchers explore the potential impact of climate change on rhinos in southern Africa by utilizing. The Representative Concentration Pathways (RCPs) defined by the Intergovernmental Panel on Climate Change (IPCC). They specifically focused on RCP 4.5 and RCP 8.5 to predict future scenarios for rhinos. RCP 4.5 assumes a moderate increase in CO₂ levels to 650ppm by 2100, resulting in a 2.4°C average temperature rise. Contingent on significant reductions in methane and CO₂ emissions starting now. Under this scenario, rhinos could survive, albeit with challenges for other species. RCP 8.5, the worst-case scenario, predicts a dramatic population increase, continued reliance on coal. failure to reduce greenhouse gases, and a 4.3°C temperature rise by 2100, posing severe risks to rhinos and significantly altering their chance of survival in southern Africa.

What are the Conservation Efforts by India?

- The Ministry of Environment and Forests has launched a **National Conservation Strategy for the Indian One-Horned Rhino**.
- Moreover, the **Assam government** constituted a **Special Rhino Protection Force** to keep a check on **rhino poaching** and related activities at **Kaziranga National Park (KNP)**.
- **India, Bhutan, Nepal, Indonesia and Malaysia** in order to conserve and protect the rhinos signed the **New Delhi Declaration on Asian Rhinos 2019**.
- Through unique programmes like **Indian Rhino Vision 2020**, the government partnered with international, national and local organizations for the conservation of the rhinos.

Topic 17. CMS COP14: ACTION PLANS FOR AFRICAN-EURASIAN MIGRATORY LANDBIRDS, OTHER AVIAN SPECIES ADOPTED

Important for the subject: Environment

The **14th Meeting of the Conference of the Parties to the Convention on Migratory Species of Wild Animals (CMS COP14)**, held in **Samarkand, Uzbekistan**, adopted an **action plan to improve the conservation status of migratory landbird species in the African-Eurasian region** on February 15, 2024.

African-Eurasian Migratory Landbirds Action Plan (AEMLAP):

- The adopted **African-Eurasian Migratory Landbirds Action Plan (AEMLAP)** includes **urgent measures for habitat conservation**, **urges against illegal and unsustainable killing and trade**, and emphasizes **preventing bird poisoning from pesticides**.
- It also included the adoption of the **12-year multi-species action plan for vultures**.
- The plan also focuses on addressing **habitat loss, degradation**, and **threats from energy infrastructure**, particularly for **migratory bustards**.
- Additional action plans were adopted for species like the **far eastern curlew**, **Baer's pochard**, **European roller**, **Great Bustard**, and the **Christmas Island Frigatebird**.
- Concerns were raised about the **declining conservation status** of the **Indian Skimmer**, with **India and Bangladesh** proposing its **listing** under the **CMS** and the **development of an international action plan for its conservation**.

Topic 18. RESEARCHERS FIND NEW CRUSTACEAN IN ODISHA'S CHILIKA LAGOON

Important for the subject: Environment



Researchers from **Berhampur University in Odisha, India**, have identified a **new species of marine amphipod**, named **Parhyale odian**, in **Chilika Lake**, Asia's largest brackish water lagoon.

About Parhyale odian:

- The **discovery increases the total known species in the Parhyale genus to 16.**
- This particular species was distinguished by its **unique characteristics**, including a **stout robust seta** on the **male's first pair of legs**, and it's **brown in colour with 13 pairs of legs.**
- The research involved **collecting specimens from the intertidal region of the lagoon.** This finding contributes to the understanding of **marine biodiversity in Chilika Lake** and highlights the **amphipods' role in marine ecosystems** and their potential as **indicators for climate change impacts on coastal environments.**
- The discovery follows the **identification of three other marine amphipods by the same research team in 2023**, underscoring their continued contributions to marine biology.

Chilika Lake

- Chilika is **Asia's largest and world's second largest lagoon.**
- It lies on the east coast of India in the state of Odisha, separated from the mighty Bay of Bengal by a small strip of sand.
- It spreads over **Puri, Khurda and Ganjam districts** of Odisha on the east coast of India, at the mouth of the Daya River, flowing into the Bay of Bengal, covering an area of over 1,100 square kilometers.
- It is the largest wintering ground for migratory birds on the Indian sub-continent and is home to a number of threatened species of plants and animals.
- In 1981, Chilika Lake was designated the first Indian wetland of international importance

under the **Ramsar Convention**.

- Major attraction at **Chilika** is **Irrawady dolphins** which are often spotted off **Satpada Island**.
- The large **Nalabana Island (Forest of Reeds)** covering about 16 sq km in the lagoon area was declared a bird sanctuary in 1987.
- **Kalijai Temple** – Located on an island in the **Chilika Lake**

Topic 19. WHAT ARE IPCC'S ASSESSMENT REPORTS?

Important for the subject: Environment

Since **1988**, the **UN Intergovernmental Panel on Climate Change (IPCC)** has produced **six assessment reports**, **three special reports**, and **methodology reports** that provide **guidelines for estimating greenhouse gas emissions and removal**.

- **Three reports** from the **IPCC's sixth assessment cycle (AR6)** were published in **2021-2022**.
- These documents — prepared by scientists from the **195 countries** that are part of the **UN Framework Convention on Climate Change (FCCC)** — examine the science, consequences, adaptation, and vulnerability as well as the mitigation aspects of climate change.
- Over the years, these reports have substantiated the fact that the **planet is warming and that humans bear primary responsibility**.

What did the report say?

- The recent report, known as the **Sixth Assessment Report (AR6)**, highlighted the **urgent need to limit the global average surface temperature increase to 1.5 degrees Celsius above pre-industrial levels**, as targeted by the **Paris Agreement**.
- It noted that the window for achieving this goal is closing rapidly and that we are nearing the limits of adaptation.
- The report **offered strategies for slowing warming and enhancing resilience and adaptation** in both **natural and human-made systems**.
- Following **AR6**, the **Intergovernmental Panel on Climate Change (IPCC)** began its **seventh assessment cycle (AR7)** by electing a new bureau.

What will the AR7 cycle produce?

- During the **AR7 cycle** discussions in **Turkey**, the **IPCC Bureau** decided to produce a comprehensive set of reports, including full assessment and synthesis reports, methodology reports, and a single special report.
- The full assessment reports will consist of contributions from **three Working**

Groups and a **synthesis report**, following the format of previous cycles.

- The decision took into account the availability of new literature, the need for climate model simulations, engagement with under-represented communities, and the workload on the **IPCC's technical support unit and authors**.
- **Two methodology reports** will focus on **short-lived climate forcers**, such as **methane**, and **carbon removal techniques**.
- Additionally, technical guidelines on impacts and adaptation will be revised. Despite suggestions from countries to cover 28 topics in special reports, the bureau opted to produce just one special report specifically addressing climate change and cities.

Timeline for the reports:

- Member countries proposed that the **IPCC assessment reports** for the **AR7 cycle** be completed by **2028** to align with the **Global Stocktake (GST)**, but the bureau has yet to decide on a release date.
- Concerns were raised that a **shortened cycle might undermine the quality of the reports** due to potential limitations in publishing new research and completing comprehensive climate modelling.
- Additionally, a **constrained timeline** could **hinder effective engagement with under-represented countries**.
- A final decision on the timeline for the **assessment reports** is expected to be made at the **61st session of the IPCC**.

Topic 20. ULTRADIAN RHYTHMS: THE CYCLES OF LIFE

Important for the subject: Environment

Ultradian rhythm:

Life on Earth is sustained by various **biological cycles**, among which the **ultradian rhythm** is a **key cyclic process** observed in **all living organisms**, from **single-celled entities** to **humans**.

- Unlike **circadian rhythms** that operate on a **24-hour cycle**, like the **sleep-wake pattern**, **ultradian rhythms** occur more frequently, within less than a **24-hour period**.

Ultradian rhythm refers to cycles with a **period shorter than a day but longer than an hour**.

- These rhythms are **responsible for governing essential physiological functions** such as **heartbeat**, **breathing**, **hormonal releases**, and **brain-wave activity**, thus playing a **crucial role in maintaining the health and well-being of organisms**.

- A well-known example of an ultradian rhythm is the sleep cycle, which involves alternating periods of rapid eye movement (REM) and non-REM sleep throughout the night.
- Each cycle lasts about 90 minutes, with REM sleep associated with dreaming and non-REM sleep being important for physical restoration and memory consolidation.
- Moreover, ultradian rhythms regulate the pulsatile secretion of hormones like growth hormone, cortisol, and insulin, which are vital for metabolism regulation, energy levels, and stress response management.

Topic 21. EXTRACTION OF RAW MATERIALS COULD RISE 60% BY 2060 – AND MAKING MINING ‘GREENER’ WON’T STOP THE DAMAGE

Important for the subject: Environment

The upcoming **Global Resources Outlook** report by the UN International Resource Panel paints a critical picture of the escalating global consumption of raw materials.

Details of the report:

- Since 1970, consumption has increased fourfold and is projected to rise by another 60% by 2060.
- The report highlights that the mass of human-made products, or the technosphere, now outweighs the biosphere—the total mass of all life on Earth.
- This shift, marking the 2020s as the era when human creations surpassed natural life in weight, has profound implications for global heating, ocean acidification, and the acceleration of species extinction.
- The mining sector’s expansion requires vast land annexation, significantly increased energy consumption since the 1970s, and contributes to ecological degradation.
- As material demand continues to rise, the declining quality of ores and the need for more intensive extraction methods signal an unsustainable trajectory.
- This process not only generates wealth for a few but also designates numerous regions, especially in developing countries, as sacrificial zones, bearing the environmental and social costs of material consumption.

Critical raw materials:

- The “critical” and “strategic,” raw materials are characterized by their scarcity, geographical concentration, and essential nature for military applications and technological competitiveness among major global powers.
- These critical raw materials are also vital for the green transition, with the EU highlighting nickel’s importance for battery production.

- The shift towards **renewable energy** and **electric vehicles** significantly **increases the demand for minerals**.
- For instance, a **wind turbine** requires **nine times the mineral inputs of a conventional gas-fired power plant**, and an **electric vehicle** needs six to ten times the minerals of a **traditional car**.

Urban mining:

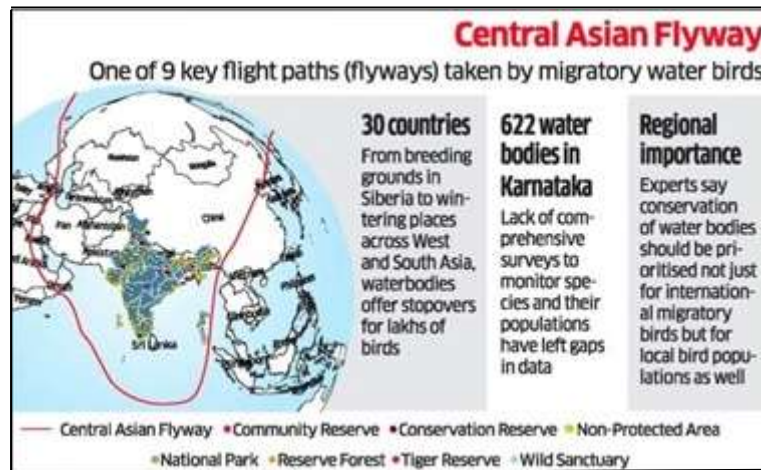
- **Urban mining** involves **recovering minerals from waste**, such as **household electronics, construction debris, sewage, and incinerator ash**.
- Despite the potential benefits, the **use of secondary materials is declining**, with **recycling rates for most minerals remaining alarmingly low**, often **below one per cent**.
- The **economic model** currently favors **extractive mining due to its cost-effectiveness and simplicity**, especially in **developing countries** where **land is cheaper**.
- **Extractive mining's capital-intensive nature** contrasts with **urban mining's labor-intensive requirements** and the need for **complex regulation of waste streams**.
- **Urban mining's growth** is hindered by **governmental reluctance to shift taxation from labor to the use of non-renewable resources**.
- Without significant **regulatory and tax reforms**, efforts towards a **circular economy** could inadvertently fuel economic growth, increase energy consumption, and exacerbate environmental damage.
- Therefore, **urban mining and circular economy initiatives** are **not inherently "green"** and their effectiveness is heavily dependent on the surrounding political-economic framework.

Is "degrowth" the answer?

- The concept of **"degrowth"** is gaining traction as a response to the **limitations of engineering solutions and green growth strategies** in addressing the **environmental crisis**.
- **Degrowth** does not advocate for a universal contraction of economic activities but **emphasizes the need for a significant and equitable reduction in the global consumption of materials and energy to restore a sustainable balance between society and nature**.
- These adjustments suggest that the current unsustainable forecasts for material usage by 2060 could be significantly lowered, highlighting degrowth as a viable path to sustainability

Topic 22. CENTRAL ASIAN FLYWAY RECOGNISED TO PROTECT OVER 600 MIGRATORY BIRD SPECIES

Important for the subject: Environment



The **Fourteenth Meeting** of the **Conference of the Parties** to the **Convention on the Conservation of Migratory Species of Wild Animals (CMS COP 14)** saw the **adoption** of the **Initiative for the Central Asian Flyway**, a **proposal led by India** and **supported by Bird Life International** along with **30 other governments** ranging from **Russian Siberia** to the **Maldives**.

Details about the initiative:

- This **initiative** under the **CMS** aims to **restore and maintain the favourable conservation status of migratory species populations** and **enhance their ecological connectivity across the flyway**.
- **Bird Life International** highlighted the **concerning decline in populations of over 240 species of migratory birds within the Central Asian Flyway**, noting that **48** of these species are classified as **Globally Threatened or Near Threatened**.
- **Migratory birds** such as the **White Stork in Uzbekistan**, the **Black-Necked Crane in Bhutan**, and the **Steppe Eagle in Kazakhstan** hold significant cultural importance for the local communities.
- The **initiative** will serve as a platform for **capacity building, knowledge sharing, research, and coordination** among **all countries within the flyway** to **conserve migratory bird populations**.
- **Major threats** to these migratory birds, such as **habitat loss, overexploitation, illegal killing, and the dangers posed by the rapid development of energy infrastructure**, which can lead to **collisions and electrocutions**.
- The **initiative** commits to **developing and enforcing a Programme of Work** that aligns with the **resolutions, decisions, and plans agreed upon by the CMS** to address these

challenges.

About Central Asian Flyway (CAF):

- **Central Asian Flyway (CAF)** covers a large area of **Eurasia** between the **Arctic** and **Indian Oceans**.
- This **flyway** comprises **several important migration routes of birds**.
- Including **India**, there are **30 countries** under the **Central Asian Flyway**.
- **The Central Asian Flyway consists of the following countries:** Afghanistan, Armenia, Azerbaijan, Bahrain, Bangladesh, Bhutan, China, Georgia, India, Iran, Iraq, Kazakhstan, Kuwait, Kyrgyzstan,
- the Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Qatar, Russian Federation, Saudi Arabia, Sri Lanka, Tajikistan, Turkmenistan, United Arab Emirates, United Kingdom (British Indian Ocean Territory), Uzbekistan and Yemen.
- At the **13th meeting of the Conference of Parties (CoP)** to the **Convention on Migratory Species (CMS)**, held at **Gandhinagar** in **February 2020**, a **resolution (UNEP/CMS/Resolution 12.11 (Rev.COP13))** and **Decision 13.46** were adopted in inter-alia providing for establishing, by **COP14**,
- Under the umbrella of **CMS** an institutional framework, under the leadership of India with the aim to agree on conservation action for migratory birds.
- With a view to fulfil its commitment, **India** is organizing **two-day online meeting on 6th -7th October 2021** with **CAF Range Countries**, anchored in the **Wildlife Institute of India**.
- Approximately **one in five of the world's 11,000 bird species migrate**, some covering enormous distances.
- Conserving migratory birds requires cooperation and coordination along the entire flyway between countries and across national boundaries.

Topic 23. VAITARNA RIVER ATTACK: WHY THE BULL SHARK IS AMONG THE MOST DANGEROUS ANIMALS IN THE WORLD

Important for the subject: Environment



A fisherman from Maharashtra's Palghar district was attacked by a **bull shark** in the **Vaitarna river**.

Vaitarna river:

- The **Vaitarna River**, which is close to the origin of the **Godavari river**, flows from the **Trimbakeshwar Hills** in **Nashik** through **Palghar** and drains into the **Arabian Sea** near **Mumbai**.
- The **Tansa** is its **left bank tributary** and the **Pinjal**, **Dehraja**, and **Surya** are its **right bank tributaries**.
- The **Vaitarna** is one of the **most polluted rivers in India**.

Bull shark:

- Also known as the **Zambezi shark** (informally **zambi**) in **Africa** and the **Lake Nicaragua shark** in **Nicaragua**.
- It is a **species of requiem shark** commonly found **worldwide in warm, shallow waters along coasts and in rivers**.
- It is known for its aggressive nature, and presence mainly in **warm, shallow brackish and freshwater systems** including **estuaries** and (usually) **lower reaches of rivers**. This aggressive nature is a reason for its population being listed as **vulnerable** on the **IUCN Red List**.
- Bull sharks are **euryhaline** and can **thrive in both salt and fresh water**.
- Unlike the river sharks of the **genus Glyphis**, **bull sharks are not true freshwater sharks**, despite their ability to survive in freshwater habitats. It has the unique ability to **inhabit fresh, saline, and brackish waters**.

- This species is known for its **adaptability**, having been found far upstream in several major rivers worldwide and is considered particularly **dangerous to humans** due to its **large size, freshwater presence, and proximity to human populations**.
- It is often considered the most dangerous shark species.

Topic 24. SCIENTISTS SHOCKED TO DISCOVER NEW SPECIES OF GREEN ANACONDA, THE WORLD'S BIGGEST SNAKE

Important for the subject: Environment



Recent findings about Green anacondas:

Recent research has significantly altered the scientific understanding of the **green anaconda**, revealing that what was thought to be a **single species** is actually **two genetically distinct species**.

- This discovery challenges previous perceptions and highlights the **importance of revising conservation strategies for these top jungle predators**.
- The **identification of substantial genetic differences** between the **two species of anacondas** underscores the need for **tailored conservation efforts** to address threats like **climate change, habitat degradation, and pollution**.
- Additionally, this finding emphasizes the critical necessity of understanding the diversity of Earth's flora and fauna.

Untangling anaconda genes:

- The known species, **Eunectes murinus**, has been named the “**southern green anaconda**” and is found in **Peru, Bolivia, French Guiana, and Brazil**.
- The newly identified species, **Eunectes akayima** or “**northern green anaconda**,” inhabits **Ecuador, Colombia, Venezuela, Trinidad, Guyana, Suriname, and French Guiana**.
- Genetic analysis revealed a **significant divergence between the two species**, estimated to have occurred nearly **10 million years ago**, with a **genetic difference of 5.5%**, a substantial variation considering the genetic difference between humans and apes is

about 2%.

- Despite their genetic differences and lack of obvious geographical barriers separating them, the two species appear nearly identical.

About Green anacondas:

- **Green anacondas**, known for being the world's heaviest and among the longest snakes, are native to South America's rivers and wetlands.
- They are **notable** for their **speed** and **ability to capture and consume large prey**.
- Historically recognized as **one of four species**, the **green anaconda**, also known as the **giant anaconda**, stands as a colossal figure in the reptile world.
- The **largest females** can exceed **seven meters in length** and **weigh over 250 kilograms**, making them **apex predators** in their environments.
- Adapted for **aquatic life**, they have their nostrils and eyes positioned atop their heads, allowing them to see and breathe while submerged.
- Their **olive colour** and **large black spots** camouflage them in the **South American Amazon and Orinoco basins' waterways**, where they utilize their **stealth, patience, and agility** to **ambush prey** such as **capybaras, caimans, and deer**.
- Unlike **venomous snakes**, green anacondas **employ their powerful bodies and large jaws** to **constrict and swallow their prey whole**.

Their ecological role:

- As **apex predators**, green anacondas play a **critical role** in **maintaining ecological balance**, influencing the behaviour of various species and indicating the health of their ecosystems.
- Their **sensitivity to environmental changes** means that **healthy anaconda populations** reflect vibrant ecosystems, while **declining numbers** may signal environmental distress.

Topic 25. USE DICTIONARY MEANING OF 'FOREST', SC TELLS CENTRE

Important for the subject: Environment

Supreme Court in a significant order, on petitions challenging the **amendments** introduced in **2023 to the Forest (Conservation) Act, 1980**, and directed – That the expression 'forest' will continue to have a "**broad and all-encompassing**" meaning for the time being as held in 1996 order and include **97 lakh square km of undeclared forest lands under the ambit of 'forest'**.

Objective (intent) of 1980 act:

- The 1980 statute was enacted to **check further deforestation** leading to **ecological imbalance**.

What is the concern:

- **Section 1A** introduced through the amended Act 2023 had “**circumscribed or substantially diluted**” the definition of forest to two categories —
- declared forests and lands recorded as forests in ‘government records’ after 1980.

Centre arguments:

- Section 1A- **expanded** the term ‘government records’ contained in the provision to include **lands recognised as forest by any State or Union Territory, local body, council or recognised communities**.

Present status:

- However, **SC directed** the government to **revert** to the “dictionary meaning” of ‘forest’ as upheld by SC in a 1996 decision in **the T.N. Godavarman Thirumulpad case**.

Broad meaning of Forest:

- **To preserve green expanses(forest) irrespective of their nature, classification or ownership.**
- “The adoption of this dictionary meaning to forests was made to **align with the intent of the Forest Conservation Act, 1980**.”
- The expression ‘forest’ **will not be confined** to lands recorded as forests in the government records only.

Present directions of SC wrt amendment 2023:

- SC said that the same dictionary meaning would **continue** till the States and Union Territories prepare a “**consolidated record**” of **all the lands recorded as ‘forest’** in government records, including **forest-like areas, unclassified and community forest lands**.
- As Part of **Rule 16** of a notification issued by the Environment Ministry on November 29, 2023, and would take a year “and also in **align** with the principles in **N. Godavarman Thirumulpad** must continue to be observed,”

- **Environment Ministry** shall have to issue **circular** to the States and Union Territories.
- States and UTs will **prepare** “comprehensive record” as per the Godavarman Thirumulpad case and will have to prepare records by March 31, 2024.
- The Environment Ministry has to **publish** these records on its website by April 15, 2024.
- In addition to these, the **establishment of “zoos or safaris” by any government or authority should not be consented** to without **the final approval of the top court**.
- The court listed the case again in July 2024.

Topic 26. EVERYTHING THAT HAPPENED AT CMS COP14

Important for the subject: Environment

The **COP14** of the **Convention on Migratory Species of Wild Animals (CMS COP14)** — the **first to happen in Central Asia** — concluded in **Samarkand, Uzbekistan**.

Outcomes of the summit:

- Some of the species included in the **CMS Appendices** were the **Eurasian lynx, sand tiger shark, Pallas’s cat, and magellanic plover**, among others.
- The summit gave added safeguards to species such as **blue sharks, chimpanzees** and **straw-coloured fruit bats** through **New Concerted Actions** adopted by **range states** (states whose territory is within the natural range of distribution of a species).
- The **State of Migratory Species Report 2024** identified **399 species** that could be listed in either the Appendices of the CMS-listed species.
- The **COP14** played a **key role** in giving recognition to the **Central Asian Flyway for migratory birds** that **stretches from Siberia to the Maldives**.
- It also tabled a new **science-based strategic plan for migratory species** extending from **2024 to 2032**.
- For **migratory aquatic species**, it introduced a new **mandate** on understanding the **impacts on migratory species, their prey and ecosystems** due to **deep-seabed mining**.
- The **COP** also introduced **three action plans for aquatic species**. Action plans for the **Atlantic humpback dolphin** were also adopted. **Uzbekistan** also announced plans to **introduce cheetahs in the country**.
- The **CMS COP14** also saw **new guidelines** presented for **mitigating the impacts of light pollution on migratory species**.
- It also **strengthened measures** for the **illegal and unsustainable killing of migratory**

species and resolutions and endorsements on climate change and its effects on migratory wildlife.

Global Partnership on Ecological Connectivity (GPEC):

- **Initiative by:** Convention on Migratory Species of Wild Animals
- **Launched at:** COP14 of the CMS, Samarkand, Uzbekistan.
- **Aim:** To “protect and connect natural areas” to ensure that key areas of migratory species are identified, protected and connected.

One Health Central India Project:

- **Launched by:** CMS under the leadership of IUCN.
- **Launched at:** COP14 of CMS, Samarkand, Uzbekistan.
- **Aim:** To address the concerns about **zoonotic diseases** — diseases transmissible to humans from animal contact — from the **COP14**.
- Under the leadership of the **International Union for Conservation of Nature**, saw the launch of the **One Health Central Asia project**.
- To prevent the emergence and spread of zoonotic diseases, the **five central Asian countries** — **Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan** — would implement actions for the same.

Topic 27. AFRICAN UNION IMPOSES HISTORIC BAN ON CRUEL DONKEY SKIN TRADE

Important for the subject: Environment



A historic ban on the trade in **donkey skin** has been agreed upon by the African heads of state.

- This agreement is announced on the **concluding day of the African Union summit in**

Ethiopia, outlawing the killing of donkeys in the African continent for their skin.

- This is a significant outcome following the **Dar es Salaam declaration adopted at the first AU-IBAR Pan-African Donkey Conference in December 2022.**
- It had demanded for an **African Union Commission (AUC) resolution** to be passed in favor of a 15-year ban on the commercial killing of donkeys for their skin.
- Other demands included the **creation of an Africa donkey strategy for donkey production and productivity, and the inclusion of donkeys in the global development agenda.**
- In September 2020, the **pan-African animal conference**, also, had urged African governments to take immediate action to protect donkeys, including the creation and successful application of laws and policies that will support them,
- and to outlaw the sale of donkeys and the trade in their skin, as these activities pose a major socioeconomic threat to communities that depend on them.
- In June 2021, a **ministerial meeting during the ECOWAS Regional Donkey Skin Trade Conference** also raised concerns over the devastating impact of the donkey skin trade on donkey populations and the communities across Africa.
- With increasing demand, at least 6.8 million donkeys are projected to be killed every year in 2027. **The number of donkeys in Africa has decreased dramatically over the past 10 years.**
- This translates to a decrease in the donkey's population by around 44 per cent in just seven years.
- The population of donkeys in Botswana declined from 493,000 in 2003 to 125,000 in 2021.

Agreement to protect donkeys & equid owners:

- The landmark moratorium on skin trade in donkeys agreed upon at the AU summit has been welcomed by wildlife conservationists.
- This agreement from leaders of the African Union strikes at the heart of the brutal skin trade.

Why donkey skin is traded

- Donkey skin is used to make the traditional Chinese medicine ejiao.
- It is in constant demand, fueling a global trade that is vicious, unsustainable and opportunistic.
- In five years between 2016 and 2021, ejiao production is estimated to have increased by 160 per cent, the Donkey Sanctuary estimated in a paper Donkeys in global trade released this year.

- The ejiao industry now requires a minimum of 5.9 million donkey skin annually to keep up with the latest Chinese demand.
- The demand for **donkey skin reduced the donkey population in China from 11 million in 1992 to just under two million.**
- **The demand for ejiao, a gelatine manufactured by boiling donkey skin, is met primarily by imported skin sourced from South America and Africa.**
- Africa is particularly affected by this, as it is home to over two-thirds of the 53 million donkeys estimated to exist worldwide.
- Farmers who depend on donkeys for their livelihoods have seen theft and cruel treatment of animals as a result of the increased demand.
- The countries where donkeys are being traded illegally for their skin include **Ghana, Nigeria, Botswana, Burkina Faso, Mali, Niger, Senegal, Uganda, Ethiopia, South Sudan, Tanzania, Kenya and Egypt.**
- The historic pan-African agreement will protect 33 million donkeys that are on the continent from being stolen, trafficked and killed.
- This will also save tens of thousands of African communities who depend on donkeys for their well-being and means of subsistence.
- Donkeys are critical to millions of people and the global trade in donkey skin undermines efforts to achieve at least nine of the 17 United Nations-mandated sustainable development goals.
- These include the goal to end poverty (SDG1), since equid ownership represents the only viable escape from extreme poverty.
- This landmark decision needs to be implemented and enforced by every country that makes up the African Union, stated Otieno Mtula, regional campaigns and advocacy manager for The Donkey Sanctuary.

Brazil is also likely to impose a ban on illegal donkey skin trade.

- This may disrupt the **supply chain and the ejiao industry in China, experts predicted.**

About African Union:

- **The African Union (AU) is a continental body consisting of the 55 member states that make up the countries of the African Continent.**
- It was officially launched in **2002 as a successor to the Organisation of African Unity (OAU, 1963-1999).**
- The AU is guided by its vision of **“An Integrated, Prosperous and Peaceful Africa, driven by its own citizens and representing a dynamic force in the global arena.”**

- The African Union (AU) was officially launched in July 2002 in **Durban, South Africa**, following a decision in **September 1999** by its predecessor, the **Organisation of African Unity (OAU)** to create a new continental organization to build on its work.
- The most important decisions of the AU are made by the Assembly of the African Union, a semi-annual meeting of the heads of state and government of its member states.
- The AU's secretariat, the African Union Commission, is based in Addis Ababa.

Various Breeds of Donkeys In India:

Donkey breeds found in India are primarily used to carry heavy loads

Breed	Native region; characteristics	Use
Kachchhi	<ul style="list-style-type: none"> • Kutch region of Gujarat; grey, white, brown or black in color 	<ul style="list-style-type: none"> • For weed removal in farms and as pack animals during pastoralist migration. • It can carry 80-100 kg and pull 200-300 kg on carts.
Halari	<ul style="list-style-type: none"> • Saurashtra region of Gujarat; white in color, docile temperament 	<ul style="list-style-type: none"> • As pack animals during pastoralist migration and to pull carts. It can walk around 30-40 km in a day
Sindhi	<ul style="list-style-type: none"> • Barmer and Jaisalmer districts of Rajasthan; brown in color 	<ul style="list-style-type: none"> • As pack animals to transport water, soil, earthenware, construction material, fodder • and to pull carts and for plowing by small and marginal farmers. They can carry 1,000-1,500 kg.
Spiti	<ul style="list-style-type: none"> • Cold desert areas of Himachal Pradesh; dark brown, brown or black in color 	<ul style="list-style-type: none"> • For immediate transport of highly perishable cash crops and fruits, food grains and other items to far flung areas; • to fetch wood, logs and other minor forest produce; and to bring dung or manure from pastures to villages or fields.

Topic 28. AMOUNT OF TINY PLASTIC PARTICLES IN BOTTLED WATER UNDERESTIMATED: STUDY

Important for the subject: Environment

Introduction:

As per **Columbia University in New York** study, published in the **National Academy of Sciences**:

- A litre of bottled water can contain more than one lakh particles of **micro-and nano-plastics(90%)** [Nanoplastics are minute, with dimensions ranging from **1 nanometre to 1 micrometre**].
- Also **much greater** concentration than earlier estimated.

Significance of Nano-plastics presence in bottled water:

- Bridge the knowledge gap in analysis of nano plastics
- Providing information about plastic pollution at the nanometre level.

Analysis of Nano-plastics:

- Nano plastics are **difficult to analyse** due to their size and inability of different diagnostic techniques to identify them.

Diagnostic technique adopted:

- A custom **hyperspectral stimulated Raman scattering (SRS)** imaging platform is a solution.
- With the use of the SRS platform, **fragmentation of the plastic content** of real-world water samples **beyond the micrometre scale, even smaller** that was unable to be detected by conventional imaging techniques.
- SRS can capture **multiple images** of an object's molecules at different wavelengths, leading to a **comprehensive picture**.

SRS Microscopy:

- SRS microscopy uses **the Raman effect, a.k.a. Raman scattering**.

Raman scattering:

- When light of a certain frequency is beamed at a group of atoms or molecules, the latter

both absorb some of the energy in the beam and scatter it to different direction.

- This is a form of **inelastic scattering**. (In elastic scattering, the scattered light still has the kinetic energy and the atoms or molecules haven't absorbed any)

Adoption by research team:

- The research team used the **SRS imaging platform** along with an **automated algorithm** to identify plastics.
- **The algorithm extracted detailed information** — i.e. at the single-particle level — about the chemical makeup from **the data produced by the SRS platform**.
- After test and verification researcher used **combined apparatus** to detect plastic particles **quickly and accurately**.
- Researcher used **bottled water as a model system** to look for micro- and nano-plastics.

Which plastics are in the water?

- -In bottled water **following types** of plastics are found: polyamide 66, polypropylene (PP), polyethylene, polymethyl methacrylate, polyvinyl chloride (PVC), polystyrene, and polyethylene terephthalate (PET).

Interesting revelation:

- According to research, counting the plastic particles in the model system revealed
- -For example, **polystyrene** particles are around **100-200 nanometres** in size whereas **PET** particles have a size of **around 1-2 micrometres**.
- Thus, **PET** is a more significant component when measuring [the particles] in mass while **Polystyrene** clearly dominates when counting the number of particles.

Relevance of study:

- -In present era of Plastic pollution concern, The study has been published.

Why plastic pollution is a concern:

- Microplastics is being found in all ecosystems from ocean trenches to the tops of Himalayan mountains.
- -Also plastic items can **break down** into **sub-micrometre** pieces, meaning they

can breach biological barriers and enter different parts of the bodies of living beings.

What were the findings?

- The investigation revealed the presence of **around 2.4 lakh micro- and nano-plastic particles per litre** of bottled water –
- that is **two to three orders of magnitude** more than the previously reported results and as per paper —**experts may have been underestimating the concentration of microplastics in bottled water.**

Various particle-type analysis:

- As per research paper, obtained values are **substantially higher** than those **currently reported**-due to **newly detected nano plastic** part of plastic particulate,
- previously invisible under conventional imaging, are **90% of the entire population of plastic particles detected.**
- **The remaining 10% identified as microplastics** have a concentration of around [30,000] particles per litre with the majority of them in the size below 2 m.
- **Larger particles (2 m)**, which are easier to identify under **regular optical microscopy**, are in the **same order of magnitude** as the reported.

Technology adopted:

- **Traditional single particle chemical imaging techniques** like Fourier transform infrared spectroscopy and Raman microscopy have **lower instrumental resolution and detection sensitivity.**
- These have a **limited ability** to study the chemical composition of a material beyond the microscopic scale.
- Also **sophisticated techniques** like electron microscopy and atomic force microscopy (that can track and study individual particles such as atoms and molecules) **can't differentiate** between different compositions and thus **uniquely identify the material.**

Other particles presence:

- As per study, presence of particles that **did not match any standards** (international rules that classify different plastic materials based on their physical and chemical properties)
- -i.e. **the presence of other particulate inhabitants** is also obtained.

Topic 29. INCOME TAX APPELLATE TRIBUNAL (ITAT)

Important for the subject: Economy

Recently, the I.T. department froze Congress bank accounts over 2018-19 returns but the appellate tribunal provided partial relief.

About Income Tax Appellate Tribunal (ITAT):

- ITAT is a quasi-judicial institution set up in January 1941.
- It specialises in dealing with appeals under the Direct Taxes Acts.

Functions:

- It hears income tax appeals from taxpayers against orders passed by the Income Tax Authorities.
- The orders passed by the ITAT are final, an appeal lies to the High Court only if a substantial question of law arises for determination.

Benches:

- Presently ITAT has 63 Benches in 27 different states covering almost all the cities having a seat of the High Court.

Strength:

- One President, who is assisted by ten (10) Zonal Vice Presidents and 115 Members (i.e. Accountant Members and Judicial Members).
- The ITAT is headed by a President, who is appointed by the Central Government. ITAT is referred to as the '**Mother Tribunal**' being the oldest tribunal in the country.

Topic 30. SBI IN TALKS WITH RBI TO LOWER CRR ON GREEN DEPOSITS

Important for the subject: Economy

The State Bank of India (SBI) is in talks with the Reserve Bank of India (RBI) to reduce the cash reserve ratio (CRR) requirement on green deposits.

About Green Deposits

- Green deposits are fixed-term investments tailored for individuals and entities seeking to

support **environmentally friendly initiatives**.

- These deposits align with the **principles of Environmental, Social, and Governance (ESG)** investing, reflecting a growing trend towards sustainable finance.
- Funds from green deposits are directed towards projects promoting **renewable energy, clean transportation, pollution control, green infrastructure, and sustainable water management**.

Green Deposits Vs Normal Deposits

- Green deposits allocate funds to specific environmentally friendly projects, unlike regular deposits.
- Interest rates on green deposits are determined by lenders and are currently comparable to those offered on conventional deposits.

RBI Framework for Green Deposits

- **Preventing Greenwashing:** The RBI's framework ensures transparency in environmental claims associated with green deposits.
- **Deposit Options:** Banks offer green deposits denominated in rupees, with choices between cumulative or non-cumulative options.
- **Applicability:** Scheduled commercial banks, small finance banks, non-banking financial companies (NBFCs), and housing finance companies (HFCs) must comply with this framework.
- **Eligibility:** Both corporate entities and individual customers can invest in green deposits, contributing to environmentally sustainable initiatives.
- **Allocation:** Funds mobilized through green deposits are directed towards sectors such as renewable energy, waste management, and afforestation.
- **Restrictions:** Lenders are prohibited from channelling green deposit funds into sectors like fossil fuels, nuclear power, or tobacco.
- **Verification:** Independent Third-Party Verification is conducted annually to assess the allocation and impact of funds raised through green deposits.
- **Oversight:** Lenders are required to review the impact of funds lent for green finance activities on an annual basis.
- **Penalties:** There are no penalties for underutilization of funds raised through green deposits, providing flexibility to financial institutions.

Topic 31. THE RECENT REPORT ON LOCAL FINTECH PLAYERS

Important for the subject: Economy

In its recent report, the Standing Committee on Communications and Information Technology expressed worries about foreign-owned fintech apps having too much control in India.

- The committee suggested that Indian-owned apps should be encouraged more.
- It pointed out that while the **Unified Payments Interface (UPI) made up a large portion (73.5%)** of all digital payments in terms of volume in the fiscal year 2022-23. However, its share of the total payment value was much smaller, at only 6.67%.

Usage Statistics

NPCI's data from December last year revealed:

- Customers initiated a total of 5,642.66 million transactions using PhonePe.
- Another 4,375 million transactions were made using Google Pay.
- Only about 24.30 million transactions were made using BHIM.

National Payments Corporation of India (NPCI)

- NPCI is an **umbrella organisation for operating retail payments and settlement systems in India.**
- It is an initiative of **RBI and Indian Banks' Association (IBA)** under the provisions of the **Payment and Settlement Systems Act, 2007.**
- The objective of **NPCI is to create a robust Payment & Settlement Infrastructure in India.**
- For this, NPCI was incorporated as a **"Not for Profit"** Company under the provisions of Section 25 of Companies Act 1956 (now **Section 8 of Companies Act 2013**).

UPI

- It was launched by **NPCI.**
- UPI is a system that **powers multiple bank accounts into a single mobile application** (of any participating bank), merging several banking features, seamless fund routing & merchant payments into one hood.
- It also caters to the **"Peer to Peer"** collect request which can be scheduled and paid as per requirement and convenience.

What does the report infer about the existing ecosystem?

Regulation of Digital Payment Apps

- The Committee underscored the importance of regulating digital payment apps due to their increasing usage in India.
- It highlighted that regulating local apps, compared to foreign ones, would be more practical for entities like the Reserve Bank of India (RBI) and the National Payments Corporation of India (NPCI).

Domination of Foreign-Owned Fintech Apps

- The Committee noted the dominance of fintech apps owned by foreign entities, such as PhonePe backed by Walmart and Google Pay, in the Indian fintech sector.
- PhonePe holds the largest market share in terms of transaction volume, followed by Google Pay.

Fintech Companies and Money Laundering Concerns

- The Committee highlighted that fintech companies were being exploited by scamsters for money laundering purposes.
- An example cited was the Abu Dhabi-based app called Pyppl, which was reportedly administered by Chinese investment scamsters.
- This situation posed challenges for Indian law enforcement agencies in tracking the flow of illicit funds gathered through scams on the platform.

Topic 32. CABINET APPROVES AMENDMENT IN THE FOREIGN DIRECT INVESTMENT (FDI) POLICY ON SPACE SECTOR

Important for the subject: Economy

The Union Cabinet chaired by **Prime Minister Shri Narendra Modi** approved the **amendment in Foreign Direct Investment (FDI) policy on the space sector.**

- The satellite sub-sector has been divided into **three different activities with defined limits for foreign investment in each such sector.**
- The **Indian Space Policy 2023** was notified as an **overarching, composite and dynamic framework** to implement the vision for unlocking India's potential in the Space sector through enhanced private participation.
- The FDI policy reform will enhance **Ease of Doing Business in the country.**
- It will further lead to greater FDI inflows and thereby contributing to growth of investment, income and employment.

FDI in Space sector:

- As per the existing FDI policy, **FDI is permitted in establishment and operation of Satellites through the Government approval route only.**

- Under the amended FDI policy, **100% FDI is allowed in the space sector.**
- The liberalized entry routes under the **amended policy** are aimed to attract potential investors to invest in Indian companies in space.

The entry route for the various activities under the amended policy are as follows:

Upto 74% under Automatic route:

- Satellites-Manufacturing & Operation, Satellite Data Products and Ground Segment & User Segment.
- Beyond 74% these activities are under government route.

Upto 49% under Automatic route:

- Launch Vehicles and associated systems or subsystems, Creation of Spaceports for launching and receiving Spacecraft.
- Beyond 49% these activities are under government route.

Upto 100% under Automatic route:

- Manufacturing of components and systems/ sub-systems for satellites, ground segment and user segment.

Benefits of Increased FDI:

- This increased private sector participation would help to generate employment, enable modern technology absorption and make the sector self-reliant.
- It is expected to integrate Indian companies into global value chains.

About Foreign Direct Investment:

Foreign Direct Investment

- FDI is the process whereby residents of **one country (the home country)** acquire **ownership of assets for the purpose of controlling the production, distribution and other activities of a firm in another country (the host country).**
- It is different from **Foreign Portfolio Investment** where the foreign entity merely buys stocks and bonds of a company. FPI does not provide the investor with control over the business.
- **Flows of FDI comprise capital provided (either directly or through other related enterprises)** by a foreign direct investor to an enterprise.
- FDI has three components, **viz., equity capital, reinvested earnings and intra-company loans.**

- Equity capital is the **foreign direct investor's purchase of shares of an enterprise in a country other than its own.**
- Reinvested earnings comprise the direct investors' share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates, or earnings not remitted to the direct investor. Such retained profits by affiliates are reinvested.
- Intra-company loans or intra-company debt transactions refer to short- or long-term borrowing and lending of funds between direct investors (or enterprises) and affiliate enterprises.

Topic 33. INDIA'S SMARTPHONE EXPORTS RISE FROM 1% TO 2.5% IN A DECADE

Important for the subject: Economy

In recent times, India has laid much emphasis on smartphone exports. In FY 2023, Prime Minister Narendra Modi lauded phone exports as they crossed **the \$10 billion** mark.

Smartphone export from India

- India is one of the leading players when it comes to cell phone exports by country.
- The country aims to accomplish the **production of electronics worth US\$ 300 billion by FY 2026**; manufacturing mobile phones will be the key to achieving India's ambitious goal.
- India's electronic goods exports surged by approximately 88% from US\$ 6,600 million in FY 2013-14 to US\$ 12,400 million in FY 2021-22.
- Mobile phones, consumer electronics, IT hardware, auto electronics, and industrial electronics were the key products exported from India.

Steps taken by India to promote smartphone exports:

- **Production-Linked Incentive (PLI) Scheme:** The government has launched the PLI scheme to provide financial incentives to smartphone manufacturers to boost local production and exports.
- **Phased Manufacturing Program (PMP):** The PMP program promotes domestic value addition in mobile phones and their sub-assemblies/parts manufacturing.
- **Foreign Direct Investment (FDI):** The government has permitted 100% FDI under the automatic route for manufacturing electronic devices (excluding countries sharing land borders with India). This has helped attract foreign investment in the electronics manufacturing sector.
- **Incentivized Areas for Export-Oriented Units:** Special Economic Zones (SEZs) have

been set up across the country to facilitate export-oriented manufacturing and trading.

- Units for manufacturing and related services set up under the Electronic Hardware Technology Park (EHTP) scheme are major contributors to India's electronics exports
- **Design Linked Incentive (DLI) Scheme:** The DLI scheme offers financial incentives and design infrastructure support across various stages of development and deployment of chipsets, systems & IP cores, and semiconductor-linked design.
- The scheme provides both a "Product Design Linked Incentive" and a "Deployment Linked Incentive".

Challenges to India's Smartphone Export Ambitions:

- **Disparity in Export Percentages:** The lower taxes in China and Vietnam helped boost their exports.
- Exports accounted for only 25% of India's smartphone production in 2023, compared with 63% of China's \$270 billion worth of production and 95% of Vietnam's \$40 billion worth.
- **Limited Tax Reductions on Components:** The finance ministry lowered taxes on some components, including battery covers, to 10% from 15%, but did not agree to many other tariff cut requests.
- **High Tariffs on Specific Components:** India still imposes a 20% tax on parts including chargers, some circuit boards, and fully assembled phones.
- **Tariff Discrepancies:** The lawmakers and lobby groups for Apple and other firms argue India's high tariffs are a deterrent for companies de-risking their supply chains beyond China,
- and nations such as Vietnam, Thailand, and Mexico have raced ahead in phone exports by offering lower tariffs on components.
- **Elevated Production Costs:** India has high production costs as we have one of the highest tariffs among the key manufacturing destinations.
- **Supply chain limitations:** Made in India phones use many parts made locally, but companies import many high-end parts from China and elsewhere due to supply chain limitations.

Topic 34. ILLEGAL LENDING APPS ON FSDC RADAR

Important for the subject:

Economy What is FSDC (Financial Stability and Development Council)?

Establishment:

It is a **non-statutory** apex council under the **Ministry of Finance** constituted by the **Executive Order in 2010**

- **The Raghuram Rajan committee** (2008) on financial sector reforms first proposed the creation of FSDC.

Composition:

- It is **chaired by the Finance Minister** and its **members** include the heads of **all Financial Sector Regulators (RBI, SEBI, PFRDA & IRDA)**,
- **Finance Secretary, Secretary of Department of Economic Affairs (DEA), Secretary of Department of Financial Services (DFS), and Chief Economic Adviser.**
- In **2018**, the government **reconstituted** FSDC to **include** the Minister of State responsible for the Department of Economic Affairs (DEA), Secretary of Department of Electronics and Information Technology,
- Chairperson of the Insolvency and Bankruptcy Board of India (IBBI) and the Revenue Secretary.
- **FSDC sub-committee** is headed by the Governor of RBI. The Council can invite **experts** to its meeting if required.

Functions:

- To strengthen and institutionalize the mechanism for maintaining **financial stability**, enhancing **inter-regulatory coordination** and promoting **financial sector development**.
- To monitor **macro-prudential supervision** of the economy. It assesses the functioning of large financial conglomerates.

Recent context:

- -Regulators discuss fresh measures to curb the further spread of harmful unauthorised lending through online apps during recent FSDC meet.

Unauthorised loan apps:

- **RBI** has shared a list of **442** unique digital lending apps used by the regulated

entities with **Ministry of Electronics & Information Technology (MeitY)** for the purpose of **whitelisting** and the same was shared with **Google**.

- As per the information received from MeitY, during April 2021 – July 2022, Google had **reviewed** approximately 3,500 to 4,000 loan apps and **suspended / removed** over 2,500 loan apps from its **Play Store**.
- Similarly, during September 2022 – August 2023, over 2,200 loan apps were removed from the Play Store. However, the problem still persists.

Various discussions at FSDC meet:

- Need for **uniform KYC norms** to ensure ‘inter-usability’ across the financial sector
- Need for “**constant vigil and proactive efforts**” to detect emerging financial stability risks in the current domestic and global macro-financial situation.
- Maintaining **the resilience** of the financial sector
- To **strengthen inter-regulatory coordination** to further develop the financial sector to provide **requisite financial resources** for **inclusive economic growth**.

Prominent discussion:

- **To arrest** the harmful effects of unauthorised lending through online apps and **measures to curb** their further spread
- FSDC reiterated push for regulators to **simplify and digitise the KYC** (Know Your Customer) process and **adopt uniform KYC norms** so that those KYC records can provide customers ‘inter-usability’ across the financial sector.

Diverse authorities attended FSDC meet:

- Along with The chiefs of various financial sector regulators and top finance ministry officials, the FSDC meeting was also attended by the **Secretary to the Ministry of Electronics and Information Technology S. Krishnan**.
- The **Ministry is critical to the process of delisting lending apps that are not authorised by the RBI**.

Topic 35. ELECTORAL BONDS CASE VERDICT: WHAT PARTIES ARGUED BEFORE SUPREME COURT

Important for the subject: Polity

Prioritizing voters’ right to information regarding political parties’ sources of funding, the Supreme Court Thursday (February 15) struck down the Electoral Bonds Scheme (EBS).

- This scheme was challenged shortly after it was announced in **January 2018**, by a **number of parties, including the Communist Party of India (Marxist), Common**

Cause and the Association for Democratic Reforms (ADR).

- The case was heard by a **5-judge constitution bench of the Supreme Court led by the Chief Justice of India** for three days from October 31 to November 2 last year.
- The court also struck down the amendments made to key laws on electoral finance which were introduced in the lead up to the **introduction of EBS**.

Amendments made through Finance Act 2017:

- On 31 March 2017, the Finance Act, 2017 amended the **Representation of the People Act, 1951 (RoPA), the Reserve Bank of India Act, 1934, the Income Tax Act, 1961, and the Companies Act, 2013**.
- **Section 11 of the Finance Act, 2017** amended Section 13A of the Income Tax Act exempting political parties from keeping a detailed record of contributions received through electoral bonds.
- **Section 135 amended Section 31 of the RBI Act, which** permitted the Union government to “authorize any scheduled bank to issue electoral bonds[s].”
- **Section 137 introduced a provision to Section 29C of RoPA**, exempting political parties from publishing contributions received through electoral bonds in “Contribution Reports.”
- These reports disclose contributions received by parties “in excess of twenty thousand rupees” from companies and individuals.
- **Section 154 amended Section 182 of the Companies Act, 2013** which removed the upper limit on how much a company could donate to a political party.
- Previously companies could only donate up to 7.5 percent of three years of the company’s net profits.

EBS violates voters’ right to information

- The petitioners, the Communist Party of India (Marxist), Common Cause and the Association for Democratic Reforms, argued that the scheme violates the right to information under **Article 19(1) (a) of the Constitution**.
- **Advocate Prashant Bhushan in particular** argued that voters have a right to information concerning the public and the government, which includes financial contributions to political parties.
- **Attorney General R Venkataramani had responded by saying that citizens do not have a “right to know” with regards to the funding of political parties**.
- It highlighted the **“deep association” between money and politics**, and how economic inequality contributes to political inequality by increasing the possibility of quid pro quo arrangements for those with the ability to contribute larger amounts to political parties.

Unlimited political contributions by companies is unconstitutional:

- Advocates Prashant Bhushan and Shadan Farasat also drew the court's attention to the rights of shareholders, who have a right to know how company resources are being utilized.
- This right is violated by preventing the disclosure of information to shareholders. Senior Advocate Kapil Sibal also drew attention to the amendment (**via the Finance Act, 2017**) **to Section 182 of the Companies Act, 2013**.
- This amendment removed the cap on the amount of money a company is permitted to contribute to a political party (set at 7.5% of its average net profits from the preceding three years).
- It was argued that removing this cap would allow unlimited contributions, **even by loss-making companies**.
- The court, however, drew a stark distinction between contributions made by companies and those made by individuals.
- It stated that contributions from companies were purely business transactions made with the **intent of securing benefits in return**.
- The court also highlighted the fact that companies have a greater ability to influence politics through contributions.
- Stating **"permitting unlimited corporate contributions authorizes unrestrained influence of companies in the electoral process"**.
- The court held that this would violate the **right to free and fair elections**.
- The court also picked up on Sibal's argument and explained that, **without the cap, loss-making companies** would be incentivised to make contributions in the hopes of making a quid-pro-quo arrangements with the government.
- As a result, the court struck down the amendment to **Section 182 of the Companies Act and reinstated** the cap on political contributions from companies.

The central government's justification:

- **Solicitor General Tushar Mehta** argued that the focus of the scheme is not to ensure **"anonymity"**, but to ensure **"confidentiality"**.
- Referring to the apex court's decision in 2019 to recognise the **right to privacy as a fundamental right**, he argued that donors have a right to privacy unless the information is a source of genuine public interest, in which case people can approach the court.
- The Solicitor General also gave the court a **detailed explanation of the ways in which Parliament**, the government and the **Election Commission** had attempted to halt the circulation of black money in politics over the years.

- The electoral bonds scheme was introduced after “**experimenting**” with a wide variety of schemes, amendments and policies.

About The scheme:

- **Electoral Bond** used to be a mode of funding to political parties in India.
- The scheme of Electoral Bond was introduced in The Finance Bill, 2017 during Union Budget 2017-18.
- The electoral bonds scheme allows corporations and individuals to anonymously donate money to political parties by purchasing electoral bonds from the State Bank of India (SBI).
- An electoral bond is like a promissory note that can be bought by any Indian citizen or company incorporated in India from select branches of **State Bank of India**.
- The bonds are similar to bank notes that are payable to the bearer on demand and are free of interest.
- An individual or party will be allowed to purchase these bonds **digitally or through cheque**.
- The SBI has sole access to the details of those who **purchased electoral bonds**.
- According to the scheme, the proceeds from any bonds, which are **not encashed within 15 days of being issued, are to be deposited in the Prime Minister Relief Fund**.

Topic 36. AFTER PAC NOD, HIKE IN REPORTING LIMITS FOR MINISTRIES' SPENDING PROPOSED

Important for the subject: Polity

After a gap of about 18 years, the government is set to revise its financial limits for ‘New Service’ and ‘New Instruments of Service’ after getting approval from Parliament’s Public Accounts Committee (PAC).

- The approval, which has come in line with **expansion in GDP growth and the Budget size, has fixed the reporting limit for ‘New Instrument of Service’**, to up to 20 per cent of the original appropriation or up to Rs 100 crore, whichever is higher.
- Approval from Parliament would be mandatory for amounts **exceeding 20 percent of the original appropriation or above 100 crores**, whichever is higher, Important for the subject to savings within the same section of the grant.
- The Ministry said it intends to simplify the process in such a way that it becomes very easy to adopt by the Ministries and **it will be very easy for the PAC to find deviations**.
- This would speed up the process of decision making for the government and also perhaps

improve the pace of scheme implementation.

- During the last 50 years, the first such change occurred in **1970**.
- Then subsequently in the **1980s, the third one was in 2005**. This is the fourth time the PAC has prepared this report.

About Finance Ministry Proposal:

- The panel has approved the **Finance Ministry's proposal to raise the reporting limit for new policy-related** expenditure by ministries/departments to **above Rs 50 crore but not exceeding Rs 100 crore** along with mandating prior approval of Parliament for spending over Rs 100 crore.
- This proposal for revision in the financial limits, which has just been the **fourth such instance since Independence**, is aimed at minimizing the frequency of Supplementary Demands for Grants presented to Parliament during a financial year.
- The last such revision had come into **effect in 2006**.

Reasons for such a step:

- Due to the low financial limits for **new policy-related expenditure earlier**, there has been a reported increase in the number of supplementary proposals from the ministries/departments.
- The time taken in seeking Parliament's approval would then cause delay in execution of projects.

About New Service (NS) and New Instrument of Service (NIS):

- **New Service (NS)** refers to **expenditure arising out of a new policy decision, not brought to the notice of Parliament earlier, including a new activity or a new investment**.
- **New Instrument of Service (NIS)** refers to **relatively large expenditure arising out of important expansion of an existing policy**.
- The **financial limits for 'New Service/New Instrument of Service'** are applied whenever the expenditure is incurred on account of the expansion of an existing policy.
- The proposed amendments intend to encourage the **Ministries to meticulously estimate their budgetary requirements**.
- The necessity for the upward revision arises due to a surge in supplementary proposals from the Ministries/Departments seeking prior approval from Parliament, causing delays in execution of projects/schemes/programmes despite availability of savings.
- With an **expected growth of GDP in the range of 6-7 per cent year-on-year**, the size of the Budget is anticipated to grow substantially in the next decade too and thus, required

an upward revision in the financial limits.

Other Key Takeaways:

- According to the report, **a substantial growth in budget size has diminished the delegated powers of the ministries leading to voluminous proposal(s) being forwarded**, for reporting/approval of the Parliament.
- The limits were very low between **Rs 10 lakh to Rs 2.5 crore** and the value differed across nearly 50 items of expenditure.
- The **PAC and the Comptroller and Auditor General of India (CAG)** have been pointing to the growing instances of **unnecessary supplementary, re-appropriations not adhering to the NS/NIS limits;**
- **and re-appropriations without reporting to Parliament** or without obtaining prior approval of the Finance Ministry.
- In a separate report titled **‘Excesses over Voted Grants and Charged Appropriations (2019-20)’**, which was also tabled in Parliament earlier this month, the PAC had raised concerns over excess expenditure, **ranging between 10.04 per cent to 79.77 per cent**,
- incurred during FY 2019-20 for grants/appropriations even after obtaining high amounts of supplementary grants by the ministries/departments to meet their additional requirements.

About Public Accounts Committee (PAC)

- The **PAC is the oldest parliamentary committee** in Indian legislative affairs and has been crucial in upholding the principle of accountability as it exercises oversight of public expenditure.
- The **Public Accounts Committee examines** the value for money of Government projects, programmes and service delivery.
- Drawing on the work of the National Audit Office the Committee holds government officials to account for the economy, efficiency and effectiveness of public spending.
- This Committee scrutinizes the value for money—**the economy, efficiency and effectiveness**—of public spending and generally holds the government and its civil servants to account for the delivery of public services.
- The Public Accounts Committee **was introduced in 1921 after its first mention in the Government of India Act, 1919 also called Montford Reforms.**
- It has existed in the Indian Constitution since then.
- PAC is one of the parliamentary committees that examine the annual audit reports of CAG which the President lays before the Parliament of India. Those three reports submitted by CAG are:

- Audit report on appropriation accounts
- Audit report on finance accounts
- Audit report on public undertakings

The financial committee has 22 members.

- All the members are taken from the Indian Parliament. Out of 22 members, 15 are elected from Lok Sabha (Lower House) and 7 members are elected from Rajya Sabha (Upper House.)

Topic 37. MAHARASHTRA ASSEMBLY CLEARS 10% MARATHA QUOTA

Important for the subject: Polity

Maharashtra Chief Minister Eknath Shinde and his Cabinet approved a Bill to provide a 10% quota for the Maratha community in education and government jobs, which was later passed unanimously by all parties during a special session of the Maharashtra legislature.

Background of Marathas:

- The Marathas are a group of castes comprising peasants and landowners among others constituting nearly 33% of the state's population.
- While most Marathas are Marathi-speaking, not all Marathi-speaking people belong to the Maratha community. Historically, they have been identified as a 'warrior' caste with large land holdings.
- However, over the years, due to factors such as land fragmentation, agrarian distress, unemployment and lack of educational opportunities, many Marathas have faced social and economic backwardness.
- The community still plays an important role in the rural economy.
- Therefore, they have been demanding reservation in government jobs and educational institutions under the category of Socially and Educationally Backward Classes (SEBC).

Status of the Maratha Reservation Demand:

2017:

- A 11-member commission headed by Retired Justice N G Gaikwad recommended Marathas should be given reservation under Socially and Educationally Backward Class (SEBC).

2018:

- Maharashtra Assembly passed a Bill proposing 16% reservation for Maratha community.

- The Bombay High Court while upholding the reservation pointed out that instead of 16% it should be reduced to 12% in education and 13% in jobs.

2020:

- The Supreme Court of India **stayed** its implementation and referred the case to the Chief Justice of India for a larger bench.

2021:

- The Supreme Court struck down the Maratha reservation in 2021 citing the **50% cap on total reservations it had set in 1992**.
- The Maratha reservation of 12% and 13% (in education and jobs) had increased the overall reservation ceiling to 64% and 65%, respectively.
- In the **Indira Sawhney judgment 1992**, SC had categorically said 50% shall be the rule, only in certain exceptional and extraordinary situations for bringing far-flung and remote areas' population into mainstream said 50% rule can be relaxed.
- The Supreme Court said that there were no **“exceptional circumstances”** or an **“extraordinary situation”** in Maharashtra for the state government to breach the limit.
- In addition, the court ruled that the state had no authority to accord socially and economically backward status to a community:
- only the president can tweak the central list of socially and backward classes, said the court. States can only make “suggestions”.
- The Bench unanimously upheld the constitutional validity of the 102nd Constitution Amendment but differed on the question of whether it affected the power of states to identify SEBCs.
- The Supreme Court highlighted that a separate reservation for the Maratha community violates **Articles 14 (right to equality) and 21 (due process of law)**.

2022:

- In November 2022, after the SC upheld the 10% quota for the Economically Weaker Sections.
- The state government said that until the issue of Maratha reservation is resolved, economically weaker members of the community can benefit from the EWS quota.

102nd Amendment Act of 2018

- It introduced Articles 338B and 342A in the Constitution.
- Article 338B deals with the newly established National Commission for Backward

Classes.

- Article 342A empowers the President to specify the socially and educationally backward communities in a State.
- It says that it is for the Parliament to include a community in the Central List for socially and backward classes for grant of reservation benefits.

Topic 38. ART 142, WHY SC QUASHED CHANDIGARH MAYOR'S ELECTION, AND WHY IT MATTERS

Important for the subject: Polity

The Bench, comprising Chief Justice of India (CJI) **D Y Chandrachud** and Justices **J B Pardiwala** and **Manoj Misra**, while setting aside the result as “contrary to law” and declaring **Kuldeep Kumar** as the “validly elected candidate”, refused to quash the election process itself.

- The Supreme Court has quashed the result of the January 30 election for the Mayor of Chandigarh after finding that presiding officer Anil Masih had deliberately invalidated eight ballots cast in favor of the Aam Aadmi Party (AAP)-Congress candidate Kuldeep Kumar ‘Tita’.
- The court used its power under **Article 142 of the Constitution** to do “complete justice” and protect the sanctity of electoral democracy.

On what grounds did the court strike down the result?

- “Allowing such a state of affairs...would be destructive of the most valued principles on which the entire edifice of democracy in our country depends,”-the court said.
- The Bench said it was evident that “while the petitioner is reflected to have polled 12 votes, the eight votes which are treated as invalid were wrongly treated to be so”, and “each of those invalid votes were in fact validly cast in favor of the petitioner”.
- It follows that Kuldeep had in fact received 20 votes, while Manoj Sonkar, the BJP candidate, had won 16.
- “We accordingly order and direct that the result of the election as declared by the presiding officer shall stand quashed and set aside,” the court said.

Why was this mayoral election important?

- The powers of the **Mayor of Chandigarh Municipal Corporation** are limited to calling meetings and deciding the agenda.
- Although the corporation has a five-year term, the Mayor is elected for only one year.

- The post is reserved for a woman candidate in the first and fourth year of each corporation.
- The last election to the **corporation was held in 2021.**

What happened after the mayoral election?

- After videos showed Masih marking ballot papers so they could be declared invalid, Kuldeep moved the High Court and then Supreme Court.
- CJI Chandrachud observed that it was obvious that Masih had defaced the ballots, and that “this man has to be prosecuted”.
- The court said it was “appalled” at the “mockery” and “murder” of democracy.

Constitutional Status of Municipalities in India:

- This Act has added a new **Part IX-A to the Constitution of India.**
- It is entitled ‘**The Municipalities and consists of provisions from Articles 243-P to 243-ZG.** In addition, the act has also added a new **Twelfth Schedule to the Constitution.**
- **This schedule contains eighteen functional items of municipalities. It deals with Article 243-W.**
- The act gave **constitutional status to the municipalities.** It has brought them under the purview of **justiciable part of the Constitution.**
- The act aims at revitalizing and strengthening the urban governments so that they function effectively as units of local government.

The salient features of the act are:

- **Three Types of Municipalities:** The act provides for the constitution of the following three types of municipalities in every state: nagar panchayat, municipal council and municipal corporation
- **Composition:** All the members of a municipality shall be elected directly by the people of the municipal area.
- For this purpose, each municipal area shall be divided into territorial constituencies to be known as wards. The state legislature may provide the manner of election of the chairperson of a municipality.
- **Reservation of Seats:** The act provides for the reservation of seats for the scheduled castes and the scheduled tribes in every municipality in proportion of their population to the total population in the municipal area.
- Further, it provides for the reservation of not less than one-third of the total number of seats for women.

- **Duration of Municipalities:** The act provides for a five-year term of office for every municipality. However, it can be dissolved before the completion of its term.
- **State Election Commission:** The superintendence, direction and control of the preparation of electoral rolls and the conduct of all elections to the municipalities shall be vested in the state election commission.
- **Finance Commission:** The finance commission (which is constituted for the panchayats) shall also, for every five years, review the financial position of municipalities and make recommendation to the governor as to:

The principles that should govern:

- (a) **The distribution between the state and the municipalities, the net proceeds of the taxes, duties, tolls and fees levied by the state.**
- (b) **The determination of the taxes, duties, tolls and fees that may be assigned to the municipalities.**
- (c) **The grants-in-aid to the municipalities from the consolidated fund of the state.** The measures needed to improve the financial position of the municipalities.
- Any other matter referred to it by the governor in the interests of sound finance of municipalities.
- **District Planning Committee:** Every state shall constitute at the district level, a district planning committee to consolidate the plans prepared by panchayats and municipalities in the district, and to prepare a draft development plan for the district as a whole.

What is Article 142?

Article 142 provides discretionary power to the Supreme Court (SC).

- **Subsection 1 of Article 142** states that the SC in the exercise of its jurisdiction may pass such decree or make such order as is necessary for doing complete justice in any cause or matter pending before it.
- Any decree so passed or order so made **shall be enforceable throughout the territory of India.**
- If at times law or statute did not provide a remedy, the Court can extend itself to put an end to a dispute in a befitting manner.
- An order to do complete justice must be consistent with the fundamental rights and cannot be inconsistent with the substantive provisions of the relevant statutory laws.
- Used in judgements related to cleaning of **Taj Mahal**, **release of A.G. Perarivalan**, **Bhopal gas tragedy case**, etc.

Topic 39. FALI S NARIMAN: 9 NOTABLE CASES OF THE LATE JURIST

Important for the subject: Polity



Eminent jurist and Senior Advocate Fali S Nariman passed away in the early hours of **February 21** at the age of **95**.

- His career as a lawyer **spanned over 75 years with the last half-century being spent as a senior advocate of the Supreme Court of India.**

Most notable cases by Jurist Fali S Nariman:

- **The Second Judges Case: Supreme Court Advocates-on-Record Association v. Union of India**
- In 1981, a five-judge constitution bench of the Supreme Court gave the central government the final say in matters regarding judicial appointments and transfers by allowing the President to refuse recommendations made by the Chief Justice of India (CJI).
- The court held that the requirement under Article 124 of the Constitution, stating that the CJI must be “consulted”, means that there must be an exchange of views, and there is no necessity for “concurrence” between the CJI and the President.
- Nariman argued that “consultation” in the context of judicial appointments means more than merely seeking advice.

The Third Judges Case: In re: Special Reference 1

- The President of India K R Narayanan exercised his power under Article 143 of the Constitution to send a “reference” to the Supreme Court for the latter’s opinion on questions of law that may have public importance.
- Nariman made submissions to assist the court in this case. Further, it expanded the size of the Supreme Court Collegium to five senior most judges from the existing three.

National Judicial Appointments Commission case: Supreme Court Advocates-on-

Record Association v. Union of India

- Nariman would also appear in the latest chapter of the judge appointments dispute following the challenge to the National Judicial Appointment Commission Act, 2014 (NJAC).
- The NJAC amended the Constitution to insert Article 124A which created a six-person commission for judicial appointments.
- This commission would comprise the CJI, two other senior SC Judges, the Union Minister of Law and Justice, and two “eminent persons” who would be nominated by a committee comprising the CJI, Prime Minister and Leader of Opposition.

Parliament cannot curtail fundamental rights: I.C. Golak Nath v. State of Punjab

- Two brothers in Punjab challenged the Constitution (Seventeenth) Amendment Act, 1964 as it amended Article 31A of the constitution.
- Fali Nariman appeared on behalf of the intervenors in this case who supported the petitioners.
- They argued that Parliament’s power to amend the constitution under Article 368 did not include articles contained in Part III of the Constitution dealing with fundamental rights.
- It was pointed out that Article 13(2) states that Parliament cannot make a law which infringe fundamental rights.

Bhopal gas tragedy: Union Carbide Corporation v. Union of India (1989)

- Senior Advocate Nariman appeared, representing Union Carbide, and offered to pay a sum of 426 million dollars as compensation to the victims of the tragedy.
- In 1989, Union Carbide reached a settlement with the central government and agreed to pay 470 million dollars as compensation.

Rights of minorities to establish and administer education institutions: TMA Pai Foundation v. State of Karnataka

- Nariman argued in the landmark TMA Pai case in support of minority rights to establish and administer educational institutions under Article 30(1) of the Constitution.
- The court held that linguistic and religious minorities have to be determined on a state-by-state basis and that the government has the power to frame regulations which will apply to minority-run educational institutions.

Governor to act only upon the aid and advice of the council of ministers, chief minister: Nabam Rebia, and Bamang Felix v. Deputy Speaker

- The Supreme Court in 2016 was tasked with navigating the political crisis in Arunachal Pradesh following the rebellion of 21 Congress MLAs in 2015.

- Nariman, on behalf of the house whip Bamang Felix, argued that the governor did not have the power to advance the assembly session as this could only be done upon the aid and advice of the council of ministers and the chief minister, as per the constitution.
- The court agreed and restored the Congress government, led by chief minister Nabam Tuki.

Obtaining bail for former Tamil Nadu Chief Minister Jayalalitha: J. Jayalalithaa v. State of Tamil Nadu

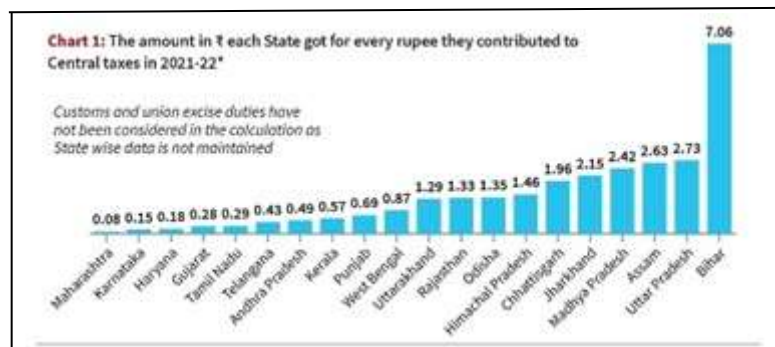
- Former Chief Minister Jayalalitha had been accused of misappropriating funds during her tenure between 1991 and 1995.
- Nariman appeared on behalf of Jayalalitha in October 2014 and convinced the court to grant bail against executing the fine and suspend the sentence passed by the Sessions judge in Bangalore.

Cauvery Water Dispute: State of Karnataka v State of Tamil Nadu

- Nariman represented Karnataka for over 30 years in the water-sharing dispute with Tamil Nadu.
- In 2016, the Supreme Court ordered the Karnataka government to release 6,000 cusecs (cubic feet per second) of water from September 21 to September 27.

Topic 40. ON FINANCIAL DEVOLUTION AMONG STATES

Important for the subject: Polity



Recently various Opposition-ruled States especially from South India have claimed that they have **not** been receiving their **fair share** as per **the present scheme** of financial devolution.

Issue in present scheme:

- **Less than proportionate share** of receipt in tax revenue when compared to **their contribution** towards tax collection highlighted in below chart 1.

State wise analysis chart:

What is divisible pool of taxes?

- **Article 270** of the Constitution provides for the scheme of distribution of **net tax proceeds collected by the Union government**-between the Centre and the States.
- **The taxes** that are **shared** between the Centre and the States **include** corporation tax, personal income tax, Central GST, the Centre's share of the Integrated Goods and Services Tax (IGST) etc.
- This division is **based on** the **recommendation of the Finance Commission (FC)** that is constituted every five years as per the terms of Article 280.
- Apart from the share of taxes, States are also provided grants-in-aid as per the recommendation of the FC.
- **Note:** The divisible pool, however, **does not** include **cess and surcharge** that are levied by the Centre.

Comparison across states (in share of states in divisible pool of taxes) in Chart 2 :

How is the Finance Commission constituted?

- The FC is a constitutional body (Art. 280 of constitution) constituted every five years, exclusively by the Union Government.
- It consists of **a chairman and four** other members (total 5) who are appointed by the President.
- **The Finance Commission (Miscellaneous Provisions) Act, 1951**, has specified the **qualifications** for chairman and other members of the commission.
- –**The Union government** has notified the constitution of the **16th Finance Commission** under the chairmanship of **Arvind Panagariya** for making its recommendations for the period of **2026-31**.

What is the basis for allocation?

- **The share of States from the divisible pool (vertical devolution)** stands at **41%** as per the recommendation of the 15th FC.
- **The distribution among the States (horizontal devolution)** is based on various criteria.

Comparison of Horizontal devolution in various FC and in various parameters and parameter changes in following Table 1:

Table 1 : The criteria for horizontal devolution among States over the last five FCs

Criteria	11th FC 2000-05	12th FC 2005-10	13th FC 2010-15	14th FC 2015-20	15th FC 2021-26
Income Distance	62.5	50	47.5	50	45
Population (1971 Census)	10	25	25	17.5	-
Population (2011 Census)	-	-	-	10	15
Area	7.5	10	10	15	15
Forest cover	-	-	-	7.5	-
Forest and ecology	-	-	-	-	10
Infrastructure index	7.5	-	-	-	-
Fiscal discipline	7.5	7.5	17.5	-	-
Demographic performance	-	-	-	-	12.5
Tax effort	5	7.5	-	-	2.5
Total	100	100	100	100	100

- The criteria as per the 15th FC can be briefly explained as follows: a. 'Income distance' is the distance of a State's income from the State with highest per capita income which is Haryana.
- States with lower per capita income would be given a higher share to maintain equity among States.
- 'Population' is the population as per the 2011 Census. Till the 14th FC, weightage was given for the population as per the 1971 Census but discontinued in the 15th FC.
- 'Forest and ecology' consider the share of dense forest of each State in the aggregate dense forest of all the States.
- 'The demographic performance' criterion has been introduced to reward efforts made by States in controlling their population.
- States with a lower fertility ratio will be scored higher on this criterion.
- 'Tax effort' as a criterion has been used to reward States with higher tax collection efficiency.

What are the issues?

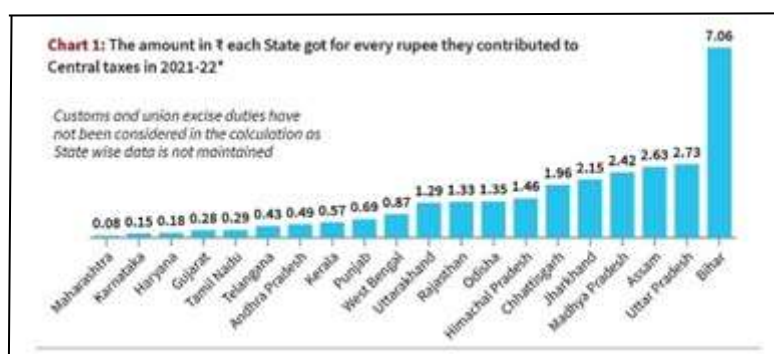
- The Constitutional scheme has always favoured a strong centre in legislative, administrative and financial relations.
- However, federalism is a basic feature and States should not feel short-changed in

distribution of resources.

- **Political differences** between the Union government and Opposition-ruled States that exacerbate the problem.

Genuine issues for consideration:

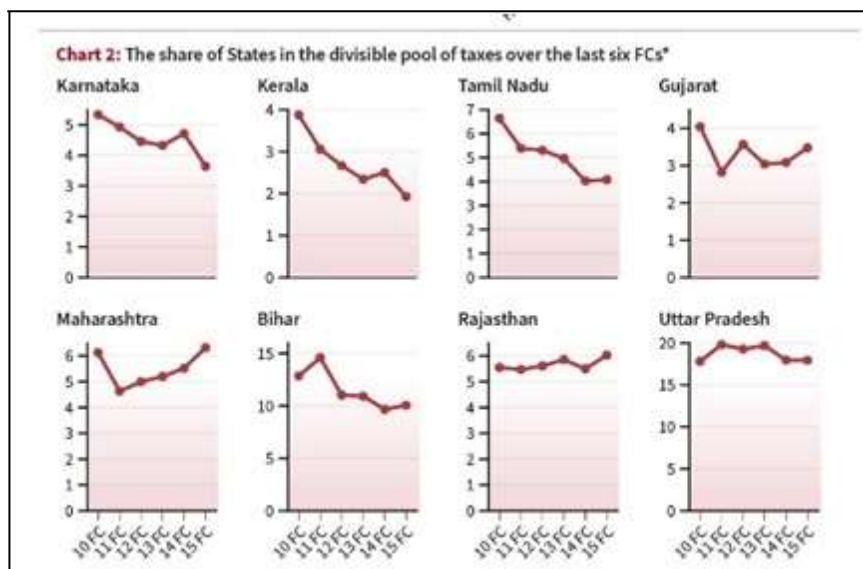
- Cess and surcharge collected by the Union government is estimated at around 23% of its gross tax receipts for 2024-25, which **does not form** part of the divisible pool and hence not shared with the States.
- **Justification:** The total tax revenue for the year 2022-23 (actual), 2023-24 (revised estimates) and 2024-25 (Budget estimates) of the **Union government** is ₹30.5, ₹34.4 and ₹38.8 lakh crore respectively.
- **The State's share** was/is ₹9.5, ₹11.0 and ₹12.2 lakh crore respectively, which constitutes **around 32%** of the total tax receipts of the Centre which is way **less than the 41%** as recommended by the 15th FC.
- **Also**, Cess like **the GST compensation cess** is for the repayment of loans taken to compensate States for the shortfall in tax collection due to GST implementation for the period 2017-22.
- Some amounts are used for centrally sponsored schemes that benefit the States. However, the **States have no control over these components.**
- **The amount each State gets back for every rupee they contribute to Central taxes shows steep variation.** Chart 1 depicts the same for the year 2021-22.



- **Industrially developed States** received much less than a rupee for every rupee they contributed as **against States like Uttar Pradesh and Bihar.**

Below factors are responsible:

- Many corporations are headquartered in these State capitals where they would remit their direct taxes.
- Also attributed to the difference in GST collection among various States.
- **The percentage share in the divisible pool of taxes has been reducing for southern States over the last six FCs as can be seen in Chart 2.**



Attributed to following factors:

- Higher weightage being given for **equity** (income gap) and **needs** (population, area and forest) than **efficiency** (demographic performance and tax effort).
- **Grants-in-aid** as per the recommendation of the FC **varies among various State.**
- As per the 15th FC, there are **revenue deficit, sector-specific and State-specific grants** given to various States as well as **grants to local bodies** that are given **based on population and area of States.**

Way forward?

- As some of states generate around 40% of the revenue and bear around 60% of the expenditure.
- **The FC and its recommendations are meant to assess this imbalance and propose a fair sharing mechanism.** -It is the responsibility of all States to contribute towards the more equitable development of our country.

- However, there are **three important reforms** that may be considered for maintaining the balance between equity and federalism while sharing revenue.
- Firstly, **the divisible pool can be enlarged by including some portion of cess and surcharge in it.**
- The Centre should also **gradually discontinue various cesses and surcharges** it imposes by **suitably rationalising the tax slabs.**
- Secondly, **the weightage for efficiency criteria in horizontal devolution should be increased.**
- **Case study:** GST being a consumption-based destination tax that is equally divided between the Union and the State means that State GST accrual (inclusive of Integrated GST settlement on inter-state sales) should be the same as the Central GST accrual from a State.
- Hence, relative GST contribution from States can be included as a criterion by providing suitable weightage in future FCs.
- Finally, **similar to the GST council**, a more formal arrangement for the **participation of States in the constitution and the working of the FC** should be considered.

Conclusively,

- These are measures that need to be implemented by the Centre after discussion with all the States.
- It is also imperative that the States uphold principles of fiscal federalism by **devolving adequate resources to local bodies for vibrant and accountable development.**

Topic 41. GLOBAL MEET URGES INDIA TO AUGMENT PULSES PRODUCTION TO MEET NUTRITIONAL NEEDS

Important for the subject: Geography

The Global Pulses Conference, an annual meeting of pulse producers, processors and traders, has suggested India to augment production of pulses to meet the nutritional requirements.

- Ministers Arjun Munda and Piyush Goyal said the Centre has taken adequate measures to improve pulses cultivation in the country by **increasing the minimum support price regularly.**
- The two-day conference is jointly organized by **the National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) and the Global Pulse Confederation (GPC).**
- India will benefit from the global conference with sharing of the best practices and

technological advancements in the field from other countries.

Recent trends of Pulses:

- **India is the largest producer, consumer and importer of pulses in the world.**
- **Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Karnataka are the top five pulses producing States.**
- Over the last decade pulses production has grown by **60% from 171 lakh tonnes in 2014 to 270 lakh tonnes in 2024.**
- The partnership between **NAFED and GPC will continue to grow** to make pulses not only India's wonder-diet but to make the wonder-diet of the world.
- The Centre has assured a price of **50% over the actual cost of production** to our farmers, thereby providing an attractive return on investment.
- The MSP is the **highest today with increases as high as 117% in masoor, 90% in moong, 75% more in chana dal, 60% more in tur and urad** over the amount provided a decade back.
- India has become **self-reliant in chickpeas (chana) and many other pulses crops, with only a slight deficiency remaining in pigeon peas (tur) and black gram.**
- Consistent efforts are being made to **attain self-sufficiency in pulses by 2027.**
- The government has increased the supply of new varieties of seeds, while also focusing on expanding cultivation of tur and black gram.

Topic 42. WITH ETHANOL MAKERS COMPETING FOR MAIZE, POULTRY INDUSTRY SENDS SOS TO GOVT

Important for the subject: Geography

The **poultry industry in India**, facing stiff competition from **ethanol producers for maize supplies**, has requested the Union Government to **permit the importation of genetically modified (GM) maize and soyameal**, essential for **poultry feed**.

- Additionally, the industry advocates for the **introduction of high-yielding GM seeds to boost domestic productivity**. Similar to the transformative impact of the **Green Revolution on wheat and paddy yields**, there is a need for similar advancements in **maize cultivation**.
- The per capita egg consumption now stood at **101 eggs**, It is expected to go up to **180 eggs in the next 6-7 years**.

Steps to increase output:

- The government should **allow the import of genetically modified (GM) maize for ethanol production** and **aim to increase maize production from 30 million**

tonnes to 40 million tonnes.

- This **increase** would help meet the **growing demand for maize as feed in the poultry industry**, which is expected to **rise by 1 million tonnes annually from the current 16 million tonnes**.
- The move towards using **corn and broken rice for ethanol**, with projections showing **maize use for ethanol to grow significantly by 2027-28**, is seen as **exacerbating the shortage of these grains for other uses**.
- While the **poultry industry** has become **more efficient, reducing resource use by 70%**, the **cost of inputs in India remains high** compared to global competitors like **Brazil and Argentina**, coupled with **high volatility**.

About maize:

- Maize is **one of the most versatile emerging crops** having **wider adaptability** under varied **agro-climatic conditions**.
- Globally, maize is known as the **queen of cereals** because it has the **highest genetic yield potential among cereals**.
- It is cultivated on nearly **190 m ha** in about **165 countries** having a wider diversity of **soil, climate, biodiversity and management practices** that contribute to **39 %** of the **global grain production**.
- The **United States of America (USA)** is the **largest producer of maize** contributes nearly **30.99%** of the total production in the world in **2020** and **maize** is the driver of the US economy.
- In **India**, **Maize** is grown **throughout the year**. It is predominantly a **Kharif crop** with **85 percent of the area under cultivation** during the season.
- **Maize** is the **third most important cereal crop in India** after **rice and wheat**.
- It accounts for around **10 per cent of total food grain production** in the country.
- **India** was also the **fifth largest producer of Maize in 2020** as per **FAO data** and **India's share in world production** accounted to be **2.59 per cent** in the same year.
- In addition to **staple food for human beings and quality feed for animals**, maize serves as a **basic raw material as an ingredient in thousands of industrial products** that include:
- **Starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries, etc.**

Areas of Cultivation:

- Major wheat-growing states in India are Karnataka, Madhya Pradesh, Bihar, Tamil Nadu,

Telangana, Maharashtra and Andhra Pradesh.

India's Production:

- Production of maize is estimated to be 35.91 million tonnes in 2022-23 (3rd Advance Estimate).

Exports:

- The country has exported 3,453,680.58 MT of maize to the world for the worth of Rs. 8,987.13 crores/ 1,116.17 USD Million in 2022-23.
- **Major Export Destinations (2022-23):** Bangladesh, Vietnam, Nepal, Malaysia and Sri Lanka.

Topic 43. WHAT'S BEHIND THE COLLAPSE IN THE PRICE OF NICKEL AND HOW CAN THE INDUSTRY SURVIVE?

Important for the subject: Geography

Australia's nickel industry has received significant federal support and temporary relief from royalty payments following a **drastic drop in global nickel prices**, which posed a threat to thousands of jobs.

- The metal's price plummeted from **\$50,000 in 2022** to **\$16,400 per tonne**, largely due to an **increase in supply from Indonesia**, particularly from **Chinese-operated mines**.

Australia included **nickel** in the **Critical Minerals List**.

China is the largest processor:

- **China dominates the global processing of crucial minerals** such as **lithium, cobalt, nickel, and graphite**, which are **vital for battery production** and the future of **clean-energy technologies**.
- Holding the **largest market share**, **China processes 35%** of the world's **nickel**, along with an additional **15% processed in Indonesia**.
- It also controls about **80% of rare earths processing, 90% of lithium, and 70% each of gallium and germanium**.
- The country's **low processing costs** and **competitive labor market** provide it with a significant advantage, positioning suppliers in a role where they must accept market prices rather than influence them.
- **Australia and Indonesia** are among the **top holders of nickel reserves globally**, each possessing around **21 million tonnes**.

China helped fund the oversupply:

- **Australia's mineral sector** has faced **challenges** due to **China's strategy of investing in**

Indonesian mines to **increase output** and **keep prices low**, effectively creating an oversupply.

- In response, **Australia** is trying to **diversify its processing capabilities** by **forming critical mineral partnerships** with countries like **India, Japan, Korea, the United States, and the United Kingdom**.
- However, these efforts are threatened by potential strategic countermeasures, such as **export bans by China on processed commodities** like **Gallium, Germanium, and rare earths**, or actions to further **increase oversupply**.
- Despite being a **leading producer of critical minerals** essential for **lithium-ion batteries** and having **superior environmental, social, and governance (ESG) standards** that attract investment,
- **Australia's lack of refining capacity** means it often has to sell off the critical minerals it mines as byproducts, highlighting a significant gap in its ability to fully capitalize on its resources.

China's stronghold will be hard to escape:

- **Australia** emphasizes the importance of establishing a **domestic processing facility**.
- This facility would allow Australia to offer minerals processed locally, adhering to **higher environmental, social, and governance (ESG) standards**, thus providing a competitive advantage over minerals processed in other regions.

Nickel Ore Distribution in India

- The **Sukinda valley** in the **Jajapur district** of **Odisha** has significant occurrences of **nickeliferous limonite**. It appears as **oxide** here.
- **Nickel** occurs in sulphide form alongside **copper mineralization** in **Jharkhand's east Sighbhum district**.
- Furthermore, it has been discovered in association with **uranium deposits** in **Jaduguda, Jharkhand**.
- **Nickel** is also found in significant quantities in **Karnataka, Kerala, and Rajasthan**.

Nickel Distribution in World:

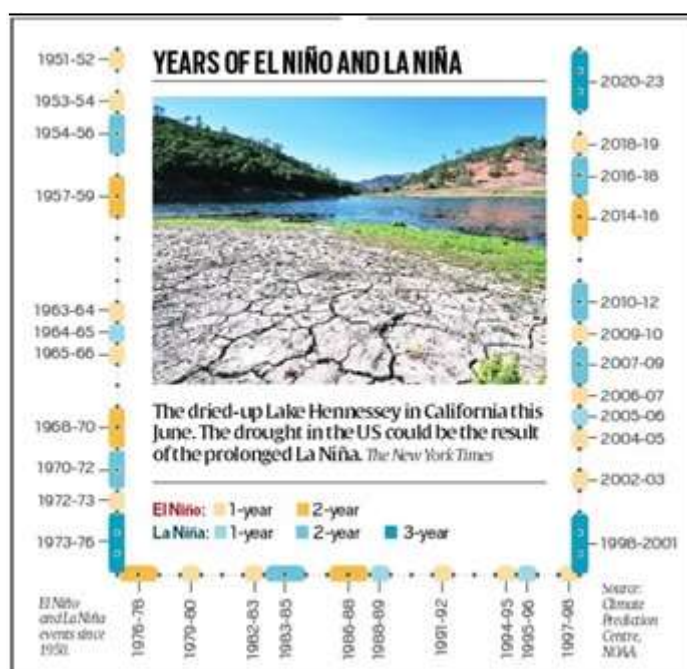
- **Indonesia** is the world's **largest producer**, followed by the **Philippines** and **Russia**. **Australia** has the **highest reserves**, followed by **Brazil, Russia, and Cuba**.

Country	Regions
Indonesia	Sulawesi, Celebes

The Philippines	Rio Tuba
Australia	Queensland and Kalgoorlie
Canada	Sudbury, Lynn Lake
CIS	Sverdlovsk and Orsk in the Urals, Kola Peninsula, Norilsk in Siberia

Topic 44. LA NINA IMPACTED AIR QUALITY IN INDIA IN THE WINTER OF 2022

Important for the subject: Geography



This is the first time that air quality in Indian cities has been linked to a **La Nina event** — and indirectly to climate change, which is making El Nino and La Nina more severe.

- The study, by researchers at the **Bengaluru-based National Institute of Advanced Studies** and **Pune-based Indian Institute of Tropical Meteorology**, has argued that the unusual air quality in some Indian cities in the winter of 2022 could be attributed to the record-breaking spell of **La Nina prevailing at that time**.
- Monsoon rainfall over India is known to be strongly influenced by **El Nino and La Nina events**, the alternating warming and cooling of the eastern **Pacific Ocean** that impacts

weather across the world.

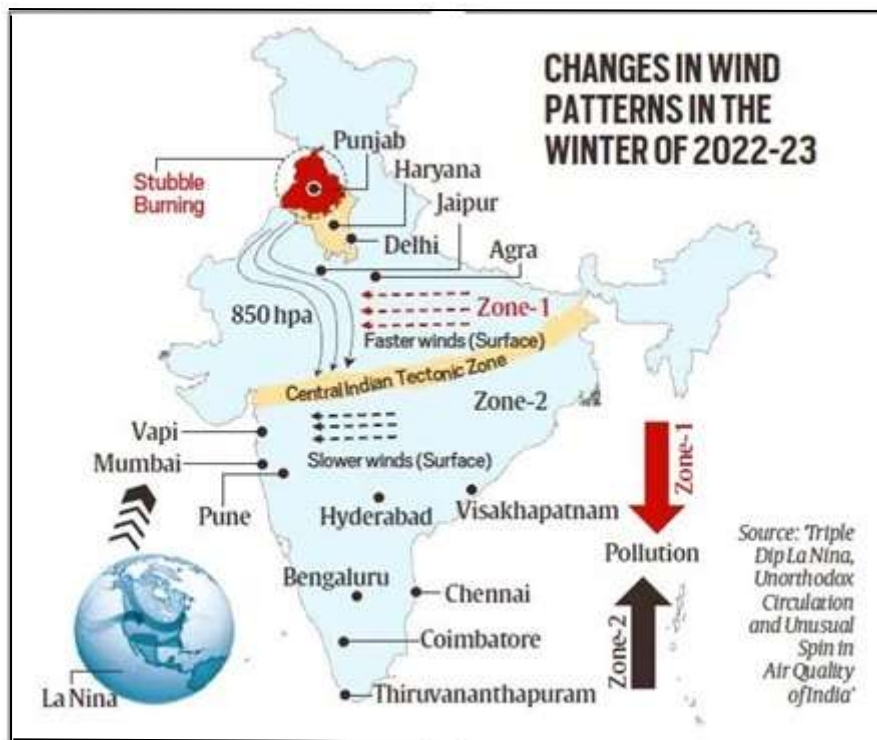
- A new study by Indian researchers has now suggested that even air quality in the country could be influenced by the two weather events.
- This is the first time that air quality in Indian cities has been linked to a La Nina event — and indirectly to climate change, which is making El Nino and La Nina more severe.
- A rare triple dip La Nina episode, said to be a mark of climate change, set off a peculiar air quality trend in the 2022-23 winter season, showed a new study.
- This period was characterized by improved air quality in north India and increased pollution levels in Peninsular India, the report published in the journal Elsevier February 18 stated.
- As per the report, Mumbai became the city to record the highest deterioration with a 30 per cent rise in Particulate Matter (PM) 2.5 levels.
- This was followed by the cities of Coimbatore recording an increase in PM 2.5 levels by 28 per cent and Bengaluru, and Chennai recording a rise in the same by 20 per cent and 12 per cent respectively.
- A newly developed advanced NIAS-SAFAR air quality forecasting model was used.
- This model is said to combine a chemical-transport model with an indigenously developed modern artificial intelligent algorithm.

What is the link between pollution and winter months in India?

- During October to January, northern Indian cities, particularly Delhi, experience very high concentrations of PM2.5.
- A variety of meteorological factors such as temperature, moisture, heaviness in air, wind speed and direction, plays a role in trapping pollutants in the lower levels of the atmosphere.
- These factors are also responsible for transporting pollutants from other regions, particularly those generated by agriculture waste burning in Punjab and Haryana, to Delhi and adjoining areas.
- The western and southern parts of the country have always had relatively lower levels of pollution, because of their proximity to oceans. The winter of 2022 showed a significant deviation from this normal.
- Northern Indian cities, including Delhi, were cleaner than usual, while cities in the west and the south, like Mumbai, Bengaluru and Chennai, experienced worse-than-usual air quality.
- The study said PM2.5 concentrations in Ghaziabad that winter saw a reduction of about

33% from normal, while in Noida, the concentration was 28% below normal.

- Delhi saw a reduction of about 10%. Simultaneously, the concentrations in Mumbai rose by 30%, while Bengaluru registered a 20% rise.
- It was this anomalous behavior that the researchers had set out to study when they found themselves led to the possible effects of La Nina.



Wind direction

- The most crucial factor in explaining the anomaly of winter 2022 was a change in the normal wind direction.
- During this time, wind usually blows in the northwesterly direction: for example, **from Punjab towards Delhi and further into the Gangetic plains.**
- This is one of the **main reasons why agricultural waste pollutants in Punjab and Haryana flow into Delhi.**
- In the winter of 2022, **however, the wind circulation was in the north-south direction.**
- The pollutants being carried from Punjab and Haryana bypassed Delhi and surrounding areas and flew over **Rajasthan and Gujarat to southern regions.**
- **“There was no change in the local sources of emissions in Delhi and Mumbai.** But the additional pollutant load from the northern states, which usually lands in Delhi and surrounding areas, moved in a different trajectory and reached peninsular India,

- some landing in Mumbai as well,” explained Gufran Beig, the lead researcher and one of the leading air pollution experts in the country.
- The **local circulation of wind near Mumbai also had an anomalous behavior that year.**
- Wind currents alternate **between blowing from the land to the sea every few days.**
- **When blowing from the land towards the sea,** the winds carry pollutants out of the city.
- In 2022, however, instead of changing direction every four to five days, the winds persisted in one direction for more than a week or 10 days, leading to greater accumulation of pollutants in Mumbai.

La Nina and climate change:

- La Nina events might produce noticeable changes in wind circulation over India. This one was a particularly strong event.
- And the impact on air circulation became evident only in the third year of La Nina. So, there may be an accumulative effect.
- It was not yet entirely clear whether El Nino would produce an opposite effect for air quality over India.
- The study did add that changes in wind patterns were not the only reasons for the unusual trends in air quality that year.
- It mentioned local meteorological conditions, unrelated to La Nina, that could also have resulted in the reduction of pollutant concentrations over northern India.

Topic 45. DOT UNVEILS AN UNPARALLELED VENTURE ‘SANGAM: DIGITAL TWIN’ INITIATIVE

Important for the subject: Schemes

Department of Telecommunications (DoT) has unveiled the ‘Sangam: Digital Twin’ initiative, an unparalleled venture inviting Expressions of Interest (EoI) from industry pioneers, startups, MSMEs, academia, innovators and forward-thinkers.

- **Digital Twin technology** offers a solution by creating virtual replicas of physical assets, allowing for real-time monitoring, simulation and analysis for experimental iterations and feedback loop to adapt to the changes for achieving the best outcomes.
- The **DoT invites industry pioneers, startups, MSMEs, academia, innovators and forward-thinkers to pre-register and actively participate in Sangam’s outreach programmes, and explore, create, and commit to transform the future of infrastructure planning and design.**

About 'Sangam: Digital Twin' initiative:

- **Sangam: Digital Twin is a PoC** distributed in two stages to be conducted in one of the major cities of India.
- **First stage is Exploratory for clarity of horizon and creative Exploration** to unleash potential.
- **Second stage is for practical demonstration of specific use cases generating** a future blueprint that may serve as a roadmap to scale and replicate successful strategies in future infrastructure projects through collaboration.
- It aims to demonstrate practical implementation of innovative infrastructure planning solutions.
- To develop a model framework for facilitating faster and more effective collaboration and to provide a future blueprint that may serve as a roadmap to scale and replicate successful strategies in future infrastructure projects.
- The initiative comes in the backdrop of past decade's breakthroughs in communication, computation and sensing in the era of techade striving for the **vision 2047**.
- India has witnessed advancements in **computational technologies, platforms, services and high-speed connectivity**.
- '**Sangam: Digital Twin**' symbolizes a collaborative leap towards reshaping infrastructure planning and design, combining the prowess of **5G, IoT, AI, AR/VR, AI native 6G**.
- **Digital Twin and next-gen computational technologies** with the collective intelligence of public entities, infrastructure planners, tech giants, startups, and academia to break the silos and engage in a whole-of-nation approach.
- **Sangam brings all stakeholders** on one platform aiming to transform innovative ideas into tangible solutions, bridging the gap between conceptualization and realization, ultimately paving the way for ground breaking infrastructure advancements.
- Sangam champions a holistic approach to innovation, urging stakeholders to transcend traditional boundaries and harness unified data and collective intelligence.
- **Echoing global movements towards smart infrastructure** and supported by India's geospatial leapfrog, Sangam carves out a position of leadership for India in digital infrastructure and innovation, while acknowledging similar strides made by global leaders.
- It is a call to action for creating an ecosystem that maximizes the value of technological advancements for fulfilling the societal needs for **efficient, effective and sustainable development**.

Topic 46. EFFORTS ON TO GET UNESCO TAG FOR 'PARUVETA UTSAVAM' OF AHOBILAM

Important for the subject: History



The **Indian National Trust** is making efforts for Art and Cultural Heritage (INTACH) to get the **United Nations Educational, Scientific and Cultural Organization (UNESCO)** to declare the annual '**Parveta Utsavam**' of Ahobilam as an 'intangible cultural heritage'.

- The **Kurnool District Gazetteers**, published by **Government Press in 1881**, records several beliefs of the Chenchu tribes, including their reverence to **Ahobila Narasimha** as their brother-in-law and inviting him home for **Makar Sankranti**.
- According to folklore, Lord Vishnu, upon his incarnation as a man-lion (Narasimha) in Ahobilam, married Maha Lakshmi, born as a tribal girl Chenchulakshmi.
- The **Chenchu tribals** give a ceremonial reception to the deity of Lord Narasimha Swamy arriving from the Ahobilam temple to their hamlet, as part of the '**Paruveta Utsavam**' in **Nandyal district**.

About Paruveta Utsavam:

- The annual mock hunting festival conducted at the Sri Narasimha Swamy temple stands as a symbol of communal harmony where the deity from the sanctum sanctorum of the temple is taken to the **32 Chenchu tribal hamlets around Ahobilam for 40 days**.
- **Annually 'Paruveta' (mock hunting festival)**, is celebrated at the **Sri Narasimha Swamy temple in Ahobilam**.
- The matter of UNESCO's recognition of the centuries-old festival is currently being reviewed by **Sangeet Natak Academy, the nodal agency**.
- Even the **Pancharatra Agama (doctrine of temple worship)** mentions **Paruveta** as '**Mrugayotsava**' and specifies certain parameters for conducting this event.
- **Ahobilam Paruveta utsavam** is unique as it is celebrated for about 40 days. No other

temple celebrates a festival for such a long duration.

- **Ahobilam Paruveta utsavam** is celebrated by all sections of people irrespective of their caste.
- For instance **Vadla Kammara community makes the Palanquin, Chenchus collect honey, Linen and sacred mango leaves from forests, Devotees from Mala Community recite Vachanas.**
- It is a festival of **communal harmony** as devotees from other religious communities like muslims also offer prayers to the lord.
- The Ayakattu honors are similar to the Ayagar system of administration of Kakatiya period which was continued during Vijayanagara Rayas.
- Business worth of some lakhs of rupees takes place during this festival which is the chief source of income for the poor. Chenchus are emotionally connected with this festival.
- Veedhinatakams, Harikatha and Burra katha are performed in every village narrating the story of the marriage of Chenchu Lakshmi with Ahobila Narasimha.

About Narasimha Deeksha:

- Paruveta is commonly observed in many temples during Vijayadashami or Sankranti.
- It is conducted for a 'mandala' (forty days). Chenchus take 'Narasimha Deeksha' by wearing yellow robes and 'Tulasi Mala' and observe celibacy during this period.
- Sankranti festival is celebrated on the day the deity reaches their hamlet.

Tribal link:

- By '**Guru Parampara**', the temple is governed by the **600-year-old Ahobila Mutt**, which encouraged this tribal festival to spread Srivaishnavism among the folk tribes.
- The tribal link to Lord Vishnu is confirmed in Vasanthika Parinayam, a Sanskrit drama written by the Mutt's 7th Jeeyar (pontiff), several centuries ago.

About Indian National Trust for Art and Cultural Heritage (INTACH)

- INTACH was founded in **1984 in New Delhi**
- It aims to create a **membership organization to stimulate and spearhead heritage awareness** and conservation in India
- It is a **non-profit charitable organization registered under the Societies Registration Act, 1860**
- The INTACH Logo, based on the anthropomorphic copper figure from **Shahabad, Uttar Pradesh, belonging to the enigmatic Copper Hoards of the Ganga Valley**

About Chenchus:

- The Chenchus, also called ‘**Chenchuvaru**’ or ‘**Chenchwar**’ are numerically the smallest Scheduled Tribe of Odisha.
- The **Chenchus are a Dravidian tribe**, a designated Scheduled Tribe in the Indian states of **Andhra Pradesh, Telangana, Karnataka and Odisha**.
- They are an aboriginal semi-nomadic tribe of the **central hill religions of Andhra Pradesh**. Their traditional way of life has been based on **hunting and food gathering**.
- Many Chenchus live in the sparse and **deciduous Nallamala forest of Telangana and Andhra Pradesh**.
- The Chenchus are referred to as one of the **Primitive Tribal Groups that are still dependent on forests and do not cultivate land but hunt for a living**.



Topic 47. WHY HAVE FRESH PROTESTS ERUPTED IN SENEGAL?

Important for the subject: International Relations

Senegal's President **Maky Sall** postponed Presidential elections due on February 25 on grounds of a **dispute between the National Assembly (parliament) and the Constitutional Council over the manner of selection of candidates resetting the next election** for December 15.

- Protests have emerged across the country especially in Dakar, capital of Senegal. Opposition leaders were dragged out by riot police.

What is the background to the current crisis?

- The current unrest is worst in decade, according to Amnesty International.
- The clashes occurred due to a two-year prison sentence slapped on the leading opposition

candidate

- Ousmane Sonko who targeted the country's elites for corruption and resisted the influence of the former colonial power France.
- In January this year, the Constitutional Council barred Mr. Sall (convicted in a trial for immoral behaviour against a woman) from the Presidential race.
- Still Sall is attempting third term for election.

What has been Senegal's recent democratic record?

- Sall's **retrograde decision** to defer elections **marks a break** with the country's periodic and smooth transfer of power witnessed for decades under **a multi-party democratic system**.
- Unlike all of its neighbours, **Senegal has never undergone a military coup or a civil war** since it gained independence from France in 1960.
- **Senegal is viewed as beacon of democracy in a region, increasingly under the grip of military takeovers.**
- Moreover, President Sall has been instrumental in pushing military dictators in **the Economic Community of West African States (ECOWAS)** to facilitate a timely transfer of power to elected governments.
- In early 2017, **Senegalese troops** successfully forced out Yahya Jammeh in the **Gambia**, after he refused to step down **after losing elections**.

Pattern of elections:

- Senegal situation highlights misrule, [similar to Guinea (President Alpha Condé's controversial re-election for a third term in 2020) - ended up in a coup the following year].
- Burkina Faso, Mali and Niger are already under military rule. So, Dakar has abandoned this regional role at a juncture due to various west African nations under military rule.
- The return of military dictatorships in African countries has been a recurrent theme in the 2020s after a serious regression after 1960s independence.

Way ahead:

- The big powers must reconsider their traditional role.

Located in the westernmost part of the continent, Senegal is bordered by Mauritania, Mali, Guinea, and Guinea-Bissau. It has a dry, tropical climate and a population of 16.7 million, a quarter of whom live in the Dakar region (0.3% of the territory).

Economic Community of West African States (ECOWAS)

- The ECOWAS, also known as CEDEAO in French, is a regional intergovernmental organization established in 1975.
 - Created through the Lagos Treaty, ECOWAS aims to foster economic integration, cooperation, and development among West African nations.
 - The Secretariat, headquartered in Abuja, Nigeria.
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