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CURRENT AFFAIRS FOR CIVIL SERVICES

Topic 1. IN BREAKTHROUGH, NEURAL NETWORK 'EXPLAINS' HOW IT FOUND NEW ANTIBIOTIC

Important for the subject: Science and technology

Scientists proposed the first artificial neural network, a technology that later led to the birth of deep-learning and artificially intelligent systems like ChatGPT, discovered streptomycin, the world's first aminoglycoside antibiotic. It would soon revolutionise the treatment of life-threatening diseases like tuberculosis.

- A groundbreaking study in Nature revealed a symbiotic relationship between deep learning and antibiotics.
- Scientists employed deep learning algorithms to unearth a novel class of antibiotics, revolutionizing drug discovery.
- The findings hold promise in combating antibiotic-resistant pathogens like **methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE),** offering a ray of hope amid a global health crisis.
- While experts applaud the study's ingenuity, concerns linger regarding the transparency of deep learning models.
- Implicit integration of explainability could enhance trust and understanding, guiding future breakthroughs.

Significance:

- As the nexus between artificial intelligence and antibiotics evolves, researchers navigate uncharted territories, driven by the shared quest for innovation and medical advancement.

About Deep Learning, Neural Networks and Machine Learning

- **Deep learning, a subset of machine learning,** has revolutionized the way machines process and interpret data. It teaches computers to do what comes naturally to humans; for example, in the case of Self-Driving cars, recognizing the signals to stop or go.
- Deep Learning involves the use of neural networks with multiple layers (three or more layers) to simulate human brain functions.
- All artificial neural networks are made of artificial 'neurons'. These are algorithms that receive an input, perform a computation, and relay the output.

Machine Learning Vs Deep Learning

- Machine learning employs a simple structure of neural networks with a limited number of layers, while deep learning uses a deep, hierarchical structure with multiple layers to capture complex relationships in the data.
- The Machine Learning though, is quick and easy to set up but may have limitations in effectiveness. Deep Learning takes more time to set up but gives immediate and effective

results.

- Deep learning is well-suited for tasks involving image and speech recognition, while machine learning is used in tasks to recommend items on different shopping websites like Amazon, Flipkart, etc.

Applications of Deep Learning

- **Image Recognition:** It classifies images, clusters them by similarities, and performs object recognition within scenes.
- **Law Enforcement:** Deep learning algorithms are important in analyzing transactional data to detect patterns indicative of fraudulent or criminal activity. For example, speech recognition like Siri or Alexa and computer vision technologies
- **Financial Services:** Financial institutions leverage predictive analytics powered by deep learning to inform algorithmic trading, assess business risks for loan approvals, detect fraud, and manage credit and investment portfolios.
- **Customer Service:** Chatbots and virtual assistants like Slush, Maya, etc., employing deep learning technology, enhance customer service experiences.
- They utilize natural language processing and speech recognition to engage with users in a personalized manner, significantly improving the efficiency of customer support.
- **Healthcare**: Deep learning has found extensive applications in healthcare, particularly in medical imaging detecting disease from X-ray images and classifying them into several disease types in radiology.
- It aids specialists in interpreting a large volume of images in less time, thereby improving diagnostic accuracy.
- **Medical Research:** Cancer researchers are using deep learning to automatically detect cancer cells.
- Teams at UCLA built an advanced microscope that yields a high-dimensional data set used to train a deep learning application to accurately identify cancer cells.
- **Education**: It enables adaptive learning platforms that analyze individual student performance and edit content to suit their needs.
- **Aerospace and Defense:** Deep learning is used to identify objects from satellites that locate areas of interest, and identify safe or unsafe zones for troops.

Topic 2. 'FIRST' PATIENT FREE OF CANCER: INDIGENOUS CAR-T CELL THERAPY BRINGS TREATMENT COST DOWN FROM RS 4 CRORE TO RS 40 LAKH

Important for the subject: Science and technology

Dr (Col) V K Gupta has been declared cancer-free since he took the **indigenously developed CAR-T cell therapy** at Mumbai's Tata Memorial Hospital.

- The therapy is developed by **Immuno Act, IIT Bombay and Tata Memorial Hospital**, the therapy has been administered to 15 patients in India.
- Months after India's drug regulator approved the commercial use of **CAR-T cell therapy**, a pioneering treatment that genetically reprogrammes a patient's immune system to fight cancer, Gupta, a Delhi-based gastroenterologist, became one of the first patients to access the therapy by paying Rs 42 lakh.
- Doctors at the Tata Memorial Hospital, where he underwent the procedure, said he is **"currently free of cancer cells",** the first commercial patient to achieve that status.

About NexCAR19:

- **NexCAR19 is the indigenously developed** therapy that Gupta underwent, **is a treatment for B-cell cancers (types of cancers that form in the immune system's cells) such as leukemia and lymphoma.**
- It has been developed collaboratively by **ImmunoACT,** a company incubated at the **Indian Institute of Technology Bombay (IITB), IIT-B and Tata Memorial Hospital.**
- The commercial use of this therapy was approved by the **Central Drugs Standard Control Organisation (CDSCO)** in October 2023.
- **NexCAR19 is available in over 30 hospitals** in more than 10 cities in India. Patients over the age of 15 years who suffer from **B-cell cancers** are eligible for this one-time therapy at these centers.
- Currently, the treatment cost is in a **price range of Rs 30-40 lakh for CAR-T therapy.** The ultimate goal is to bring the cost down to Rs **10-20 lakh.**

Who can get the NexCAR19 therapy?

- The therapy is for people with **B-cell lymphomas** who didn't respond to standard treatments like chemotherapy, leading to relapse or recurrence of the cancer.
- Recovery typically occurs within **two weeks after one cycle of the treatment.**
- In our data, approximately **70% of patients respond to the treatment**, with variations between **leukemia and lymphoma cases**.

- About **50% of these responsive patients achieve a complete response.**

About CAR-T cell therapy:

- As part of the therapy, **the patient's T-cells (types of immune cells)** are collected and genetically modified into potent cancer fighters known as **CAR-T cells so that they express chimeric antigen receptors (CARs) specific to cancer cells.**
- The **modified CAR-T cells** are then expanded in the laboratory before being infused back into the patient.
- These engineered cells recognise and attack **cancer cells, with a focus on B-cell cancers, thus offering a targeted and potent immunotherapy.**
- **CAR-T** is a **revolutionary therapy that modifies immune cells, specifically T-cells, by turning them into potent cancer fighters known as CAR-T cells.**
- **T-cells are special cells** (white blood cells that find and fight illness and infection) whose primary function is cytotoxic, meaning it can kill other cells.
- In **CAR-T therapy, we genetically modify them into cancer-fighting cells.**
- These supercharged cells are then put back into the body, and they go after cancer cells — especially in blood cancers like **leukemia and lymphomas.**

Is India's indigenous CAR-T cell therapy any more or less effective than CAR-T cell therapies abroad?

- Specifically, it leads to significantly lower drug-related toxicities. It causes minimal damage to neurons and the central nervous system, a condition known as neurotoxicity.
- Neurotoxicity can sometimes occur when CAR-T cells recognise the CD19 protein and enter the brain, potentially leading to life-threatening situations.
- The therapy also results in minimal Cytokine Release Syndrome (CRS), which is characterized by inflammation and hyper inflammation in the body due to the death of a significant number of tumor cells, as CAR-T cells are designed to target and eliminate cancer cells.

First CAR-T cell therapy to get CDSCO approval

- Immuno ACTs is the first CAR-T cell therapy to get CDSCO approval in many hospitals, including Chandigarh-based **Postgraduate Institute of Medical Education and Research (PGIMER).**
- They are also conducting ground breaking clinical trials in the use of **CAR-T cell therapy to treat cancer.**
- The commercial use of this therapy to treat certain blood cancers was approved by the **Central Drugs Standard Control Organisation (CDSCO) in October 2023.**

- **Pulitzer Prize-winning oncologist Siddhartha Mukherjea** is also conducting his first phase II multicentre CAR-T cell therapy study. His start-up Immuneel is working on the therapy.

How effective and different is this from other cancer treatments like, say, chemotherapy?

- **While chemotherapy and immunotherapy** may add a few months or years to a **cancer patient's life, cell-and-gene therapy** is designed to cure and provide lifelong benefit.
- It makes **treatment easier with a one-time therapy (unlike several sessions of chemotherapy)** that can be truly transformative for a patient.
- It's a lifeline for **non-responsive cancer patients.**

Topic 3. INDIA'S FIRST HYPERVELOCITY EXPANSION TUNNEL TEST FACILITY- A MAJOR STEP IN THE GOVERNMENT'S PATH TOWARDS ATMANIRBHARATA

Important for the subject: Science and technology

A crucial step in the country's journey towards Atmanirbhar Bharat has been achieved with **India's first Hypervelocity Expansion Tunnel Test Facility successfully established and tested by Indian Institute of Technology, Kanpur (IITK).**

- Establishment of such a facility will **position India globally for advanced experimental hypersonic research.**
- It is a major capacity boost for **India's space and defense sectors** and puts India in a better position to **develop advanced hypersonic technologies** and systems fast-forwarding the Hon'ble PM's dream of a scientifically advanced nation.
- The development of the facility was supported by the **Fund for Improvement in S&T Infrastructure (FIST) of the Department of Science & Technology (DST)** with a sum of Rs 4.5 Crores in 2018.
- The facility was developed by the **Hypersonic Experimental Aerodynamics Laboratory at the Department of Aerospace Engineering, IIT Kanpur** and is capable of generating flight speeds between 3-10 km/s, simulating the hypersonic condition.

- **Named S2**, it was **indigenously designed** and developed and is a valuable test facility for ongoing missions of **ISRO and DRDO including Gaganyaan, RLV and hypersonic cruise missiles.**

About the facility:

- The facility consists of 4 major sections i.e. free **piston driver, compression tube, shock /acceleration tube and test section with a high vacuum system for generating and sustaining the hypersonic flow.**
- The complete instrumentation of the facility i.e. **pressure sensors and associated equipment / instruments for acquiring and processing the data and the vacuum system with test section and associated instrumentation was acquired through the DST- FIST program.**
- **Hypersonic research** activities are fast growing in India and the implementation of **Hypersonic Test Facility in India** will enable more aerospace engineers and researchers to pursue hypersonic research.
- The research activities and data generated in the facility will serve as an input for optimization of existing vehicles as well as **futuristic defense and Space Missions.**

Topic 4. WHY THE UNION BUDGET'S PLANS FOR DEEP TECH AND RESEARCH FUNDING ARE SIGNIFICANT

Important for the subject: Science and technology

In the Interim Budget speech, **Finance Minister Nirmala Sitharaman announced a Rs 1 lakh crore fund to provide long-term, low-cost or zero-interest loans for research and development.**

- A promise has been made to launch a new scheme to strengthen deep-tech capabilities in the defense sector — an announcement that is likely to be followed up later in the year with a larger policy to promote deep tech startups across all sectors, not just defense.
- The separate announcements on the **fund and defense deep tech are intricately linked,** and must be seen together with the government's other plans for the R&D sector.

The 1 lakh crore corpus

- **Rs 1 lakh crore corpus to finance research and development** becomes important.
- Startups and other **private sector ventures** who can obtain seed money for their projects are expected to be the main beneficiaries.
- The idea is to start the flow of money in the research ecosystem and the hope is that as projects take off, industry would be encouraged to invest its own money, and the pool would grow, benefiting everyone in the research community.
- Expectations of the infusion of private sector money into research have been believed

earlier.

- Even where funds are available, delays and interruptions in disbursal often affects projects.
- There have been **only nominal increases in budgetary allocations of its science and research departments in the Interim Budget.**
- The **highest increase, for CSIR, which runs a network of 37 labs, is all of about 9%, and the Department of Space has received only a 4% increment in its budget.**
- The **Departments of Atomic Energy and Biotechnology, and the Ministry of Earth Sciences have actually had their budgets slashed.**

What is deep technology:

- The term **"deep tech" was coined by Swati Chaturvedi, the founder and CEO** of the online investment platform Propel(x), which connects early stage Deep Tech with investors.
- **Deep tech, or deep technology, refers to those startups whose business model is based on high tech innovation in engineering, or significant scientific advances.**
- **Deep technology (also deep tech or DeepTech) or hard tech** is a classification of organization, or more typically startup company, with the **expressed objective of providing technology solutions based on substantial scientific or engineering challenges.**
- They present challenges requiring lengthy research and development, and large capital investment before successful commercialization.
- Their primary risk is technical risk, **while market risk is often significantly** lower due to the clear potential value of the solution to society.
- The **underlying scientific or engineering problems being solved by deep tech** and hard tech companies generate valuable intellectual property and are hard to reproduce.

Applications of Deep Technology:

Advanced Materials

- These are **new or modifications of existing synthetic or biobased materials** that yield superior performance.
- Oftentimes, new materials are developed using two or more existing materials that differ significantly from one another, but when combined, result in a material with its own characteristics (like fiberglass), called a composite material.

Example of such advanced materials are –

- Photovoltaic films

- Biodegradable plastic

Artificial Intelligence

- AI refers to the simulation of human-like intelligence in machines that are programmed to think like humans and perform tasks that used to be the exclusive purview of humans.
- The **launch of voice assistants, medical imagery analysis, big data analytics, etc.** are a sure-shot sign that machines can be developed to do any task that a human can do.

Biotechnology

- Biotechnology involves developing valuable products by exploiting existing biological processes or by developing new ones.
- Genetic manipulation of microorganisms for the production of **antibiotics and vaccines, genetically modified seeds** that are more resistant to climate change and pests, etc. are some examples of how biotechnology is disrupting the current system.

Blockchain

- Blockchain is a growing list of records called blocks that stores a history of transactions in a secure and transparent way.
- The users of the blockchain can track the history and add to the blockchain but can't modify the existing blocks.

Robotics & Drones

- Robotics is the intersection of science, engineering and technology producing machines called robots to perform tasks in an automated fashion.
- Usually, deep tech is used to develop robots to get the work done in industries where the working environment is dangerous or hazardous for humans.
- The new technology makes use of human senses in **robots to develop more self-sufficient artificially intelligent robots** that permit mobility and decision making in an unistructural environment to help humans complete tasks in even a better way.
- D**rones are a subclass of robots that can fly and are usually more mobile**.
- These robots are often used to transport goods, map territory, or for surveillance purposes.

Photonics & Electronics

- **Photonics is a discipline of science focused on generating and harnessing** the properties of photons (particles of light).
- It involves the use of lasers, optics, fiber-optics, and electro-optical devices in numerous fields of **technology like alternate energy, manufacturing, telecommunication, security, etc.**

Quantum Computing

- Quantum computing refers to leveraging the **unique properties of matter at nanoscale to solve computational problems,** such as integer factorization substantially faster than classical computers.

Several quantum computing models exist today, like –

- **Quantum Circuit Model, Quantum Turing Machine, Adiabatic Quantum Computer, One-Way Quantum Computer, And Various Quantum Cellular Automata.**

Why does deep tech matter?

- D**eep tech refers to advanced and disruptive technologies,** many of which are still under development, that have the potential to trigger transformative change, and provide solutions for the future.
- The term is used to describe cutting-edge research in **nanotechnology, biotechnology, material sciences, quantum technologies, semiconductors, artificial intelligence, data sciences, robotics, 3D printing, etc.**
- These technologies are expected to play a key role to address complex global challenges **like climate change, hunger, epidemics, energy access, mobility, physical and digital infrastructure, and cyber security.**
- **Advanced capabilities in deep tech** are also likely to enhance productivity and drive economic growth and create jobs in coming years, and offer competitive advantage to countries with strong foundations in these areas.
- With its **large base of relatively high-quality science** and engineering manpower and a fairly well-established technology culture, India feels it is well placed to be one of the frontrunners in these areas.

Building an ecosystem for Deep Technology

- The government has tried to incentivise research in some of these areas by setting up a **National Mission on Transformative Mobility and Battery Storage and National Quantum Mission.**
- The **National Deep Tech Startup Policy (NDTSP), piloted by the Department for Promotion of Industry and Internal Trade and the Office** of the Principal Scientific Adviser, is currently awaiting government approval.
- The policy seeks to address specific challenges faced by technology startups, and to provide them with a platform to compete and collaborate with the best in the world.
- The idea is to create a deep tech start up ecosystem by offering the right incentives to companies that **invest time and money in innovation and research.**

Topic 5. QUANTUMSCAPE SOLID-STATE BATTERY MAY BE THE FUTURE OF EVS

Important for the subject: Science and technology

Quantum Scape, a **U.S.-based company,** has developed a **solid-state battery** prototype that marks a significant **advancement in electric vehicle (EV) technology**.

- This **battery retained 95% of its capacity after 1,000 charging cycles,** potentially enabling an **EV** to cover a **total mileage of over 500,000 kilometres** with a **single charge range of 500-600 kilometres**.
- This performance **surpasses** the **current industry target for solid-state battery development,** which is about **700 charging cycles** with a **maximum capacity loss of 20%.**
- The **tests**, conducted by **Volkswagen's battery company PowerCo**, suggest this technology could address many challenges facing current EV batteries, such as **cost, safety, capacity, charging time,** and **durability.**
- **Solid-state batteries** differ from **traditional lithium-ion batteries** by using a **solid electrolyte** instead of a **liquid one,** eliminating many **safety** and **performance issues** associated with the latter.
- This **new type of battery** offers **improved temperature tolerance, is non-flammable,** and **does not leak,** making it potentially more suitable for varied climates.
- **Solid-state batteries** have been a research focus for **40 years,** with recent breakthroughs overcoming **long-standing challenges in cycle life, thermal stability,** and **current density**.
- **Quantum Scape's solid-state lithium-metal cell,** notable for its **anode-free design** and **ability to be produced in layers for series cell production,** represents a leap forward in **energy density** and **manufacturing scalability.**
- Major automotive companies like **Volkswagen, BMW, Toyota,** and **Hyundai** are investing in **solid-state technology,** with launches of **solid-state battery EVs anticipated around 2025**.

About Solid State batteries:

- These batteries use **solid electrodes** and a **solid electrolyte,** instead of the **liquid or polymer gel electrolytes** found in **lithium-ion** or **lithium polymer batteries**.
- **Solid-state batteries** can provide solutions for many problems of **liquid Li-ion batteries,** such as **flammability, limited voltage, unstable solid-electrolyte interphase formation, and poor cycling performance** and **strength.**
- In the **charging & discharging cycle**, ions transfer to and fro between the **anode** (negative electrode generally made of graphite) and **cathode** (positive

electrode made of lithium).

Advantages of the solid-state battery technology:

- Higher cell energy density (by eliminating the carbon anode)
- Lower charge time (by eliminating the need to have lithium diffuse into the carbon particles in conventional lithium-ion cells)
- Ability to undertake more charging cycles and longer life.
- Improved safety and Lower cost.
- Increase the capacity of EV batteries.

Topic 6. WITH CRISPR POISED TO REVOLUTIONISE THERAPY, A PAUSE TO CONSIDER ETHICAL ISSUES

Important for the subject: Science and technology

What is CRISPR?

CRISPR stands for **Clustered Regularly Interspaced Short Palindromic Repeats.** CRISPR-Cas9 is the most prominent technology that enables to **edit parts of the genome by removing, adding or altering sections of the DNA sequence**.

- The CRISPR-Cas9 system consists of two key molecules that introduce a change mutation into the DNA.
- **Cas9- An enzyme** that acts as a pair of 'molecular scissors' that can cut the two strands of DNA at a specific location in the genome.
- **Guide RNA (gRNA)-** The gRNA is designed to find and bind to a specific sequence in the DNA.
- The Cas9 follows the guide RNA to the same location in the DNA sequence and makes a **cut across both strands of the DNA.**
- At this stage, the cell recognises that the **DNA is damaged and tries to repair it.**
- The DNA repair machinery is used to introduce changes to one or more genes in the genome of a cell of interest.
- The technology replicates a natural defence mechanism in some bacteria that uses a similar method to protect itself from virus attacks.

What are the advantages of this technology?

- **Faster and Cheaper**– It is faster and cheaper than previous techniques of editing DNA.
- **High accuracy**– Genetic engineering has made the work more accurate by allowing

scientists to have greater control on trait development.

- **Viable compared to GMO-** CRISPR technology proves viable against the criticisms of Genetically Modified Organisms (GMO).

What are the issues with CRISPR technology?

- **Ethical concerns**– In 2018, a Chinese researcher's disclosure of creating a 'designer baby' has caused widespread concern in the scientific community.
- **Biological concerns**– Though the technology is not 100% precise and has the risk of causing mutations, side effects and undesirable changes like antibiotic resistance.
- **Genetic drive –** Once the manipulated genes get transferred on to next generations, they become part of the environment.
- **Gene gap**– CRISPR can be very expensive and get limited to those who can afford it.

Where does India stand in the field of gene editing and CRISPR?

- India is at its infancy when it comes to genome editing.
- Research in gene editing is not so abundant but it is growing steadily.
- Although the funding for biology has been steadily growing, a lot of investment is needed in infrastructure.
- India's draft gene-editing rules allows genome-edited organisms without any "foreign" genes to be Important for the subjected to a different regulatory process than the one applied to genetically engineered products.

Topic 7. R&D SPEND — GOLDEN INTERVENTION OR SMOKE AND MIRRORS

Important for the subject: Science and technology

The announcement in the interim Budget by Union Finance Minister Nirmala Sitharaman regarding the establishment of a **one lakh crore rupees corpus with fifty-year interest-free loans to promote private sector research and innovation in sunrise domains** has ignited discussions about the effectiveness and implications of such a move.

A sunrise industry

- A sunrise industry refers to a sector or area of economic activity that is experiencing rapid growth and expansion, often characterized by the emergence of new technologies, products, or services.
- These industries typically represent promising opportunities for investment and development due to their potential to drive innovation, create jobs, and contribute significantly to economic growth.

Private Sector Contribution and International Comparisons

- India's private sector's contribution to research and development (R&D) expenditure has historically been low, constituting only **36.4%** of the national gross expenditure on R&D (GERD) in 2020-21.
- Comparisons with global leaders in R&D investment such as Germany, South Korea, and the United States, where private sector contributions to national GERD are significantly higher (67%, 79%, and 75% respectively).
- Highlight the disparity and raise questions about the necessity for private sector dominance in R&D spending.
- These comparisons also prompt reflection on whether international benchmarks for R&D expenditure are relevant to India's unique developmental context.

Trends in India's R&D Expenditure

- Despite an increase in absolute terms, India's R&D expenditure as a fraction of GDP has been steadily declining, underscoring a lag in keeping pace with more technologically advanced nations.
- The decline from 0.82% to approximately **0.64% of GDP** from 2009-10 to 2020-21 highlights the need for concerted efforts to bolster R&D investment in India.

Topic 8. CSIR-NISCPR CELEBRATES THE FOUNDATION DAY

Important for the subject: Science and technology

The **Council of Scientific and Industrial Research-National Institute of Science Communication and Policy Research (CSIR-NIScPR)** celebrated its **Foundation Day with a dynamic event** showcasing a commitment to advancing science communication, STI policy research, innovation, and research.

- **Prof. Ranjana Aggarwal who is Director of CSIR-NIScPR** had emphasized the **institute's dedication to disseminating scientific achievements in all Indian languages.**
- Highlighting the new initiatives of the Institute, Prof. Aggarwal mentioned the concrete outcomes of the **Science Media Communication Cell, SVASTIK, Technology Readiness Level efforts and many others.**
- She also emphasized the strong **focus on language diversity** as a means to reach a wider audience.
- She had shared insights into the **institute's prominent role as the host of the National Science Library, the largest in Asia.**
- Prof. Aggarwal highlighted the institute's commitment to creating rural livelihoods by

leveraging CSIR technology.

Key deliberations out of the address by the Director CSIR-NIScPR:

- **Science Media Communication Cell (SMCC)** is an innovative initiative bridging the gap between media and science.
- This cell is designed to **enhance the communication of scientific achievements to the public, fostering a better understanding of S&T knowledge to society.**
- **NETRA Framework** has been developed in collaboration with **National Research Development Corporation (NRDC) for assessing technology readiness levels.**
- **CSIR-NIScPR** will play a pivotal role in **certifying technologies for the NRDC,** further supporting technological advancements.
- This initiative will utilize the networks of the **Unnat Bharat Abhiyan and Vijanan Bharati, aiming to empower rural communities through innovation.**
- In line with Prime Minister Modi's vision, **SVASTIK seeks to disseminate scientifically validated traditional knowledge of India.**
- This initiative reflects **CSIR-NIScPR's dedication towards preserving and promoting traditional wisdom.**

About CSIR-NIScPR

- **CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR)** is one of the constituent laboratories of the **Council of Scientific & Industrial Research (CSIR)** under the **Ministry of Science & Technology, Government of India.**
- **CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR), New Delhi** came into existence on **01-04-2021** with the merger of erstwhile **CSIR-National Institute of Science Communication and Information Resources (CSIR-NISCAIR).**
- **New Delhi** and erstwhile **CSIR-National Institute of Science, Technology and Development Studies (CSIR-NISTADS), New Delhi**
- Consequent upon the **merger of erstwhile CSIR-NISCAIR & erstwhile CSIR-NISTADS** into a new institute **CSIR-NIScPR, all units/divisions have been reorganized.**
- The new entity may serve as a **'Think Tank' for the Indian ST&I system** and may lead **ST&I communication and policy** studies at National level fulfilling the emerging National aspirations and needs.
- It specializes in the **fields of science communication.** STI focuses on **evidence-based policy research and studies.**
- It publishes various **journals, books, magazines, newsletters, and reports on science**

and technology.

- It also conducts research on **science communication, science policy, innovation systems, science-society interface,** and science diplomacy.
- **Council of Scientific and Industrial Research (CSI**R) was set up in **1942** and its major objectives mentioned in the **Memorandum of Association of the Council are "the collection and dissemination of information" and "publication of scientific papers and journals".**

Topic 9. MISCONCEPTION DRIVES UNDER-PRESCRIPTION OF ORS

Important for the subject: Science and technology

Oral Rehydration Salts (ORS)

It involves drinking water with modest amounts of sugar and salts, specifically sodium and potassium.

- It is on the World Health Organization's List of Essential Medicines. Globally oral rehydration therapy is used by approx. 41% of children with diarrhoea.
- Its use has played an important role in reducing the number of deaths in children under the age of five.
- Oral rehydration therapy (ORT) is a type of fluid replacement used to prevent and treat dehydration, especially due to diarrhea, decreases the risk of death from diarrhea by up to 93%.

What is misconception here:

- Healthcare providers assume that patients do not want ORS and this led to under-prescription.
- Oral Rehydration Salts (ORS) are a lifesaving and inexpensive treatment for diarrhoea in children, but few prescribe it in developing countries especially.
- However, presently, nearly half of diarrhoeal cases around the world do not receive ORS, according to researchers.
- As per a randomised controlled trial to simultaneously study the role of three leading explanations for under-prescribing of ORS are as :
- Providers might think patients prefer non-ORS treatments such as antibiotics or dislike ORS because of poor taste and perceptions that ORS is not a real medicine.
- Providers could be responding to financial incentives to sell more profitable alternatives (ORS) is inexpensive and antibiotics generate nearly double the profit).
- ORS stock-outs. Additionally, Provider misperceptions that patients do not want ORS

play the biggest role in the under prescribing of ORS as estimated as 42% of under prescribing, whereas stock-outs and financial incentives explained only 6% and 5% respectively.

- Also, 28% providers prescribed/dispensed ORS when standardised patients expressed no preference, and 55% prescribed ORS when they expressed an ORS preference.

Topic 10. CSIR NAL FLIES TEST-DRONE THAT CAN DOUBLE UP AS 'PSEUDO SATELLITE'

Important for the subject: Science and technology

National Aerospace Laboratories (NAL) successfully tests solar-powered High Altitude Pseudo Satellite (HAPS), a UAV.

- HAPS are like drones, except that they are expected to be in the stratosphere — well above where commercial planes fly — and can be powered enough by solar cells and a battery-system to be able to hover for days on end.

Features of High-Altitude Pseudo Satellite (HAPS):

- HAPS can fly at 18-20 km altitude, remain airborne for months, akin to a satellite.
- Cost-effective compared to traditional satellites, offers continuous surveillance.

Benefits/Advantages of HAPS:

- These solar-powered vehicles have been designed to plug the **missing link between unmanned aerial vehicles (UAVs) flying in lower altitudes and conventional satellites in space.**

The use of HAPS is considered for a variety of **applications such as:**

1. telecommunications,
2. emergency/public safety communications,
3. intelligent transportation systems,
4. maritime surveillance,
5. environmental monitoring,
6. land border control applications, etc.

- Compared to ground-based communication networks, HAPS can cover larger areas with less interference.
- They could also help ease data transfer when used as an intermediate conduit between a satellite and ground-based telecom networks.
- Unlike regular satellites that are expensive to build and launch, HAPS cost far less and

are easier to launch.

National Aerospace Laboratories (NAL)

- It is India's **only government aerospace R&D lab, established in 1959 under CSIR.**
- Focuses on high-tech aerospace disciplines, advanced test facilities recognized as National Facilities.
- Contributions span five decades, enriching Indian aerospace programs globally.
- Developed critical technologies for strategic sectors, supporting national mission-mode programs.

Topic 11. SERUM'S HPV VACCINE NON-INFERIOR TO GARDASIL: STUDY

Important for the subject: Science and technology

Phase-2/3 trial of Serum Institute of India's **human papillomavirus (HPV) vaccine Cervavac** conducted at 12 tertiary care hospitals across India in girls and boys aged 9-14 years has found the vaccine to be safe and non-inferior to a comparator vaccine **Gardacil manufactured by Merck.**

What is CERVAVAC?

- It is India's first indigenously developed quadrivalent human papillomavirus (qHPV) vaccine that is said to be **effective against four strains of the virus – Type 6, Type 11, Type 16 and Type 18.**
- A quadrivalent vaccine is a vaccine that works by **stimulating an immune response against four different antigens, such as four different viruses or other microorganisms.**
- CERVAVAC is based on VLP (Virus-Like Particles), similar to the Hepatitis B vaccination.

Approval:

- The vaccine has received the **Drugs Controller GeneraI of India's approval** and has been cleared by the government advisory panel NTAGI for use in the public health programme

Significance:

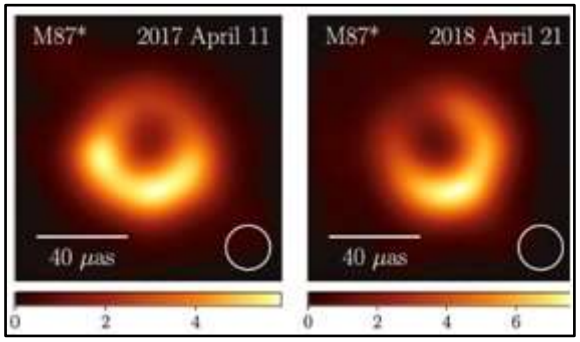
- It has a significant potential to eliminate cervical cancer and it would be helpful if included in national HPV vaccination efforts and offered at a lower cost than existing vaccinations.
- The **vaccine is extremely effective only when it's administered before the first sexual intercourse.**

What is Cervical Cancer?

- Cervical cancer develops in a woman's cervix. It is the **4th most common type of cancer among women, globally and 2nd most common among women in India.**
- India contributes the largest share of the global cervical cancer burden; nearly 1 in every 4 deaths globally due to cervical cancer (as per The Lancet study).
- Almost all cervical cancer cases (99%) are linked to infection with high-risk HPV, an extremely common virus transmitted through sexual contact.
- Effective primary (HPV vaccination) and secondary prevention approaches (screening for and treating precancerous lesions) will prevent most cervical cancer cases.
- When diagnosed, cervical cancer is one of the most successfully treatable forms of cancer, as long as it is detected early and managed effectively.
- Cancers diagnosed in late stages can also be controlled with appropriate treatment and palliative care.
- With a comprehensive approach to prevent, screen and treat, cervical cancer can be eliminated as a public health problem within a generation.

Topic 12. EARTH-WIDE TELESCOPE CONFIRMS BLACK HOLE'S SHADOW IS 'REAL'

Important for the subject: Science and technology



Imaging the black hole:

Scientists have made significant advancements in our understanding of **black holes**, particularly one located **53 million light-years** away, which was **first imaged in 2017** by the **Event Horizon Telescope (EHT).** This imaging feat was groundbreaking as it provided the **first visual confirmation of black holes' existence,** supporting a key aspect of **general relativity**.

Detailed analysis of Black hole's image:

- Recent enhancements in the **EHT's** capabilities have allowed researchers to **observe finer details near the black hole's event horizon**, the point beyond which light cannot escape.
- These observations revealed a **distinct ring formation around the event horizon.**
- The **initial EHT observations** had identified the **black hole's "shadow"** – an area shaped by the gravitational effects of the event horizon and a **critical indicator** of the **black hole's presence**.
- This evidence was not only a source of amazement but also served to **validate** the **mass, size,** and **shape** of the **black hole** against predictions made by **general relativity.**
- The **latest findings,** resulting from **improved telescope resolution and coverage,** have **reaffirmed the dimensions and characteristics of the black hole's shadow.**
- This outcome helps to **assure scientists** that **their observations are not skewed by biases,** further enhancing our comprehension of these mysterious cosmic entities.

Event Horizon Telescope (EHT):

- The **Event Horizon Telescope (EHT)** is a **global network of 8 radio telescopes** that **collaborate to observe celestial bodies,** utilizing a **method** known as **very-long baseline interferometry**.

The 8 radio telescopes are:

1. Atacama Large Millimetre/sub-millimetre Array,
2. Atacama Pathfinder Experiment,
3. IRAM 30-metre telescope,
4. James Clerk Maxwell telescope,
5. Large Millimetre Telescope Alfonso Serrano,
6. Submillimetre Array,
7. UArizona Submillimetre Telescope and
8. South Pole Telescope.

- This **technique** involves **synchronizing the data** collected from various telescopes using **highly accurate clocks** to study **specific objects in space**.
- The resolution of the network is determined by the maximum distance between these telescopes.
- In **2017,** the **EHT** made a **significant discovery, detecting a bright, asymmetric ring of light** that aligns with the **expected characteristics of a supermassive black hole**, a

finding further corroborated by independent analyses of EHT data.

- Following these observations, efforts were made to **enhance the EHT's capabilities.**
- These improvements included **increasing the rate at which data is recorded, enhancing the ability to capture spatial information,** and **incorporating the Greenland Telescope into the array.**
- The addition of the **Greenland Telescope** notably enhanced the **EHT's resolution** in the **north-south direction**.

Piecing the data together:

- In a recent observational campaign, the **Event Horizon Telescope (EHT)** involved **nine stations** to **collect data over six days** in April 2018, utilizing **four different frequencies**.
- To delve deeper into the phenomena observed, the research team employed **general relativistic magneto hydrodynamic (GRMHD) simulations** to model the **M87 black hole,** taking into account the **influence** of the **black hole's gravity** on the surrounding spacetime, in line with **Einstein's theory of general relativity**.

Gravitational lensing:

- The recent findings from the **Event Horizon Telescope (EHT)** have confirmed the **presence of an asymmetric ring structure around a black hole**, measuring approximately **42 microarc seconds** across.
- Observations made in **2017** and **2018** showed that the **diameter of this ring remained relatively constant,** demonstrating that the **black hole's gravity consistently bends light over time, forming the observed ring**.
- This behaviour is a **direct manifestation of gravitational lensing**, a phenomenon predicted by the **general theory of relativity,** where **massive objects cause spacetime to bend,** affecting the **path of light** passing near them.

Significance of observations made by EHT:

- The **EHT** observations revealed that the **southwest portion of the ring appears brighter,** which is attributed to the **black hole's rotation** affecting the **distribution of light** due to **spacetime** being dragged along its rotation direction.
- These observations align with the characteristics expected of a **Kerr (rotating) black hole,** with a mass about **6.5 billion times that of the Sun.**
- Additionally, the study noted a **shift** in the **orientation or position of the black hole's accretion disk** and the **jet of high-energy particles** it emits by **approximately 30 degrees** between **2017** and **2018**.
- This change is speculated to be related to the **black hole's spin** and has **implications for understanding the complex dynamics between the accretion disk, the jet,** and **the**

surrounding magnetic fields.

- The EHT's efforts have consistently validated the **ring formation process** and the **black hole's physical traits across different observations and frequencies**.
- The project has also demonstrated **improvements in observational techniques,** narrowing the **gap** between **image-based studies** and **direct modelling methods.**
- Looking ahead, the EHT team plans a **"movie project"** in **2026** to observe changes in the **black hole's brightness** over a period, offering further insights into the dynamics of black holes and the physics governing their surrounding environments.

Topic 13. SCIENTISTS PLAN TO BUILD EVEN LARGER ATOM-SMASHER BY 2040

Important for the subject: Science and technology

Scientists at **CERN**, the **European Organization for Nuclear Research,** are making strides towards initiating a multibillion-euro project for constructing a **larger and more potent particle collider,** the Future Circular Collider (FCC), aimed at delving deeper into the universe's mysteries.

Large Hadron Collider (LHC)

- The Large Hadron Collider is a giant, complex machine built to study particles that are the smallest known building blocks of all things.
- LHC is a collider that accelerates two beams of particles in opposite directions and smashes them head-on.
- These beams of particles are Hadrons.
- Hadron is a subatomic particle made of quarks, gluons and anti-quarks.
- Hadrons are the heaviest particles and are composed of two or more quarks that are held strongly by electromagnetic force.
- LHC is built by the European Organization for Nuclear Research (CERN).

About the Future Circular Collider (FCC):

- The project is expected to commence its first phase by **2040,** primarily supported by **European and Western countries.**

- This initiative follows the success of the **Large Hadron Collider (LHC),** notable for its role in **confirming the existence of the Higgs boson** in **2012,** a pivotal discovery in physics.
- FCC will have the potential to significantly advance the understanding of **fundamental physics** and drive technological innovation in fields like **cryogenics** and **superconducting magnets,** with broader socioeconomic benefits.
- The planned collider, with a **reduced loop circumference** from **100 kilometers** to **91 kilometers,** aims to achieve **particle collision energy levels of 100 TeV,** significantly surpassing the **LHC's 13 TeV,** and further expanding the frontier of particle physics.

Topic 14. WHY INDIA WANTS TO DEVELOP HIGH-ALTITUDE PSEUDO-SATELLITE VEHICLES, POWERED BY THE SUN

Important for the subject: Science and technology

The Bengaluru-based National Aerospace Laboratories (NAL) successfully flew a prototype of a new-generation **unmanned aerial vehicle (UAV)** that is being seen as a huge technology breakthrough.

- **HAPS** technology is still under development.
- Several countries, and companies, have **developed and flown such vehicles with encouraging success, but none has mastered the technology yet.**
- The **world record for a vehicle of this class is held by the Airbus-manufactured Zephyr,** which flew continuously for 64 days in August 2022 before crashing.
- For India, **HAPS is another technology area where it is entering** the race at a relatively early stage.
- The **primary utility of HAPS vehicles** is in the field of surveillance and monitoring, but there are other situations, like disaster management, wherein it can be very useful.
- The prototype tested by NAL **last week spent eight and a half hours in the air.** Next month, NAL, a unit of the **Council of Scientific and Industrial Research (CSIR),** plans to keep it in flight for at least 24 hours.
- The full-scale machine that NAL is trying to build, by 2027, would be aiming to remain in the air for 90 days at a stretch.

What is the need for such UAVs?

- The kind of jobs that **HAPS are meant to do are currently done by UAVs and satellites**, but both have certain limitations.
- The **normal UAVs, or drones as they are commonly called, are mostly battery-powered and cannot remain in the air beyond a few hours.** Continuous monitoring is not **something they can do very effectively.**

- In addition, **they fly at relatively low levels**, because of which their vision is restricted to small areas.
- **Satellites can observe much larger areas,** but the ones in low-earth orbits are continuously moving with respect to Earth. They cannot be constantly **keeping an eye on the target area.**
- **Geostationary satellites, located at a height of about 36,000 km** above the ground, can keep a constant gaze over one area. But these are fairly expensive, and once deployed, cannot be repurposed or reoriented.

HAPS are meant to overcome all these shortcomings wrt satellites.

- HAPS work l**ike geostationary satellites** but with added flexibility.
- They can be easily r**edeployed over another location**, or can be reequipped with a different payload, something that is not possible with a geostationary satellite

Engineering challenges of HAPS

- The **primary challenge is to generate enough solar power to keep the aircraft flying,** the payloads operating, and the batteries charging. The **batteries need to be enough** to continue the operations through the night.
- There are **design-related challenges as the aircraft needs to be extremely lightweight** to minimize the power requirement, but it also has to be stable. This is **one of the reasons why this aircraft is meant to fly in the stratosphere.**
- The **region between 17 and 23 km** above the **earth's surface** is climatologically conducive for their flight. The **wind speed is very low and ideal for light-weight aircraft** to remain stable.
- It helps that this height, much above the region in which civilian aircraft fly, is favorable for observation and surveillance activities.
- But temperatures at that **height can drop to -50 degree Celsius or lower.** Electronics need to be kept warmer, and that is an additional burden on power resources. Also, **air density is just about 7 percent of what it is at sea level.**
- That creates acute complications for the aircraft, for example in producing lift and thrust. Because of limitations of **space and weight, solar cells and batteries need to have very high efficiencies**

India and the HAPS

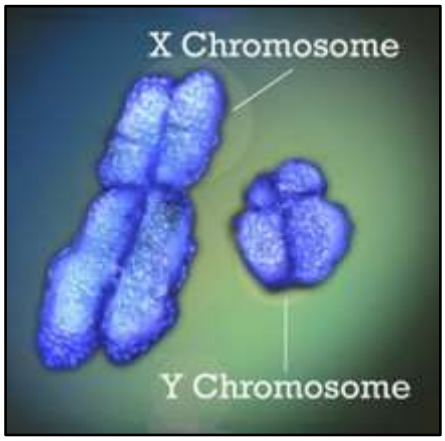
- For India, **HAPS is another technology area** where it is entering the race at a relatively early stage.
- In the last few years, t**here has been great emphasis** on promoting research in emerging technologies, so that the country is not dependent on others for critical technologies of the

future.

- Joining **technology development at an early stage also results i**n capacity building, early adoption of technologies, control over patents, business opportunities and spin-off technologies.
- **India had moved into HAPS technology development at the right time,** and the successful test flight showed that it had capabilities similar to some of the other countries trying to develop this technology.

Topic 15. THE ROLE OF X CHROMOSOME IN AUTO-IMMUNE DISEASES

Important for the subject: Science and technology



A **2023 University of Oxford study** shows **autoimmune diseases** affect about **10%** of the population, with a **higher incidence in women (13%)** than **men (7%).**

- The **higher susceptibility of women to autoimmune diseases** has puzzled researchers for decades, considering factors like e**nvironmental influences, genetics, hormonal imbalances,** and **lifestyle habits.**
- However, Scientists discovered a **molecular coating** on **one of the two X chromosomes** in **women,** potentially explaining the **gender disparity in autoimmune disease susceptibility.**

X-Chromosome Inactivation:

- This molecular coating, a **mix of RNA and proteins,** is **crucial for X-chromosome inactivation**, ensuring **only one set of X chromosomes is active in female cells.**

Role of XIST Molecule:

- The **process** involves the **XIST molecule**, which **mutes gene expression** but **allows some genes to escape inactivation,** potentially leading to **autoimmune diseases.**
- XIST also triggers inflammatory immune responses and autoantibody production

Experimental Findings:

- Bioengineered male mice expressing a **modified version of XIST** showed **increased autoantibody levels** and **immune cell activity** when introduced to a **lupus-like disease,** indicating a susceptibility to autoimmune attacks.
- Further studies are needed to identify specific **XIST-related antigens** contributing to **sex-biased immunity,** aiming for improved detection and diagnosis of autoimmune diseases in women.

Implications for Women:

- Since **XIST** is **expressed only in cells with two X chromosomes,** this points to why women are more susceptible to **autoimmune diseases and attacks.**

Topic 16. THE UNTAPPED POTENTIAL OF STEM CELLS IN MENSTRUAL BLOOD

Important for the subject: Science and technology

Approximately 20 years ago, **biologist Caroline Gargett** discovered two types of cells in the **endometrium** through rigorous microscopy examination, suspected to be adult stem cells due to their regenerative capabilities.

- The discovery of these cells, known as endometrial stromal mesenchymal stem cells, opened new avenues for research in tissue repair and disease treatment.

Which blood cells are present in menstrual blood?

- **Endometrial stem cells can be obtained non-invasively from menstrual blood and are referred to as menstrual blood-derived stem cells.**
- Menstrual Stem Cells were first identified from menstrual blood in 2007.
- These menstrual stem cells could offer several advantages.
- They come from a source that's **easy to obtain** from women.
- They could be used to treat patients without the **fear of tissue rejection.**

Endometrium

- Endometrium lines the inside of the uterus.
- The endometrium has a **deeper basal layer that remains intact**, and an upper functional layer that sloughs off during menstruation.
- During a single menstrual cycle, the endometrium thickens as it **prepares to nourish a fertilised egg, then shrinks as the upper layer sloughs away.**

Important Role:

- It plays a vital role in repairing and **regenerating the upper layer of tissue that gets shed each month during menstruation.**
- This layer is crucial to pregnancy, providing support and nourishment for a developing embryo.
- The layer, and the endometrial stem cells that prod its growth.
- It also appears to play an important role in infertility.

What are Stem Cells?

- A stem cell is a cell with the unique ability to **develop into specialized cell types in the body.**
- These cells provide new cells for the body as it grows, and replace specialized cells that are damaged or lost.
- In the future, they will be used to replace cells and tissues that have been damaged or lost due to disease.
- Human body is **made up of numerous types of cells.**
- Most cells are specialized for particular functions, like **the red blood cells that carry oxygen in our bodies through the blood, but they are unable to divide.**

All stem cells regardless of their source have three general properties:

- They are capable of dividing and renewing themselves for long periods
- They are unspecialized.
- They can give rise to specialized cell types.

Embryonic stem cells vs Adult stem cells

- Stem cells come from two main sources: **embryos or adult tissues.**
- **Embryonic stem cells can give rise to virtually any cell type in the body, but they are controversial because conventional procedures for obtaining them involve the destruction of an embryo.**
- **Adult stem cells, such as those found in bone marrow**, do not pose the same ethical concerns, but they have limited powers and collecting them can require invasive procedures.

Topic 17. DOES UPDATING COVID-19 VACCINES FREQUENTLY HAVE ANY BENEFITS?

Important for the subject: Science and Technology

Researchers update the composition of influenza vaccines **every six months** to match the strains of the virus that are circulating in the wild, so that the shots may provide protective immunity against the flu.

- But despite their best efforts, researchers rarely perfectly match the strains loaded in the vaccine with the strains circulating by the time the vaccines reach the market.
- The reason for this is the **long gestation period usually at least six months between identifying the circulating strain and the development, manufacturing,and distribution of the vaccines.**
- By the time the updated flu vaccine is available, the circulating strain may have drifted from the one contained in the vaccine, thanks to the high mutational rates of influenza viruses.
- The **Omicron variant,** with its antigenic distance, has further complicated vaccine efficacy.
- Despite efforts to update vaccines, newer variants like **XBB.1.5 and JN.1** present hurdles.
- Studies suggest updating vaccines may enhance neutralizing antibody titers against future variants, but uncertainties persist about long-term efficacy and T-cell immunity.
- India, with its Corbevax and Gemcovac vaccines, faces decisions on updating formulations to counter emerging variants.

Virus Variant:

- Variants of a virus have one or more mutations that differentiate it from the other variants that are in circulation. While most mutations are deleterious for the virus, some make it easier for the virus to survive.
- The **SARS-CoV-2 (Corona) virus** is evolving fast because of the scale at which it has infected people around the world. High levels of circulation mean it is easier for the virus to change as it is able to replicate faster.
- The original **pandemic virus (founder variant) was Wu.Hu.1 (Wuhan virus).** In a few months, variant D614G emerged and became globally dominant.

Concerns Related to Different Variants:

Increased Transmission:

- In many countries, including India, variants, by virtue of increased transmissibility, have

kicked off new wave(s) of epidemic transmission.

Increased Severity:

- Regarding virulence (propensity to cause severe/life-threatening disease), the UK variant is worse. The South Africa and Brazil variants do not seem to have higher virulence.

Lowered Immunity:

- The third concern is regarding the immunity cover offered by vaccination using antigens made from the D614G variant — which applies to most vaccines in current use.
- Lowered efficacy of vaccines was found more with the South African and less with the Brazil variant.
- Hence, reinfection can occur in spite of immunity by earlier D614G infection or vaccination.
- Vaccine efficacy may be lower now than what was determined in phase-3 trials as VOC were not then widely prevalent.

Topic 18. BIDEN GOVT. SETS TIGHTER STANDARDS FOR SOOT POLLUTION

Important for the subject: Environment

The Biden administration has introduced **stricter standards for soot pollution, aiming** to **reduce emissions** from various sources like **tailpipes** and **smokestacks (**a chimney or funnel for discharging smoke from a locomotive, ship, factory, etc.**) to prevent thousands of premature deaths annually.**

About the new EPA rules:

- The **Environmental Protection Agency's (EPA) rule** could **mandate power plants to capture smokestack emissions**, a technology not widely used in the US.
- The **new EPA rule** is seen as a significant **health improvement measure** by **environmental** and **public health groups,** but industry groups fear it could result in **manufacturing job losses** and **potential shutdowns of power plants or refineries**.
- The rule is expected to bring **$46 billion** in **net health benefits** by **2032,** including the **prevention** of up to **800,000 asthma attacks** and **4,500 premature deaths, benefiting children, the elderly,** those with **heart and lung conditions,** and **communities** historically impacted by **industrial pollution**.
- The regulation **lowers the allowable fine particle pollution levels to 9 micrograms per cubic meter of air** from the **previous 12 micrograms** set under the Obama administration.
- This rule **mandates** states and counties to **meet the new air quality standards to reduce**

pollution.

The rule applies to both existing and future plants.

- By **2038**, **almost all coal plants and large gas-fired plants** would need to significantly **reduce or capture their emissions,** with **non-compliant plants facing retirement**.
- The **US electricity mix** includes about **20% coal** and **40% natural gas**, with the rest from **nuclear** and **renewables.** The **power sector's carbon emissions** are currently at **1984 levels,** despite a **73% increase** in **electricity use.**
- The **new EPA rule doesn't mandate specific carbon capture equipment** but sets **carbon dioxide pollution caps** that the industry must meet, possibly leading to more use of carbon capture technology.

Associated challenges:

- Administration officials dismissed concerns about the rule's impact on industry, noting technological advancements have enabled compliance with past standards, and highlighting the decline in soot pollution over the last two decades despite economic growth.
- Industry groups and some officials argue the stricter standard could hinder permitting for new or expanded industrial plants and potentially push companies to relocate to countries with laxer air-quality standards, contradicting the administration's economic and environmental objectives.

Topic 19. EU SETS NEW CLIMATE GOAL FOR 2040 — HIGH AMBITION, YET GAPS PERSIST

Important for the subject: Environment

The **European Union,** through the **European Commission**, announced a **new proposed climate goal**, targeting a **90% reduction** in **net emissions by 2040** compared to **1990 levels**.

- This follows the **EU's previous commitment** in **September 2020** to **cut greenhouse gas emissions by 55% below 1990 levels by 2030**, an increase from an earlier target of **40%.**
- The **2030 target** was formalized as the **EU's second Nationally Determined Contribution** to the **UNFCCC** in **December 2020** and was enshrined in the **EU Climate Law in 2021**, which also **commits** the **EU** to achieving **carbon neutrality by 2050**.
- To support the **2030 target**, the **Commission** released the **"Fit for 55" package** in **2021,** offering proposals to meet the **emissions reduction goal.**
- The **2024 proposal** for a **2040 target** is part of an interim step **mandated** by the **EU Climate Law,** following the **first Global Stocktake** at the **28th Conference of Parties to the UNFCCC** in **Dubai** in **December 2023,** which requires the development

of a **2040** target within six months of the **GST conclusion**.

Fossil fuel phaseout sees a timeline for coal but with caveats:

- The **Global Stocktake (GST)** emphasized the need to **transition away from fossil fuels**, aligning with the **EU's 2040 target** to significantly **reduce the use of coal,** rapidly **decrease natural gas usage,** and **phase out oil last.**
- Despite the transition, a **minimal amount of fossil fuels** will still be used, primarily for **non-energy purposes** and **long-distance transport.**
- The **shift** in the **energy mix** will **decrease fossil fuel imports** but may **increase imports of raw materials** and **critical minerals for renewable energy deployment.**
- The **EU's energy crisis** prompted **diversification of energy suppliers** and an **increase in liquefied natural gas (LNG) imports,** making the **EU** a **key LNG importer.**
- Record **increases** in **renewable energy adoption** in the **EU** saw **wind** and **solar surpass fossil gas** in **electricity generation** in **2022.**
- The **EU imports LNG** from the **United States, the Middle East, and Africa,** with recent gas deals signed with **Qatar** and **potential agreements** with **Nigeria** and **Mozambique**, indicating continued **gas imports beyond 2050.**
- These **gas import deals** pose a **risk of carbon lock-in and stranded assets,** particularly for **African countries** expanding **export capacities,** especially if the **EU's new climate target** leads to **reduced fossil fuel imports**.

Missing reflection of the EU's historical emissions burden

- The **EU's 2030 goal** aims for a **55%** reduction in emissions, resulting in **2.16 gigatonnes of CO2 equivalent** based on **1990 levels,** while the **2040 target** of a **90% reduction** would lead to **0.48 gigatonnes of CO2 equivalent.**
- The **European Union Scientific Advisory Board for Climate Change** recommended a **reduction range of 90-95%,** but the **final 2040 proposal** adheres to the lower end of this spectrum.

Heavy faith in carbon capture & CO2 removal:

- The **EU's 2040 climate proposal** relies heavily on **carbon capture,** expecting **carbon removals to reach 400 tonnes** of **CO2 by 2040,** up from **310 tonnes of CO2 by 2030**.
- Without **carbon capture and removal technologies,** actual **emissions reduction** would be around **84%** by **2040,** per **Climate Action Tracker.**
- The proposal envisions **decarbonizing the energy sector** shortly after **2040**, utilizing **renewables, nuclear, hydrogen**, and **carbon capture and removal technologies,** with significant reliance on unproven carbon capture methods.

- About **40%** of the **carbon capture target** is expected from **direct air capture,** which is costly.
- The **2040** proposal accompanies other climate policies like the **Carbon Border Adjustment Mechanism (CBAM)** and the **Green Deal Industrial Plan,** aiming to support domestic green technology manufacturing.
- The **Net Zero Industry Act (NZIA)** promotes the **domestic production of green technologies** and may include provisions for **nuclear power**.

Key initiatives in news:

Fit for 55:

- Under this, the **European Commission** has asked all of its **27 member countries** to **cut emissions** by **55 per cent below 1990 levels by 2030**.

Global Stocktake:

- It refers to a proposed **five-year review** of the **impact of countries' climate change actions.**
- Under the **Paris Agreement,** every country must present a **climate action plan** in **five-year cycles.** The **first global stocktake** was scheduled for **2023** under the **Paris Agreement**.
- It will **assess** whether the net result of the **climate actions** being taken was consistent to keep the **increase in global average temperature** from **pre-industrial times** to **within 2 degrees Celsius**.
- It also recognises that money needs to be made available for **Loss and Damage** and **energy transition** in **developing countries**.

Climate Action Tracker:

- An independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C."
- A collaboration of two organizations, Climate Analytics and New Climate Institute, the CAT has been providing this independent analysis to policymakers since 2009.
- **Net Zero Industry Act (NZIA):** The **European Commission** proposed the NZIA on 16 March 2023.
- **NZIA** will help strengthen the **European manufacturing capacity** of **net-zero technologies** and overcome barriers to scaling up the **manufacturing capacity** in
- The measures in the Regulation will increase the competitiveness of the net-zero technology industrial base and improve the EU's energy resilience.

- This proposal shows **Europe's commitment** to playing a leading role in the net-zero technology transition and helping to deliver on the **Fit-for-55** and **REPowerEU**

Carbon Border Adjustment Mechanism (CBAM):

- **CBAM** is part of the **"Fit for 55 in 2030 package",** which is the **EU**'s plan to **reduce greenhouse gas emissions** by **at least 55% by 2030** compared to **1990 levels** in line with the **European Climate Law**.
- The **CBAM** is a **policy tool aimed** at **reducing Carbon Emissions** by ensuring that imported goods are Important for the subject to the same carbon costs as products produced within the EU.

Implementation:

- The **CBAM** will be implemented by requiring importers to declare the quantity of goods imported into the **EU** and their embedded **Greenhouse Gas (GHG) emissions** on an annual basis.
- To offset these emissions, importers will need to surrender a corresponding number of CBAM certificates, the price of which will be based on the weekly average auction price of EU Emission Trading System (ETS) allowances in €/tonne of CO2 emitted.

Objectives:

- **CBAM** will ensure its **climate objectives** are **not** undermined by **carbon-intensive imports** and spur cleaner production in the rest of the world.

Topic 20. CLEAN WATER CRISIS: NITROGEN POLLUTION TO TRIPLE SCARCITY IN RIVER SUB-BASINS WORLDWIDE

Important for the subject: Environment

The **growing crisis of water scarcity is** worsened by **declining water quality across various regions,** with a particular focus on **nitrogen pollution** in **rivers.**

Clean Water Scarcity: Study findings

- This issue, **first recognized in 2010,** is projected to continue until **2050**, significantly impacting global water scarcity by potentially **tripling** the number of **sub-basins** affected.
- A study published in **Nature Communications** introduces **"clean-water scarcity"** as a concept that **assesses water scarcity** by considering both **quantity** and **quality.**
- It predicts that an additional **40 million square kilometres of river basin area** and **three billion people** could **face water scarcity** by **2050**, a situation far **grimmer** than previously estimated.
- This **assessment** highlights the role of **nitrogen pollution** in **exacerbating water**

scarcity, affecting **2,000 sub-basins worldwide**.

- In **2010,** while **984 sub-basins** were identified as **water-scarce based on quantity**, the inclusion of water quality issues raised this number to **2,517**, expected to **grow to 3,061 by 2050** in a **worst-case scenario.**
- The study also notes a **dramatic increase in the global population living in areas of severe water scarcity** when quality is considered, jumping from **45%** to **80%**.
- **Future hotspots for clean-water scarcity** include **China, India, Europe, North America,** and **potentially Central Africa,** each facing unique challenges.
- The study indicates that **nitrogen pollution** from **human waste, agriculture,** and **fertilizers is significant,** with **sewage** expected to become the dominant source due to urbanization and inadequate **wastewater treatment**.
- This trend is particularly noted in **India** and **Africa**, where **sewage** is projected to surpass **agriculture** as the **primary pollution source** in the **worst-case scenario**.
- The **urgency of integrating water quality** considerations into **water management policies** is underscored, with references to **India's deviation from Sustainable Development Goals,** particularly in **clean water and sanitation.**
- The report calls for proactive measures to address **water quality** and **pollution**, highlighting the critical need to manage **nitrogen pollution** as part of mitigation strategies to combat the escalating issue of water scarcity.

Impact of Nitrogen Pollution:

- During precipitation, surplus nitrogen oxide compounds and sulfate oxides mix with oxygen molecules and other atmospheric components to produce acid rain.
- Nitrogen pollution often results in Eutrophication – the abnormal growth of algae on water bodies.
- Deterioration of soil microbes and acidification.
- It intensifies the greenhouse effect.
- Leads to photochemical smog.

Steps taken to control Nitrogen Pollution:

- **Mandatory neem-coated urea production:** Nitrogen is used most effectively when it is released from urea that has been coated with neem because it takes longer for plants to absorb.
- **Soil Health Card:** It informs farmers about the nutritional state of their soil and offers suggestions for the right amount of nutrients to add to improve soil health and fertility. It has caused the consumption of nitrogen in agriculture to decline.

- **Bharat Stage Norms:** It aims to regulate the harmful emissions from vehicles, like carbon monoxide (CO), unburnt hydrocarbons (HC), Nitrogen Oxides (NOx), and Particulate matter (PM).
- **The National Air Quality Index (NAQI)** has been put into place, and nitrogen dioxide is one of the eight pollutants whose emission needs to be managed and tracked.

International Initiatives:

- **Gothenburg Protocol:** It **aims** to **Abate Acidification, Eutrophication, and Ground-level Ozone** and is a part of the **Convention on Long-Range Transboundary Air Pollution.**
- To control and reduce emissions of **sulfur dioxide (SO2), nitrogen oxides (NOx), ammonia (NH4), volatile organic compounds (VOCs),** and **Particulate Matter (PM)** that are caused by human activities.
- **International Nitrogen Initiative (INI):** The goal of this global initiative is to **maximize nitrogen's advantageous contribution to the production of sustainable food.**
- It was established in **2003** with support from the **International Geosphere-Biosphere Program (IGBP)** and the **Scientific Committee on Problems of the Environment (SCOPE)**. The **Indian government** is also involved in this project.
- **Colombo Declaration on Sustainable Nitrogen Management:** The declaration aims to halve nitrogen waste by

Topic 21. MORE WILD WATER BUFFALOES IN CENTRAL INDIA TO FIX POPULATION DECLINE AND ECOLOGICAL DEGRADATION

Important for the subject: Environment

A **recent study** focuses on the **revival possibilities of the wild water buffalo,** proposing a **strategic reintroduction plan** in the **Kanha Tiger Reserve, Madhya Pradesh**.

- While the **northeastern population of the species is relatively stable**, the **central Indian cluster has alarmingly reduced to 30-35 individuals,** with the **Udanti-Sitanadi National Park** in **Chhattisgarh** witnessing a **drastic decline** to **only six bulls** and **no cows**.
- Despite the **Supreme Court of India's 2012 directive** to **Chhattisgarh** for **population revival measures,** successful breeding efforts have been scarce.
- **Kanha Tiger Reserve**, with its 390 sq. km of suitable **low-lying grasslands** and **minimal human interference,** has been identified as an **ideal site for reintroduction.**

Reintroduction of buffaloes as a nature-based solution to grassland degradation:

- Reintroducing **wildwater buffaloes** to **Central India's grasslands** is seen as a **beneficial**

nature-based solution for **combating grassland degradation**.

- These **megaherbivores** play a **significant role** in **maintaining ecological balance** within **open grass ecosystems**.
- Unlike **small ungulates** that are **selective feeders, wild water buffaloes** graze on a wider variety of plants, promoting a **natural succession mechanism** that ensures a **balanced consumption and regeneration of different species**.
- The **grassland ecosystems** play a crucial role against **fire** and **megaherbivores** are **key regulators.**
- The absence of these regulators can lead to the **dominance of grasses with stronger defence mechanisms,** requiring **intensive human management to sustain ecological balance.**

Ensuring genetic purity and managing predator pressure:

- The **decline of the wild buffalo population** is attributed to **factors** such as **domestication, habitat loss, disease transmission from livestock, competition,** and **historical hunting**.
- These challenges, coupled with the **species' slow reproductive rates**, have led to a situation described as **"extinction debt,"** indicating a **heightened risk of future extinction due to past adversities**.
- This **reintroduction effort aims to serve as a nature-based solution to ecological challenges** and **prevent the extinction of a key species in grassland ecosystems,** despite the uncertainties and potential hurdles involved.

Wild Water Buffaloes:

- The **wild water buffalo (Bubalus arnee), Chhattisgarh's state animal** and classified as **endangered** on the **IUCN Red List**, is on the **brink of global extinction**, with **less than 4,000 individuals** remaining in the wild.
- **India** hosts about **90%** of these animals, primarily in **two isolated clusters** in the **northeast** and **central parts of the country,** highlighting **India's critical role** in the **species' conservation efforts.**
- Also known as **Asiatic water buffaloes**, they are **large bovine animals that are native to the Indian subcontinent** and **Southeast Asia.** They are **one of the two species of buffalo that exist,** the other being the **domesticated water buffalo**.
- They **prefer swampy and marshy habitats**, such as grasslands, reed beds, and forests, near rivers, lakes, and other water bodies.
- They are typically found in areas with **warm and humid climates**, including India, Nepal, Bhutan, Bangladesh, and Southeast Asia. In India, wild water buffaloes are **found**

in the northeastern states of Assam, Arunachal Pradesh, and Meghalaya.

- They are **excellent swimmers and can move easily through water**. They are mostly active at dawn and dusk and spend most of their day resting and feeding.
- They are **herbivores** and primarily feed on grasses, aquatic plants, and other vegetation. Wild water buffaloes are also known to wallow in mud and water, which helps them regulate their body temperature and avoid parasites.
- **Threats**: They are threatened by h**abitat loss and fragmentation due to human activities**, such as agriculture, infrastructure development, and logging.
- They are also at **risk of poaching** for their meat, horns, and other body parts. In addition, they are **vulnerable to diseases**, such as bovine tuberculosis and foot-and-mouth disease, which can be **transmitted by domestic cattle**.

Kanha Tiger Reserve:

- **Location:** It stretches over an area of 940 square km in the two districts – Mandla and Balaghat – of Madhya Pradesh.
- **History:** The present-day Kanha area was divided into two sanctuaries, Hallon and Banjar. Kanha National Park was created in 1955 and in 1973 was made the Kanha Tiger Reserve.

Kanha National Park is the largest National Park in Central India.

Features:

Fauna:

- The State animal of Madhya Pradesh – Hard Ground Barasingha (Swamp deer or Rucervus duvaucelii) is found exclusively in Kanha Tiger Reserve.
- Other Species found include Tiger, Leopard, Dhole, Bear, Gaur and Indian Python etc.

Flora:

- It is best known for its evergreen Sal forests (Shorea Robusta).
- It is the first tiger reserve in India to officially introduce a mascot, "Bhoorsingh the Barasingha".

Topic 22. POLLINATOR-PLANT INTERACTIONS DISRUPTED BY NITRATE RADICALS

Important for the subject: Environment

Air pollutants reduce nocturnal hawkmoth pollination of evening **primrose flowers** by **altering** the **flowers' appealing scents**, as per a study.

- The findings illustrate the **impact of anthropogenic airborne pollutants** on an **animal's olfactory ability** and suggest that **such pollutants may limit global pollination**.
- The study reveals that **air pollutants,** specifically **oxidants** like **ozone (O3)** and **nitrate radicals (NO3).**
- Significantly **impact** the **nocturnal hawkmoth pollination** of evening **primrose flowers** in **Washington state** by **altering the flowers' scents**.
- This alteration **hinders** the **hawkmoths' ability to locate the flowers,** as these pollutants **degrade the scent compounds essential for pollination**.
- **NO3,** particularly prevalent at **night** in **polluted areas,** was found to be **more reactive than O3,** targeting and oxidizing specific **monoterpenes** vital for **hawkmoth** recognition of the flowers.
- The oxidation of these scents led to a **70% reduction** in **hawkmoth visitation,** potentially decreasing plant fruiting and overall fitness.
- Human activities have altered the environment. **Airborne pollutants**, such as **oxidants** like **ozone** and **nitrate radicals,** are known to **degrade the chemical compounds** that produce **floral scents**.

Topic 23. WHAT ARE THE CHANGES IN THE NEW WATER ACT?

Important for the subject: Environment

The Lok Sabha passed the **Water (Prevention and Control of Pollution) Amendment Act, 2024** to replace the Water (Prevention and Control of Pollution) Act, of 1974.

What is the Water (Prevention and Control of Pollution) Act of 1974?

- The **Water (Prevention and Control of Pollution) Act of 1974** was **India's first legislation** aimed at addressing **water contamination,** establishing an **institutional framework** through the **creation** of the **Central Pollution Control Board (CPCB)** and **State Pollution Control Boards (SPCB)** in **September 1974**.
- These boards are tasked with **monitoring** and **preventing** the **contamination of public water resources** by **sewage** and **industrial effluents.**
- The **Act** requires **industrial units to obtain permission** from **state boards** before setting up **factories** and to **comply with specific environmental norms**.
- The **CPCB's role** includes **collecting** and **disseminating data** on **water pollution** and setting **technical standards,** while the **SPCB** enforces compliance, with penalties for violations including factory shutdowns, monetary fines, and imprisonment of up to six years.
- However, there have been **no recorded instances of imprisonment for environmental**

violations in India.

Amendments to the act:

- The **amendments** to the **Water (Prevention and Control of Pollution) Act, 1974,** reflect **significant changes** to **enhance water management** and **pollution control** in **India.**
- Since **water is a state Important for the subject,** the **central government's legislative power** is **limited** unless **requested by two or more states.**
- The recent amendments, applicable to **Himachal Pradesh, Rajasthan,** and **Union territories** (while the original Act applies to **25 states**), notably **replace imprisonment for "minor" violations with fines** ranging from **₹10,000** to **₹15 lakh**.
- The amendments also **increase the central government's authority,** allowing it to **override State Pollution Control Boards (SPCBs)** in specific scenarios.
- Unlike the **original Act**, which **mandates SPCB consent for establishing any industry or treatment plant** that could discharge sewage.
- **The amendments permit the central government, in consultation with the Central Pollution Control Board (CPCB),** to **exempt certain categories of industrial plants** from this requirement.
- However, **operating** or **establishing** an **industrial unit without SPCB consent** remains a **serious offense,** potentially resulting in **six years of imprisonment and a fine.**
- The amendments also **empower** the **central government** to **issue guidelines** regarding the **grant, refusal,** or **cancellation** of **SPCB consents,** maintaining the **penalty** for **unauthorized industry operation** and **introducing fines for tampering with monitoring devices.**
- Additionally, the **central government** gains the **authority** to **frame rules** for selecting **SPCB chairpersons** and **issue guidelines** for **consent-related procedures by state boards**.

Topic 24. BRUMATION: WINTER IS COMING FOR REPTILES

Important for the subject: Environment

An alligator observed lying still underwater with only its snout visible may not necessarily be dead; it could be undergoing brumation.

What is brumation?

- **Brumation** is a **period of dormancy in reptiles,** akin to **hibernation in mammals**, that **occurs during colder months** when **temperatures fall and food is scarce**.
- This state **allows reptiles to conserve energy** by **significantly slowing their**

metabolism, enabling them to **survive without food for extended periods.**

- During **brumation, reptiles** often **retreat to places** like **underground burrows or rock crevices** where **temperatures** are **more stable**.
- This behaviour has been noted in various **reptilian species,** including **box and painted turtles, snakes,** and **lizards.**
- Which find **refuge** in environments ranging from mud at the bottom of bodies of water to underground dens or caves.
- **Brumation** is **essential for reptiles to weather cold temperatures and scarce food conditions**, allowing them to **conserve resources** until the **return of warmer, more favourable conditions for feeding and reproduction**.

Topic 25. IS THE GREAT INDIAN BUSTARD ON THE VERGE OF LOCAL EXTINCTION?

Important for the subject: Environment

The **Great Indian Bustard (GIB)**, a **critically endangered bird** with a **global population of fewer than 140 individuals**, faces the **threat of local extinction** in the **Rollapadu Wildlife Sanctuary** in **Nandyal district** of **Andhra Pradesh**, as it has not been spotted in the area for the last couple of years.

- The majority of the remaining wild population of **GIBs**, about **120**, is found in the **arid grasslands of Thar in Rajasthan,** specifically within the **Desert National Park** and the **Pokhran Field Firing Range.**
- In **2018**, a **conservation breeding program** was initiated through a collaboration between the **Ministry of Environment, Forests and Climate Change (MoEFCC),**
- **The Rajasthan Forest Department,** and **the Wildlife Institute of India (WII)**, with the **International Fund for Houbara Conservation (IFHC)** in **Abu Dhabi** serving as a technical partner due to their success in breeding other bustard species.
- The **GIBs' low reproduction rate,** characterized by **laying only a few eggs** and **requiring nearly a year of parental care for chicks,** poses a significant challenge to their conservation.
- The breeding program, which started in **2019,** involves **collecting eggs from the wild and artificially hatching them** at the **Sam Forest Chowki** in **Rajasthan,**
- Repurposed as a conservation breeding centre to support the survival and growth of the GIB population.

About Rollapadu Wildlife Sanctuary:

- It is located in the **Nandyal district** of **Andhra Pradesh.**

- It lies between the **Nallamalai** and **Yerramalai hill ranges** of the **Eastern Ghats.**
- It was declared a sanctuary in 1988 to protect the dwindling populations of the critically endangered Great Indian Bustard.
- It is the **only GIB Sanctuary** in **Andhra Pradesh.**
- It owes its genesis to the discovery of the **endangered Great Indian Bustard (GIB)**.
- **Flora:** About **32 species** of **grasses** like **Aristida funiculata, Chrysopogon fulvus, Heteropogoncontortus**, **Cassia fistula** (Golden shower tree), B**utea monosperma (Flame of the forest), Acacia spp, Ziziphus mauritiana,** etc.

Fauna:

- The **grassland Sanctuary** is rich in **invertebrate fauna** particularly the **insects** that form a major part of the diet of most of the birds.
- Land monitor lizards, Geckos, Skinks, Saw-scaled viper; etc. So far about 6 species of amphibians have been recorded here.
- There are about **124 bird species** like the **Lesser florican, Demoiselle crane, Black stork, White stork, Harriers,** etc;
- These plains are also a home to **endangered mammals** like the **Golden jackal, Indian wolf, Black buck, Chinkara**; etc.

Topic 26. MIGRATORY SPECIES FACING PERIL GLOBALLY SHOW THE REPORT, AS CMS COP14 BEGINS IN SAMARKAND

Important for the subject: Environment

A report released at the **14th Conference of Parties (COP14)** to the **Convention on the Conservation of Migratory Species (CMS) of Wild Animals** in **Samarkand, Uzbekistan**, on February 12, **2024,** highlights the **dire situation** facing millions of **migratory animal species** due to **human-induced pressures**.

- The **State of the World's Migratory Species report** points out that **aquatic ecosystems suffer the most,** with **97%** of **migratory fish** listed under **CMS at risk of extinction,** experiencing **significant declines** in abundance over the past 50 years.
- Additionally, **28 fish species** are classified as **'Critically Endangered'** according to the **IUCN's Red List.**
- The **CMS** finds that **44%** of its **listed species** are seeing **population declines,** with **one in five at risk of extinction**.
- A staggering **82%** of **Appendix I species** are **threatened with extinction** and **76%** show **declining population trends**.

- Similarly, **18%** of **Appendix II species** are **threatened**, with almost **42%** displaying **declining population trends.**
- The report bases its findings on data from the **IUCN Red List assessment** and the **Living Planet Index**,
- Revealing that out of **4,508 migratory species** assessed globally and occurring in multiple range states, **74%** are **not currently listed** in the **CMS appendices**.
- Of these **non-CMS species, 8%** are considered **'Globally Threatened,'** and **4%** are **'Near Threatened.**

What are the causes?

- The **extensive threats** faced by **migratory species** due to **overexploitation, habitat loss,** and **other anthropogenic pressures.**
- **Key findings** include that **89% of Appendix I species** are affected by **overexploitation,** while **86% suffer from habitat loss, degradation,** and **fragmentation**.
- Similar pressures impact **Appendix II species**, albeit at slightly lower percentages.
- **Significant threats identified** include **bycatch,** particularly for **seabirds** like **albatrosses** and **petrels, Illegal killing,** and **overfishing**.
- **Habitat encroachment** from **agriculture, infrastructure development,** and **pollution** from **various sources** are also **major concerns,** affecting **ecosystems** and **migratory paths** across the globe.
- The report highlights the adverse effects of **noise, light, plastic,** and **chemical pollution** on various species, including **birds** and **marine animals**.

Convention on the Conservation of Migratory Species of Wild Animals

- Also known as the **Convention on Migratory Species (CMS)** or the **Bonn Convention**, is an international agreement that aims to conserve migratory species throughout their ranges.
- The Agreement was signed under the auspices of the **United Nations Environment Programme** and is concerned with conservation of wildlife and habitats on a global scale.
- Signed in 1979 in Bonn, West Germany, the Convention entered into force in 1983. As of September 2020, there are **131 Member States** to the Convention. The depositary is the Government of the Federal Republic of Germany.
- The CMS is the **only global, and United Nations-based, intergovernmental organization** established exclusively for the conservation and management of terrestrial, aquatic and avian migratory species.

- Under this convention, **migratory species threatened with extinction** are listed on **Appendix I** and Parties strive towards strictly protecting these animals, conserving or restoring the places where they live.
- Mitigating obstacles to migration and controlling other factors that might endanger them.
- Migratory species that need conservation and management or would **significantly benefit from international co-operation** are listed in **Appendix II** of the Convention.

Topic 27. CUTTING LIANAS CAN BOOST CARBON SEQUESTRATION IN FORESTS, FINDS STUDY

Important for the subject: Environment

A **study** published in **2023** has shed light on the **carbon sequestration** and **timber production benefits** of **removing lianas, long-stemmed woody vines,** from **trees** in **managed forests.**

- **Lianas,** which can **significantly hinder tree growth** by **smothering** them as they **climb to the forest canopy,** are **more prevalent in areas disturbed by activities** such as **logging** and **natural events** like **wildfires**.
- The study suggests that **removing lianas** from just **five trees per hectare** across **250 million hectares** of **degraded managed land** could **eliminate 800 million tons of CO2 from the atmosphere over 30 years,** at a **minimal cost of $1.50 per hectare**.
- This **method**, emphasizing **selective liana removal** rather than a blanket approach, **aims** to **enhance the growth of targeted trees for timber** and **carbon benefits** while **maintaining the ecological balance**.
- **The Nature Conservancy (TNC)** is conducting trials, including one in the **Belize Maya Forest,**
- To determine the **most effective methods of liana removal** and its **impact on tree species, forest connectivity,** and **biodiversity.**
- The trials also explore the potential of **lianas** for **carbon storage** versus the **additional growth of trees without lianas.**

Probable impact of removing liana:

- Despite the **potential benefits**, concerns about the **impact on biodiversity** and the **ecological role of lianas,**
- Which provide **food, medicine,** and **habitat connectivity** for various species, highlight the need for a **balanced approach to liana cutting**.
- Trials in **Gabon** and **Indonesia** are **exploring liana cutting** alongside technologies like **LiDAR** and **reduced impact logging systems** to enhance both **carbon**

sequestration and **sustainable timber production.**

- The **initiative** underscores the **possibility of harmonizing conservation efforts** with **timber production,**
- Suggesting that **liana cutting** could be a **key strategy in managed forests to improve tree growth, carbon capture,** and **timber quality** while supporting **local economies and biodiversity**.

Liana trees:

- A **liana** is a **long-stemmed, woody vine** that is **rooted** in the **soil** at **ground level** and **uses trees,** as well as other means of **vertical support,** to **climb up to the canopy** in search of **direct sunlight**.
- The word liana does not refer to a taxonomic grouping, but rather a **habit of plant growth – much like tree or shrub**.

Topic 28. GUPTESWAR FOREST IN ODISHA DECLARED AS BIO-DIVERSITY HERITAGE SITE

Important for the subject: Environment

The pristine **Gupteswar Forest,** adjacent to **Gupteswar Shiva temple** in **Odisha's Koraput district** has been declared as the **fourth Biodiversity-Heritage Site (BHS) of the state**.

- The state has now **four BHSs.** The other **three** are **Mandasaru BHS** in **Kandhamala district, Mahendragiri BHS** in **Gajpati district,** and **Gandhamardan BHS** in **Bargarh and Bolangir districts**.

About the Gupteswar forests:

- The site is spread over **350 hectares of demarcated area.** Along with its sacred grooves traditionally worshipped by the local community, the site is bestowed with a wide range of flora and fauna.
- **Biodiversity in the forest:** there is the presence of at least 608 faunal species including 28 species of mammals, 188 species of birds, 18 species of amphibia, 48 species of reptiles,
- 45 species of Pisces, 141 species of butterflies, 43 species of moths, 41 species of odonates, 30 species of spiders, six species of scorpion, and 20 species of lower invertebrates.
- **Threatened medicinal plants** like Indian trumpet tree, Indian snakeroot, Cumbi gum tree, Garlic pear tree, Chinese fever vine, Rohituka tree, Jodpakli, Indian jointfir, a number of wild crop relatives of ginger and turmeric are found there.
- **Fauna:** mugger crocodile, kanger valley rock gecko, sacred Grove Bush Frog, and

avifauna like black baza, Jerdon's baza, Malaber trogon, common hill myna, white-bellied woodpecker, and banded bay cuckoo.

- The **limestone caves of Gupteswar** are adorned with **eight species of bats** out of the **total 16 species** found in **southern Odisha.**
- Among them, **two species Hipposideros galeritus** and **Rhinolophus rouxii** are under the **near-threatened category** of the **International Union for Conservation of Nature**.

Biodiversity Heritage Sites (BHS):

- Such sites are **mentioned** in **Section 37** of the **Biodiversity Act 2002**.
- According to the Act, these areas are **areas that are unique, ecologically fragile ecosystems** which comprise any of:
- **"species richness, high endemism, presence of rare, endemic and threatened species, keystone species, species of evolutionary significance,**
- **Wild ancestors of domestic/cultivated species or landraces or their varieties, past pre-eminence of biological components represented by fossil beds and having cultural or aesthetic values."**
- The **state government** has the **power to declare** such a site within its jurisdiction. They need to **consult the local bodies** before doing so.
- They can also call for suggestions, or consider the sites that have already been suggested by the **Biodiversity Management Committees** and other such authorities.
- The **rules for the management and conservation of such sites** are made by the **state governments** themselves, in **consultation with the Union Government**.
- The **state government** can also frame the schemes to compensate or rehabilitate the people who get economically affected, and/or displaced due to any such declaration of a bio-heritage site.
- As of January 2024, **India has 44 such sites.**

Topic 29. FROM RESTORING FORESTS TO RIVER BASINS, SEVEN CONSERVATION INITIATIVES ACROSS CONTINENTS RECOGNISED BY UN

Important for the subject: Environment

The **United Nations** has named **seven initiatives** from **Africa, Latin America, the Mediterranean,** and **Southeast Asia** as **World Restoration Flagships.**

- These projects **aim** to **revive and preserve ecosystems on the brink of degradation due to wildfires, drought, deforestation,** and **pollution.**
- The **initiatives** are expected to **restore approximately 40 million hectares** and **create about 500,000 jobs.**

- Awarded by the **UNEP** and **FAO**, these initiatives will receive **technical** and **financial support** from the **UN.**
- The announcement was made ahead of the **6th session** of the **UN Environment Assembly,** scheduled for February 26-March 1, 2024, at the UNEP headquarters in **Nairobi, Kenya.**
- **Part of the UN Decade on Ecosystem Restoration:** These awards are part of a broader campaign led by **UNEP** and **FAO** to **prevent, halt, and reverse ecosystem degradation globally.**
- The initiatives support global commitments to restore one billion hectares, an area larger than China.

The seven projects are:

Project	Description
The Restoring Mediterranean Forests Initiative	• It involves **Lebanon, Morocco, Tunisia,** and **Türkiye,** adopting an **innovative approach** to **protect and restore natural habitats and vulnerable ecosystems**. • It has successfully led to the **restoration** of approximately **two million hectares of forests**.
The Living Indus initiative	• Launched in response to the **2022 climate change-induced floods in Pakistan, aims** to **restore 25 million hectares** of the **Indus River basin by 2030,** covering **30%** of **Pakistan's surface area**. • Officially launched at the **27th Conference of Parties to the UN Framework Convention on Climate Change in Sharm el-Sheikh,** the initiative includes **25 high-impact interventions** targeting policymakers, practitioners, and civil society. • It recognizes the **Indus River** as a living entity with rights, a concept used to protect rivers globally. • The **initiative** involves international collaboration with countries including **Australia, Bangladesh, Bolivia, Brazil, Canada, Ecuador, India, New Zealand, Peru,** and **Sri Lanka.**

The Acción Andina initiative	• Spearheaded by the **Peruvian conservation non-profit ECOAN**, is dedicated to **protecting and restoring one million hectares of forest** in the **Andes.** • Engaging around **25,000 people** from remote **Andean communities,** the movement **aims** to **restore 5,000 hectares** and **protect over 11,000 hectares** of **Andean forests.** • By **2030,** participants are expected to benefit in various ways, including **access to medicine, solar panels, clean-burning clay stoves, improved grazing management.** • **Sustainable agriculture, microbusiness,** and **ecotourism management of Indigenous cultures**. • Additionally, the initiative focuses on **securing land titles for local communities** to safeguard the forests against mining, timber exploitation, and other degradation drivers, as highlighted by UN agencies.
The Sri Lanka Mangrove Regeneration initiative	• It is a collaborative, science-driven effort led by local communities aimed at restoring the natural balance of ecosystems. • Since its inception in 2015, the program has successfully restored 500 hectares of mangroves. • Looking ahead, there are plans to restore an additional 10,000 hectares by 2030, which is expected to benefit 5,000 households and create over 4,000 new jobs, as outlined in a UN statement.

The Terai Arc Landscape initiative	• Focuses on **restoring the forests within critical corridors** of the **Terai Arc Landscape** through collaboration with **local communities.** • **Citizen scientists, community-based anti-poaching units,** and **forest guards.** • According to the **UN**, this initiative has led to the restoration of **66,800 hectares** of **Nepal's forests,** improving the **livelihoods of approximately 500,000 households**. • Additionally, the initiative has played a significant role in supporting the **tiger population** in the landscape shared by **India** and **Nepal.** • Which has increased to 1,174, more than doubling from its lowest count since the program's inception in 2001. • The efforts are set to continue, with plans to restore almost 350,000 hectares by 2030.
The Regreening Africa initiative	• It **aims** to significantly impact over **600,000 households** by enhancing **carbon storage, increasing crop and grass yields,** • **improving soil resilience to prevent floods,** and **naturally enriching the soil with fixed nitrogen,** acting as a **natural fertiliser.**
The Growing Forests in Africa's Drylands initiative	• It seeks to **increase** the area of **restored hectares from 41,000 today to 229,000 by 2030**. • African farmers play a crucial role in this project, planting tens of millions of trees annually. • Additionally, the **initiative aims** to support further development through the creation of **230,000 jobs,** as highlighted by the **intergovernmental bodies**.

Topic 30. ON THE RIGHTS OF FOREST-DWELLERS

Important for the subject: Environment

The notification of the **Thanthai Periyar Sanctuary** in Erode district of Tamil Nadu triggered concerns among forest-dwellers around it.

- They expressed fear that this may lead to their rights under the **Scheduled Tribes and**

Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA) being denied.

- The Thanthai Periyar Sanctuary is **located between the Sathyamangalam Tiger Reserve of Tamil Nadu, the Male Mahadeshwara Wildlife Sanctuary and the Cauvery Wildlife Sanctuary of Karnataka.**
- Six tribal forest villages were denied basic rights and facilities because these are not revenue villages and have been excluded from the sanctuary.

About Forest Rights Act, 2006:

- The Forest Rights Act (FRA), 2006 recognizes the rights of the **forest dwelling tribal communities and other traditional forest dwellers to forest resources,**
- **on which these communities were dependent for a variety of needs, including livelihood, habitation and other socio-cultural needs.**

Objectives:

- To undo the **historical injustice** occurred to the forest dwelling communities.
- To **ensure land tenure, livelihood and food security of the forest dwelling Scheduled Tribes and other traditional forest dwellers.**
- To **strengthen the conservation regime** of the forests by including the responsibilities and authority of Forest Rights holders for sustainable use, conservation of biodiversity and maintenance of ecological balance.

What Rights Do Forest Dwellers Get Under the Act?

- The Forest Rights Act, 2006 recognises three types of Rights:

Land Rights:

- The Act gives the forest dwellers the right to ownership to land farmed by them, Important for the subject to a **maximum of 4 hectares per family.**
- Ownership is only for land that is actually being cultivated by the concerned family and no new lands can be granted.
- The land cannot be sold or transferred to anyone except by inheritance.

Use Rights:

- The rights of the dwellers extend to extracting **Minor Forest Produce** (such as tendu patta, herbs, medicinal plants etc.), grazing areas, to pastoralist routes, etc.
- Minor forest produce **does not include timber.**

Right to Protect and Conserve:

- The Act gives the forest dwelling communities the right to protect and manage the forest.

- This is vital for the thousands of village communities who are protecting their forests and wildlife against threats from forest mafias, industries and land grabbers.

Who Can Claim These Rights?

- Members or community of the Scheduled Tribes who primarily reside in and who depend on the forests or forest lands for bonafide livelihood needs.
- It can also be claimed by any member or community who has **for at least three generations (75 years) prior to 13th December, 2005** primarily resided in forests land for bona fide livelihood needs.

How Are These Rights Recognised?

- **Section 6 of the Forest Rights Act, 2006** provides a transparent three step procedure for deciding on who gets rights:
- **Step-1:** Gram Sabha makes a recommendation – i.e. who has been cultivating land for how long, which minor forest produce to be collected, etc.
- **Step-2**: The Gram Sabha's recommendation goes through two stages of screening committees at the Taluka and District levels.
- **Step-3**: The District Level Committee makes the final decision. The committees have six members – three government officers and three elected persons.

About Gram Sabha:

- Gram Sabha is a body consisting of all persons whose names are included in the electoral rolls for the Panchayat at the village level.
- The term is defined in the Constitution of India under Article 243(b).

What Are the Rights in the Thanthai Periyar Sanctuary?

- As per the new notification, cattle-grazers can no longer graze in the Thanthai Periyar Sanctuary.
- Bargur cattle, a traditional breed native to the Bargur forest hills, may now be prevented from accessing their traditional grazing grounds.
- In March 2022, the Madras High Court revised an older order imposing a total ban on cattle grazing in all the forests of Tamil Nadu and restricted the ban to national parks, sanctuaries, and tiger reserves.
- Tamil Nadu is the only State in the country where there is such a ban.
- This order is despite the FRA, which recognised "grazing (both settled or transhumant) and traditional seasonal resource access of nomadic or pastoralist communities" in all forests.

Topic 31. MSP GUARANTEE ACROSS CROPS CAN RAISE INCOME AND DEMAND

Important for the subject: Environment

CRISIL Market Intelligence & Analytics has said that **Guaranteeing a Minimum Support Price (MSP) across crops** would **support farm incomes** and spur **consumption demand,** estimating the **"real cost"** of such a guarantee at around **₹21,000 crore,** based on **Marketing Year (MY) 2023 trends**.

- **MSP-based procurement** is done in **only a few States.**
- **CRISIL's analysis** focused on **16 of the 23 crops for whom MSPs are announced,** which **account for over 90% of India's farm output**.
- In **Kharif 2022** and **rabi 2023**, just **9%** of **mustard production** was procured, and **3%** of **five other crops**.
- In this milieu, **guaranteeing MSP for all crops** can lead to farmers moving to crops other than paddy and wheat.

Minimum Support Price (MSP):

- **MSP** is the **guaranteed amount paid to farmers** when the **government buys their produce.**
- **MSP** is based on the **recommendations** of the **Commission for Agricultural Costs and Prices (CACP),** which considers various factors such as **cost of production, demand and supply, market price trends, inter-crop price parity,** etc.
- **CACP** is an **attached office** of the **Ministry of Agriculture and Farmers Welfare.** It came into existence in January **1965.**
- The **Cabinet Committee on Economic Affairs (CCEA)** chaired by the **Prime Minister**

of India takes the **final decision (approve) on the level of MSPs.**

- The **MSP** is **aimed** at ensuring **remunerative prices** to growers for their produce and encouraging **Crop Diversification.**

Crops Under MSP:

- The **CACP** recommends **MSPs** for **22 mandated crops** and **fair and remunerative price (FRP) for sugarcane.**
- The **mandated crops** include **14 crops of the kharif season, 6 rabi crops** and **2 other commercial crops.**

Three Kinds of Production Cost:

- The **CACP** projects **three kinds of production costs for every crop,** both at **state** and **all-India average levels.**
- **'A2':** Covers all paid-out costs directly incurred by the farmer in cash and kind on seeds, fertilisers, pesticides, hired labour, leased-in land, fuel, irrigation, etc.
- **'A2+FL':** Includes A2 plus an imputed value of unpaid family labour.
- **'C2':** It is a more comprehensive cost that factors in rentals and interest for owned land and fixed capital assets, on top of **A2+FL.**
- **CACP** considers both **A2+FL** and **C2** costs while recommending **MSP.**
- **CACP** reckons **only A2+FL cost for return.**
- However, **C2** costs are used by **CACP** primarily as benchmark reference costs (opportunity costs) to see if the MSPs recommended by them at least cover these costs in some of the major producing States.

Need for MSP:

- The **twin droughts** of **2014** and **2015** forced the farmers to suffer from declining commodity prices since **2014.**
- The **twin shocks of Demonetisation** and the **Rollout of GST,** crippled the **rural economy,** primarily the **non-farm sector,** but also **agriculture.**
- The slowdown in the **economy** after **2016-17** followed by the pandemic further ensured that the situation remains precarious for the majority of the farmers.
- **Higher input prices** for **diesel, electricity** and **fertilisers** have only contributed to the misery.
- It ensures that farmers receive a **fair price** for their **crops**, which helps in reducing farm distress and poverty. This is particularly crucial in states where agriculture is a major source of livelihood.

Topic 32. SCIENTISTS SEEK MORE PROTECTIONS FOR 'LIVING FOSSIL'

Important for the subject: Environment

Environmental groups are advocating for **endangered species protection** for the **American horseshoe crab,** citing threats from **commercial exploitation, habitat loss, and climate change**.

- These **ancient marine arthropods, not true crabs** but **closer to spiders and scorpions,** have seen significant **population declines,** particularly in the **Delaware Bay,** once their **largest habitat**.
- Over fishing for biomedical use, where their **unique blue blood is harvested,** along with use as **bait,** has contributed to a sharp decrease in numbers.
- This decline also affects other species reliant on horseshoe crab eggs for food, such as the **Rufa red knot bird.**
- The petition to the **National Oceanic and Atmospheric Administration (NOAA)** seeks both protection under the **Endangered Species Act** and the **establishment of critical habitats for their preservation**.

About Horseshoe crabs:

- **Horseshoe crabs** are **ancient marine arthropods** that have been around for more than **450 million years**.
- They are **found** in **shallow waters** along the **Atlantic coast of North America** and in the **Gulf of Mexico** and are known for their **unique appearance,** with a **hard exoskeleton** and a **long, pointed tail.**
- The **crabs** are represented by **four extant species** in the world. Out of the four, two species are distributed along the **northeast coast of India.**
- **Only T gigas species** of the **horseshoe crab** is found along **Balasore coast of Odisha.**
- The crab was included in the **Schedule IV** of the **Wild (Life) Protection Act, 1972,** under which, the catching and killing of a **horseshoe crab** is an offence.
- **Horseshoe crabs** play an **important ecological role** as a **food source for migratory shorebirds and other animals,** and their eggs are an important food source for fish and other marine animals.
- **Horseshoe crabs** are also important to the **biomedical industry** because of their **blue blood,** which contains a substance called **Limulus amebocyte lysate (LAL)** that is **used to test for bacterial contamination** in **medical equipment and vaccines.**
- It is such an important animal that **all COVID-19 vaccines were tested against blood of Horseshoe crabs** to ascertain if the vaccine was free from any contamination.

Topic 33. COP14: DRAFT RESOLUTIONS ON THE ATLAS ON ANIMAL MIGRATORY SPECIES, AND MALTREATMENT OF SEABIRDS SUBMITTED

Important for the subject: Environment

At the **14th Conference of the Parties** to the **Convention on the Conservation of Migratory Species of Wild Animals (COP14)** held in **Samarkand, Uzbekistan,** draft decisions were submitted on the development of an **Atlas on Animal Migration**.

"Atlas on Animal Migration" initiative:

- This initiative is proposed by **the European Union (EU)**.
- It **aims** to document and understand the **migration patterns of migratory mammals** in **Central Asia** and **birds** in the **Eurasian-African region,** including the **impact of human activities like hunting**.
- The **atlas** is seen as a **crucial tool** for **conservation efforts,** assisting in identifying **key sites for migratory species** and **informing policy and management decisions** to **align with global biodiversity goals,** such as the **Kunming-Montreal Global Biodiversity Framework.**
- The draft decisions encourage parties to utilize the **atlas** in their **conservation strategies** and **direct** the Secretariat to **enhance and expand the atlas's modules for better accessibility and usability**.
- Additionally, the **COP14** addressed the issue of **seabird bycatch in fisheries,** particularly in the **southwest Atlantic Ocean,**
- Urging **measures to prevent harm** to these species and highlighting the **significant threat** posed by **overexploitation,** with millions of birds, including **albatrosses** and **petrels**, killed annually in fishing operations.

Topic 34. CAN'T TREAT SCS AS HOMOGENOUS GROUP, OBSERVES CJI-LED BENCH

Important for the subject: Polity

A seven-judge Constitution Bench, headed by Chief Justice of India D.Y. Chandrachud, observed that Scheduled Castes cannot be treated as a "homogenous group" for granting reservation as some may have advanced in society while other continue to remain "particularly underprivileged".

- The debate revealed that the Bench was exploring a diametrically opposite view from that held in a 2004 Constitution Bench judgment in the **E.V. Chinnaiah case.**
- In this verdict, 20 years ago, a five-judge Bench had held that Scheduled Castes were a

"**homogenous group"** and sub-classification would be a violation of the right to equality.

What are Caste and Sub-Caste?

- **Caste System in India**: It is a social hierarchy that has existed for centuries, traditionally dividing people into different groups based on their occupations and social roles.
- **Association with main categories:** Brahmins (priests and scholars), Kshatriyas (warriors and rulers), Vaishyas (merchants and farmers), Shudras (laborers and service providers), and the outcastes.
- **SubCastes**: There are numerous sub-castes and sub-groups within each of these main categories. These sub-castes often originated from regional, occupational, or social distinctions.

What is Sub categorisation of Caste?

- **Sub Categorisation of Caste:** It refers to further classifying broader caste groups into sub-groups based on various criteria.
- **Demand for Sub Categorisation of Caste:** Over time, some castes and communities have sought recognition and specific privileges based on their unique characteristics, historical backgrounds, or socio-economic status.
- **Sub-categorization attempts to address the diversity** within larger caste groups and provide targeted benefits to specific sub-groups that may be perceived as socially and economically disadvantaged.

Topic 35. PRADHAN MANTRI MATSYA KISAN SAMRIDHI SAH-YOJANA (PM-MKSSY)

Important for the subject: Polity

The Union Cabinet chaired by **Prime Minister Shri Narendra Modi** approved the **"Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY)", a Central Sector Sub-scheme** under the **Pradhan Mantri Matsya Sampada Yojna.**

- **PM-MKSSY is a Central Sector Sub-scheme under the Pradhan Mantri Matsya** Sampada for **formalization of the fisheries sector and supporting fisheries** micro and small enterprises.
- It comprises an investment of over **Rs. 6,000 crores over a period of next four (4) years from FY 2023-24 to FY 2026-27** in all States/Union Territories.

Aims and objectives of PM-MKSSY:

- **Gradual Formalization of the unorganized fisheries** sector through self registration of fishers, fish farmers and supportive workers under a National Fisheries Sector Digital Platform including creation of work based digital identities of fish workers for improved

service delivery.

- **Facilitating access to institutional financing fisheries sector micro and small enterprises.** Providing a **one-time incentive to beneficiaries for purchasing aquaculture insurance.**
- **Incentivizing fisheries and aquaculture microenterprises t**hrough performance grants for improving fisheries sector value-chain efficiencies including creation and maintenance of jobs.
- **Incentivising micro and small enterprises** through **performance grants for adoption and expansion of fish and fishery product safety** and quality assurance systems including creation and maintenance of jobs.

Expenditure involved

- **The Sub-scheme will be implemented as a Central Sector Sub-scheme under the Central Sector Component of the PMMSY at an estimated outlay of Rs.6,000 crore consisting of 50%.**
- i.e. **Rs.3,000 crore public finance including the World Bank and the AFD external financing**, and rest 50% i.e.Rs.3,000 crore being the anticipated investment from the beneficiaries/private sector leverage.
- It will be **implemented for 4 (four) years from FY 2023-24 to FY 2026-27** across all the States and UTs.

Intended Beneficiaries:

- **Fishers, Fish (Aquaculture) Farmers, Fish workers, Fish Vendors or such other persons directly engaged in fisheries value chain.**
- **Micro and Small enterprises in the form of Proprietary Firms, Partnership Firms and Companies registered in India, Societies, Limited Liability Partnerships (LLPs).**
- **Cooperatives, Federations, Village Level Organizations like Self Help Groups (SHGs), Fish Farmers Producer Organizations (FFPOs) and Startups** engaged in fisheries and aquaculture value chains.
- FFPOs also include **Farmers Producer Organizations (FPOs).** Any other beneficiaries that may be included by the **Department of Fisheries, GoI as targeted beneficiaries.**

Implementation strategy:

The Sub-scheme has the following major components:

Component 1-A:

Formalization of fisheries sector and facilitating access of fisheries microenterprises to Government of India programs for working capital financing:

- For this purpose, **a National Fisheries Digital Platform (NFDP)** will be created and all the stakeholders will be mobilized to register on it.
- They will be encouraged to do so through **providing financial incentives. The NFDP will serve multiple functions** including disbursement of financial incentives.

Component 1-B:

Facilitating adoption of aquaculture insurance:

- It is proposed to f**acilitate creation of appropriate insurance products and to cover at least 1 lakh** hectare of aquaculture farms during the project period to provide the scale of operation.
- Further, it is proposed to provide one time incentive to the willing farmers against purchase of insurance with a **farm size of 4 hectares of water spread area and less**.

Component 2:

Supporting microenterprises to improve fisheries sector value chain efficiencies:

- This component seeks to **improve value chain efficiencies in the fishery sector** through a system of performance grants with associated analytics and awareness campaigns.

Component 3:

Adoption and expansion of fish and fishery product safety and quality assurance systems:

- It is proposed to **incentivize fisheries micro and small enterprises to adopt safety and quality assurance systems in marketing of fish and fishery products** through provision of performance grants against a set of measurable parameters.
- **Performance Grant disbursement criteria for components 2 and 3 Number of jobs created and maintained**; including jobs created and maintained for women.
- For each job created and maintained for a woman an amount of Rs.**15,000 per year will be paid**.
- Similarly, for each job created and maintained for a man an amount of Rs.**10,000 per year will be paid, Important for the subject to the limit of 50% of total eligible grant.**

Component 4: Project management, monitoring and reporting:

- Under this component, it is proposed to set up P**roject Management Units (PMUs)** to manage, implement, monitor and evaluate project activities.

Topic 36. ENHANCING RETIREMENT AGE FOR JUDGES BASED ON PERFORMANCE NOT PRACTICAL IDEA: GOVT TELLS PARLIAMENT PANEL

Important for the subject: Polity

The government has told a **parliamentary panel that extending the retirement age** of Supreme Court and High Court judges based on their performance may not be practical.

- The government said that **Enhancing retirement age for judges will "further erode" the powers of Parliament and may also result in "undue favoritism".**
- The committee headed by **BJP's Sushil Kumar Modi had recommended** a system of appraisal which may be devised and put in place by the SC collegium, before any judge is recommended for enhancement of their tenure.
- The **Standing Committee on Law and Personnel, in its report on 'Judicial Processes and their Reforms',** had recommended a **performance appraisal system for extending the tenure of judges of the Supreme Court and high courts beyond the existing retirement age.**

Constitutional provisions:

- According to **constitutional provisions, at present, while Supreme Court judges retire at the age of 65 years, judges of the 25 high courts demit office at 62.**
- According to **Article 124(2) of the Constitution**, the age of retirement for **Supreme Court judges is 65.**
- As per **Article 217(1) of the Constitution**, **High Court judges retire at 62**.
- Initially, the retirement age of **High Court judges was 60, which was later in 1963 increased to 62 through the 114th constitutional amendment.**
- **Article 124(7) of the Constitution bars judges of the Supreme Court from practicing before any forum**
- For High Court judges, an amendment was brought in 1956 to allow practice before the Supreme Court and High Courts other than the one they served in under Article 220

Challenges relating to extension of retirement age:

- It will result in empowering the **SCC (Supreme Court Collegium) for the evaluation of the judges** at the time of giving extensions on individual basis.
- It will further erode the **powers of Parliament and empower (the) Judiciary** through the SCC to take decisions on the enhancement of age.
- The Department of Justice in the law ministry also said that this step may also result in **"undue favoritism" and make the judges "susceptible to pressures".**
- It would create an **avoidable burden on the limited manpower resources i**n the

Judiciary and the Executive, who are involved in the appointment process.

Committee Recommendations:

- In 1974, **the 58th report of the Law Commission recommended** bringing **parity between the age of retirement of judges of the High Court and Supreme Court.**
- In 2002, **Justice Venkatachaliah Report** – the report of the National Commission to review the working of the Constitution, **also recommended that the age of retirement should be increased for judges of High Courts and Supreme Court to 65 and 68, respectively.**

Topic 37. CAN PREAMBLE BE AMENDED KEEPING DATE INTACT, ASKS SC

Important for the subject: Polity

The Preamble was amended through the 42nd Constitutional amendment during the Emergency only once in December 1976 by the Indira Gandhi government to introduce the words **'socialist'** and 'secular', between 'sovereign' and 'democratic' making sovereign, socialist, secular, democratic and republic from original a 'sovereign, democratic republic' and, the phrase "unity of the nation" was replaced with "unity and integrity of the nation".

- The Bench was hearing a petition filed by BJP leader Subramanian Swamy to delete the words socialist and secular from the Preamble.
- Questions regarding dates statements: It was not that the Preamble could not have been amended", but could it have been done without changing the date:
- Advocate Vishnu Jain said the Preamble "did come with a date. Therefore, amending it without any debate" had been suspect.
- Dr. Swamy said the amendments were pushed through during the Emergency
- Advocate Sriram Parakkat, appearing leader for CPI said the 42nd amendment was indeed "infamous". It had after all tried to reduce the power of the Supreme Court and High Courts.
- **Amendment status validity**: In fact, the largest Bench in the history of the Supreme Court (13 judges) in the Kesavananda Bharati case had held that the Preamble was an integral part of the Constitution to interpret various parts of constitution.
- Read altogether and was Important for the subject to the amending power of the Parliament, provided the basic structure was not tinkered with.
- The court agreed to hear further arguments in the week commencing April 29, 2024.

Preamble

- **A preamble** is an introductory statement in a document that explains the document's philosophy and objectives. In a Constitution, it presents the intention of its framers, the history behind its creation, and the core values and principles of the nation.

- The preamble basically gives idea of the following things/objects: Source of the Constitution Nature of Indian State Statement of its objectives Date of its adoption

History of the Preamble

- The ideals behind the Preamble to India's Constitution were laid down by Jawaharlal Nehru's Objectives Resolution, adopted by the Constituent Assembly on January 22, 1947.

- Although not enforceable in court, the Preamble states the objectives of the Constitution, and acts as an aid during the interpretation of Articles when language is found ambiguous.

Components of Preamble

- It is indicated by the Preamble that the source of authority of the Constitution lies with the people of India. Preamble declares India to be a sovereign, socialist, secular and democratic republic.

- The objectives stated by the Preamble are to secure justice, liberty, equality to all citizens and promote fraternity to maintain unity and integrity of the nation.

Status of Preamble

- The preamble being part of the Constitution is discussed several times in the Supreme Court.

- **Berubari Case:** It was used as a reference under **Article 143(1)** of the Constitution which was on the implementation of the Indo-Pakistan Agreement related to the Berubari Union and in exchanging the enclaves which were decided for consideration by the bench consisting of eight judges.

- Through the Berubari case, the Court stated that 'Preamble is the key to open the mind of the makers' but it cannot be considered as part of the Constitution. Therefore, it is not

enforceable in a court of law.

- **Kesavananda Bharati Case:** In this case, for the first time, a bench of 13 judges was assembled to hear a writ petition. The Court held that: The Preamble of the Constitution will now be considered as part of the Constitution.

- The Preamble is not the supreme power or source of any restriction or prohibition but it plays an important role in the interpretation of statutes and provisions of the Constitution.

- So, it can be concluded that preamble is part of the introductory part of the Constitution. In the 1995 case of Union Government Vs LIC of India also, the Supreme Court has once again held that Preamble is the integral part of the Constitution but is not directly enforceable in a court of justice in India

Amendment of the Preamble

- **42nd Amendment Act, 1976**: After the judgment of the Kesavanand Bharati case, it was accepted that the preamble is part of the Constitution.
- As a part of the Constitution, preamble can be amended under Article 368 of the Constitution, but the basic structure of the preamble cannot be amended.
- Because the structure of the Constitution is based on the basic elements of the Preamble. As of now, the preamble is only amended once through the 42 Amendment Act, 1976.
- The term 'Socialist', 'Secular', and 'Integrity' were added to the preamble through 42 Amendment Act, 1976. 'Socialist' and 'Secular' were added between 'Sovereign' and 'Democratic'. 'Unity of the Nation' was changed to 'Unity and Integrity of the Nation'.

Topic 38. RS PASSES BILLS TO ADD PAHARIS, VALMIKIS TO ST, SC LISTS IN J&K

Important for the subject: Polity

Criteria for inclusion in Schedule list (SC, ST) is determined based on following factors:

The community's distinct and identifiable ethnological traits as tribal identity.

- Traditional practices, customs, and way of life as part of tribal culture i.e. unique and distinctive culture that sets the community apart from other groups.

- Community's geographical isolation is taken into account to assess its historic and continuous presence in specific regions.

- Socio-economic backwardness is considered to evaluate the level of disadvantage faced by the community.

- However, The Constitution of India does not define the criteria for recognition of STs.

Process: Stages are as follows–

- initiates at the State or Union Territory level-the concerned government or administration recommends the inclusion of a specific community.
- The proposal is sent to the Union Ministry of Tribal Affairs for examination and further deliberations.
- After this, the Ministry of Tribal Affairs, through its own deliberations, examines the proposal and sends it to the Registrar General of India (RGI).
- Once approved by the RGI, the proposal is sent to the National Commission for Scheduled Tribes

The proposal is sent back to the Union government

- Bill that amends the Constitution (Scheduled Tribes) Order, 1950 following its passage in both the Lok Sabha and Rajya Sabha.
- The inclusion of any community in the Scheduled Tribes list takes effect only after the President assents to a Bill.

Recent addition in Jammu and Kashmir:

- addition of the Pahari ethnic group to the Union Territory's ST list.
- added the **Paddari Tribe, Gadda Brahmin**, and Koli communities to the ST list and the Valmiki community (including synonyms) to the Scheduled Castes list of Jammu and Kashmir.
- Bills state that the reservation already available for these existing tribes will be maintained while giving these new communities additional reservation.
- Amid protest by Gujjar-Bakarwal it is said that the ST quota of Gujjar and Bakarwal will remain unaffected and there would be no dilution in the same.
- Constitutional provision related to tribes are mentioned in Art, 366 (25) with **article 342(1)** for inclusion of tribes by President along with these 5th and 6th schedule is also part of it.

Topic 39. SWAMINATHAN, RAO, SINGH TO GET BHARAT RATNA

Important for the subject: Polity

Bharat Ratna:

It is the **highest civilian award**, Instituted on **2nd January 1954.** The first recipients of it were C. Rajagopalachari, Sarvepalli Radhakrishnan; and C. V. Raman, who were honoured in 1954.

- Till date, **53 individuals,** including **18 posthumously.**
- The original statutes did not provide for posthumous awards but were amended in January 1966 to permit them to honor.
- **Lal Bahadur Shastri**, the first individual to be honored posthumously.
- **Discontinued**: It was suspended from July 1977 to January 1980 and for a second time from August 1992 to December 1995.
- **Controversy**: In 1992, the government's decision to confer the award posthumously on Subhas Chandra Bose.
- But it was opposed by those who had refused to accept the fact of his death, including some members of his extended family.
- Following a 1997 Supreme Court decision, the press communique announcing Bose's award was cancelled; it is the only time when the award was announced but not conferred.
- It has been conferred on India-born citizens, one naturalized citizen, Mother Teresa, and on two non-Indians: Abdul Ghaffar Khan and Nelson Mandela.
- **Criterion**: The award is conferred in recognition of "exceptional service/performance of the highest order", without distinction of race, occupation, position or gender.
- The award was originally limited to achievements in the arts, literature, science, and public services, but the Government of India expanded the criteria to include "any field of human endeavour" in December 2011.
- Although there is no formal nomination process, recommendations for the award are made by the Prime Minister to the President.
- The recipients receive a Sanad (certificate) signed by the President and a peepal leaf-shaped medallion with no monetary grant associated with the award.

Constitutional validity:

- Usage of the title 'Bharat Ratna' as a prefix by the awardee is exempt from Article 18 (1) of the Constitution, as per the Supreme Court's precedent in Balaji Raghavan/S.P. Anand

v. Union of India in 1995.

- Additionally, recipients may either use the expression **"Awarded Bharat Ratna by the President"** or "Recipient of Bharat Ratna Award" to indicate that they have been honored with the award.
- With official announcements, recipients are announced and registered in the Gazette of India, a publication released by the Department of Publication, Ministry of Urban Development used for official government notices.
- Bharat Ratna recipients rank seventh in the Indian order of precedence.

2024 rat Ratna:

- This year's tally of five Bharat Ratna awardees, one more than the four announced in 1999, is the highest that has ever been announced in a single year. Four of the five awards announced this year are posthumous.

Exceptional service of 2024 awardees-

- **Karpoori Thakur**: Socialist, Politician from Bihar served two time CM and introduced reservation in state jobs.
- **L.K. Advani** : From Delhi, 7th deputy PM , longest serving opposition member in Loksabha, founder of political party BJP
- **P.V. Narsimha Rao** : Lawyer, Politician from Telangana and 9th PM ,first PM from South India and introduced Liberal i.e. LPG reforms in Indian economy
- **Chaudhary Charan Singh** : From U.P. state , 5th PM , Indian independence role, Politician known as "Champion of India's peasants", founder of Lokdal political party
- **M.S. Swaminathan**: From Tamilnadu, agronomist, geneticist, administrator and father of Green revolution in India and made Self-reliant in food grains through HYVs seeds of wheat and rice and technology in agriculture.

Topic 40. LAW COMMISSION REPORT SUGGESTS CREATION OF EPIDEMIC PLAN AND STANDARD OPERATION PROCEDURE TO DEAL WITH FUTURE EPIDEMICS

Important for the subject: Polity

The **286th Law Commission Report** recommended creation of an Epidemic Plan and Standard Operation Procedure to address future epidemics

- After the Covid-19 pandemic, **the Law Commission suo moto** decided to examine the existing legal framework to tackle what it calls "significant deficiencies in addressing the containment and management of future epidemics in the country".
- Highlighting the limitations of the **Epidemic Diseases Act, 1897 (EDA), the 286th Law Commission Report states "the management, control and prevention of epidemic diseases cannot be restricted to a century-old law."**
- **Law commission** highlighted that there is no clear demarcation between the powers of the Centre, state, and local authorities during an epidemic, which leads to uncoordinated responses.

Key findings of the report:

- The report notes that the **EDA was not designed to combat modern issues** with the spread of infectious diseases.
- **Globalization and increased connectivity** is resulting in infectious diseases rapidly turning into epidemics or pandemics. The report claims that **EDA has great potential for abuse.**
- The report seeks to make comprehensive recommendations for the amendment of the EDA or the introduction of a new law altogether.
- The most dramatic change suggested is the creation of an **Epidemic Plan and a Standard Operating Procedure to address the spread of infectious diseases.**

More about Epidemic Plan:

- This would make sure the **powers and obligations of different levels of government** are clearly demarcated so that there is a coordinated response to any public health emergency.
- The duty to create this **Epidemic Plan falls on the Central government and the report recommends doing so in collaboration with state governments** and after consulting the ministries concerned, private health institutions, expert bodies and other stakeholders.
- The report recommends that the **EDA must include provisions to ensure that the Epidemic Plan is prepared, enforced, and revised at regular intervals.**
- The plan should include provisions on quarantine, isolation, and lockdowns, while ensuring that the measures are implemented fairly, without violating the fundamental

rights of citizens.

- It should also contain provisions on **privacy-friendly disease surveillance, regulating the distribution, availability and transport of medical supplies.**
- **proper dissemination of information to the public, medical testing and research for vaccinations and medicines, and the safe disposal of infectious waste among a variety of other Important for the subjects.**

About Standard Operating Procedure (SOP):

- The report suggests the **creation of a Standard Operating Procedure (SOP)** which will **"ensure proper and coordinated response to any epidemic with pre-defined powers and roles in case of a public health emergency"**
- The SOP suggested in the report defines **three stages of the spread of infectious diseases as well as the responses at each stage.**
- At the first stage, **"Outbreaks in the State"**, the report recommends **giving states the power to take "sufficient measures" that are in line with the Epidemic Plan.**
- It includes empowering local authorities to take preventative measures to contain the **disease at a "micro-level".**
- At the second stage, **"Inter-State Spread of Epidemic Diseases/Pandemic"**, the report suggests that the **Central government should have the power to frame regulations** on the basis of the Epidemic Plan, and states should act in accordance with these regulations.
- For the third stage, **"Extreme Threat from Infectious Diseases"**, the recommendations are similar to those provided for the second stage.
- If states are unable to contain the spread of infection and there are conflicting guidelines then, the **Central government will step in to impose uniform measures, either by itself or by empowering a central agency.**

About Law Commission:

- The **Law Commission of India is a non-statutory body** constituted by the Government of India from time to time.
- The **first Law Commission of independent India was established in 1955** for a three-year term. Since then, twenty one more Commissions have been established.
- The **first Law Commission was established during the British Raj era in 1834 by the Charter Act of 1833 and was chaired by Lord Macaulay.** It works as an **advisory body to the Ministry of Law and Justice.**
- The **Law Commission undertakes research in law and review** of existing laws in India for making reforms therein and enacting new legislations on a reference made to it by the **Central Government or suo-motu.**

Topic 41. APPOINTING DEPUTY CMS NOT A BREACH OF CONSTITUTION: SC

Important for the subject: Polity

The Supreme Court dismissed a petition challenging the appointment of Deputy Chief Ministers in States, citing that no such position is outlined in the Constitution.

About Supreme Court Decision:

- Dismissed a petition challenging Deputy Chief Ministers' appointments in States, citing lack of existence in the Constitution.
- **Judicial Reasoning:** Chief Justice D.Y. Chandrachud found no issue with Deputy Chief Ministers being Members of Legislative Assemblies (MLAs) and State government Ministers, despite nomenclature.
- **Legal Rationale:** Chandrachud stated that Deputy Chief Ministers are essentially State Ministers and require MLA status, which doesn't violate the Constitution.
- **Equality Concerns:** Petitioner argued appointments were driven by religious and sectarian factors, violating Articles 14 and 15 of the Constitution.
- **Court Response:** Dismissed the petition, deeming it lacking in substance.
- **Role Clarification:** Chandrachud emphasized that Deputy Chief Ministers function like other Ministers, possibly with seniority, but without higher salaries.

Structure of the Post of Deputy CM

- **Constitutional Status:** Deputy CM is a political post, not a constitutional one like the Vice President of India.
- **Origin:** Originated from the post of Deputy Prime Minister in 1947, with Sardar Vallabhai Patel being the first Deputy PM.
- **Appointment and Removal:** At the discretion of the Chief Minister, who can appoint multiple Deputy CMs.
- **Tenure:** No fixed tenure; Chief Minister can reshuffle portfolios or remove Deputy CMs anytime.

Current Status: As of July 2023, 12 states in India have Deputy CMs. **Financial Powers:**

No specific financial authority; requires CM's approval for expenditure beyond allocated budget.

Topic 42. T.N. GOVERNOR RAVI REFUSES TO DELIVER CUSTOMARY ADDRESS

Important for the subject: Polity

Mr. Ravi announced his decision after reading the first paragraph of the address prepared by the government that wished "happiness, prosperity and well-being" in the new year and quoted a couplet from Tirukkural.

Constitutional Background:

- The **Constitution gives the President (Article 87) and the Governor (Article 176)** the power to address a sitting of the legislature. The special power is with regard to two occasions.
- The first is to address the opening session of a new legislature after a general election. The second is to address the first sitting of the legislature each year.
- Commonly referred to as the President's or Governor's Address, they are a **constitutional requirement.**
- A session of a new or a continuing legislature cannot begin without fulfilling this requirement.

Governor's Address to the State Legislature:

Article 176 of the Constitution –

- At the commencement of the first session after each general election to the Legislative Assembly and at the commencement of the first session of each year, the Governor shall address the Legislative Assembly and inform the Legislature of the causes of its summons.
- In the case of a State having a Legislative Council, both Houses assembled together.
- Provision shall be made by the rules regulating the procedure of the House or either House for the allotment of time for discussion of the matters referred to in such address

What does the Address contain?

- The President's/Governor's speech follows the convention of the British system, where it **contains legislative and policy proposals that the government intends to initiate.**
- The speech also recaps the government's accomplishments in previous years.
- The contents of the speech are put together by aggregating inputs from various ministries

of the government

Is the Address prepared by the President/Governor themselves?

- The Constitution, under **Article 74 and Article 163** respectively, **binds the President and the Governor to act on the aid and advice of the Council of Ministers of the Union and state governments** respectively, on a majority of issues.
- Therefore, the speech that the President or the Governor reads before the legislature is the viewpoint of the government and is prepared by it.

If the President/Governor disagrees with the text of the speech, are they still bound to read it?

- The President or a Governor cannot refuse to perform the constitutional duty of delivering an address to the legislature.
- But there can be situations when they deviate from the text of the speech prepared by the government.
- So far, there have been no instances of the **President** doing so. But there have been multiple occasions when a Governor skipped a portion of the address to the Assembly

Does such an omission, as happened recently in Tamil Nadu, violate any constitutional convention?

- In **Shamsher Singh v. State of Punjab**, the Supreme Court said that the principle that the President (or the Governor) is guided by the aid and advice of the Cabinet covered every function.
- Whether it relates to addressing the House or returning a Bill for reconsideration, or assenting or withholding assent.
- Many experts believe that it was the intention of the Constitution-makers that the Governor's speech would be prepared by the **Council of Ministers and the Governor would read it.**
- Hence, they are of the opinion that if a Governor violates this convention and deletes any para of the address under the cloak of his discretionary power, his **action may not be unlawful' from a rigid legalistic viewpoint.**
- However, this will surely strike at the roots of the norms of the parliamentary system of government.

Topic 43. STATE BORROWING LIMITS: READY FOR DIALOGUE WITH KERALA, CENTRE INFORMS SC

Important for the subject: Polity

The Union government informed the Supreme Court on Tuesday that it is prepared to engage with the Kerala government on the limits the Centre imposed on the state's borrowing powers.

- This development came after a two-judge bench comprising **Justice Surya Kant and Justice K. V. Viswanathan** suggested that the finance secretary of Kerala meet with the Union finance minister to resolve the matter.
- Finance ministry clarified that there was no proposal to relax the existing terms for borrowing capacity of state governments, **including Kerala, for 2023-24.**
- Centre applies a common yardstick while fixing the annual borrowing limit of all state governments under **Article 293(3) of the Constitution, and that it is guided by the recommendations of the Finance Commission**

Arguments by Kerala Government:

- The Kerala government challenged the **Centre's decision to impose a ceiling** on its borrowing amount.
- Kerala argued that this **restriction resulted in a severe crisis** in its budget operations and violated the principles of fiscal federalism.
- **Section 4 of the Fiscal Responsibility and Budget Management Act, 2003**, imposed a net borrowing ceiling on Kerala, restricting its borrowings from all sources, including from the open market.

Centers view:

- The **Union government stated that any financial stress faced by the Kerala government** was primarily due to poor financial mismanagement.
- According to the Union government, **"substantial financial resources"** were provided to the Kerala government from financial years 2020-21 to 2023-24, over and above the amount recommended by the **15th Finance Commission.**
- The Union government also said any **state defaulting on debt servicing could create reputation issues and a domino effect,** threatening India's financial stability.
- The Attorney General emphasized that **all states require permission from the Centre to borrow from any source.**
- This permission is granted while considering **the overall objectives of macroeconomic stability for the country as a whole.**
- The borrowing limits are fixed in a **non-discriminatory and transparent manner as**

guided by the recommendations of the Finance Commission.

- Reckless borrowing by states to finance unproductive expenditure could crowd out private borrowing from the market.

Topic 44. IS LA NINA IN THE OFFING? HOW THE SHIFT FROM EL NINO MAY IMPACT MONSOON, SUMMER IN INDIA THIS YEAR

Important for the subject: Geography

India is likely to see **increased rainfall** during the **southwest monsoon** season following a **dry winter** and **predictions of a hot spring and summer** in the **northwest, northeast,** and **central regions**.

- This expected **increase in rainfall** is attributed to the development of a **La Nina event,** contrasted with the **current El Nino conditions** and **global warming effects,** which typically result in **higher temperatures** and **reduced rainfall.**
- **El Nino** and **La Nina** are **phases** of the **El Nino Southern Oscillation (ENSO)** that **influence global climate patterns,** with **La Nina** generally **bringing cooler temperatures and more rainfall to India.**
- Despite **La Nina's** tendency to **increase rainfall,** recent observations, such as **early and intense heatwaves** during a **La Nina year,** suggest changes in its impact.
- The current **El Nino** is anticipated to end by early summer, followed by a **brief neutral period,** then shifting to **La Nina conditions,** with a greater than **70%** chance of a **La Nina event** by late **2024**.
- Predicting **ENSO conditions** is challenging due to the **spring barrier,** but historical trends show a significant correlation between **strong El Ninos** and **subsequent La Nina events.**
- The upcoming **La Nina** could result in **above-average rainfall for India** during the latter part of the **monsoon season**, potentially **impacting all India mean rainfall positively,** although some states may experience deficits.
- The previous **La Nina event** led to **above-normal rainfall** and **extreme weather events across India,** and a similar pattern could occur in **2024,** exacerbated by **global warming** and **regional sea temperature increases**.

ENSO cycle:

- **El Nino–Southern Oscillation (ENSO)** is an **irregularly periodic variation** in **winds** and **sea surface temperatures** over the **tropical eastern Pacific Ocean**.
- Every three to seven years, the surface waters across the **tropical Pacific Ocean warm**

or cool by **1°C** to **3°C**, compared to normal.

- The **warming phase of the sea temperature** is known as **El Nino** and the **cooling phase** as **La Nina.**
- Thus, **El Nino** and **La Nina** are opposite phases of what is known as the **El Nino-Southern Oscillation (ENSO) cycle.**
- These deviations from normal surface temperatures can have **large-scale impacts** not only on ocean processes but also on global weather and climate.

Topic 45. RANN OF KUTCH AND DHOLAVIRA

Important for the subject: Geography

Why in news?

Till not so long ago in Gujarat, the distance from Bhuj to Dholavira was around 240 km via Rapar and Bhachau.

- But in the run-up to the G-20 Summit, the Government of India cleared 31.9 km-long **Khavda-Khadir road**, through the Rann of Kutch, on a priority basis
- The road was originally sanctioned in 2019, but was delayed, and finally opened for

tourists in 2023.

- Dholavira, a UNESCO World Heritage Site was once a Harappan city situated on the **island of Khadir**, where the remains of the famous **Indus Valley Civilisation** can be found.
- Because of the new road it takes just 130 km to reach **Bhuj, the capital of Kutch.**
- The **Rann of Kutch** is famous for its white salty desert sand and is reputed to be the largest salt desert in the world.
- Motorbike tourists call it as 'Road to Heaven'.
- There are many other locations for nature lovers in **Khadi**r, such as **Fossil Park, Bokad Gado**, **Bhim Godo, Sonpari**, **Cheria Bet, Chhipar**, **Sunset point at Bhanjado Hill**, and D
- Tourists interested in bird watching, wildlife, history/archaeological, art and handicraft, tribal studies are already flocking to this area. Many of them also visit **Smriti van Earthquake Memorial of Bhuj.**

Rann of Kutch

- It is a **large area of salt marshes** that span the **border between India and Pakistan**.
- It is located mostly in the **Kutch district of Gujarat**, with a minor portion extending into the **Sindh province of Pakistan.**
- It is divided into the **Great Rann and Little Rann.**
- It extends east and west, with the **Thar Desert to the north and the low hills of Kutch to the south.**
- The **Indus River Delta** lies to the west in southern Pakistan.
- The **Little Rann of Kutch** lies southeast of the Great Rann, and extends southwards to the Gulf of Kutch.

The climate of the ecoregion is

- **Temperatures average 44 °C** during the hot summer months, and can reach highs of 50 °C.
- During the winter the temperature can drop to or **below freezing.**
- The Rann of Kutch is the **only large flooded grasslands zone** in the Indomalayan realm.

The Indomalayan realm is one of the eight biogeographic realms.

- **It extends across most of South and Southeast Asia and into the southern parts of East Asia.**
- The area has desert on one side and the sea on the other enables various ecosystems,

including **mangroves and desert vegetation.**

- The Little Rann of Kutch is home to the Indian wild ass (khur). To conserve this species, the Indian Wild Ass Sanctuary (IWAS) was created in 1973.
- In 2008, to project Kutch as an international nature destination, the Government of Gujarat designated the area as the **Kutch Biosphere Reserve.**
- **Biosphere reserves** aim to promote sustainable development in the surrounding area, which is reserved for conservation and research.
- Such reserves are protected under the Wildlife Protection Act, the Indian Forest Act and the Forest Conservation Act.
- The government provides funds for the conservation of the landscape's biological diversity and its cultural heritage

Kutch Desert:

- Kutch Desert covers a vast area to the n**orth of India and northwest by Sindh (Pakistan), west and southwest by the Arabian Sea, and to the northeast by Rajasthan.**
- The Rann of Kachchh comprises a **unique example of Holocene sedimentation**.
- It is connected to the **Arabian Sea through Kori Creek** in the west and the **Gulf of Kachchh in the east**, and is very close to sea level.
- The **Wild Ass Wildlife Sanctuary**, situated in the Indian state of Gujarat, is **the largest wildlife sanctuary in the country**.
- It is spread in the entire area of the l**ittle Rann of Kutch where small grass-covered areas,** known as **baits**, forms the flora and is an important source to support the fauna of the region.

About Dholavira:

- It was discovered in 1968 by archaeologist **JagatPati Joshi.**
- After Mohen-jo-Daro, Ganweriwala and Harappa in Pakistan and Rakhigarhi in Haryana of India, Dholavira is the **fifth largest** metropolis of **Indus Valley Civilization (IVC).**
- The ancient city of Dholavira is an archaeological site at **Kachchh District,** in the state of Gujarat, which dates from the 3rd to mid-2nd millennium BCE.
- **Dholavira's location is on the Tropic of Cancer.**
- It is located on **Khadirbet island** in the Kachchh Desert Wildlife Sanctuary in the Great Rann of Kachchh.

Distinct Features of the Dholavira Site:

- Artifacts that were found here include terracotta pottery, beads, gold and copper ornaments, seals, fish hooks, animal figurines, tools, urns, and some imported vessels.

Cascading series of water reservoirs.

Outer fortification.

- Two multi-purpose grounds, one of which was used for festivities and other as a marketplace.
- Nine gates with unique designs.
- Funerary architecture featuring tumulus — hemispherical structures like the Buddhist Stupas.
- Multi-layered defensive mechanisms, extensive use of stone in construction and special burial structures.
- It was also a hub of manufacturing jewellery made of shells and semi-precious stones, like agate and used to export timber.
- Unlike graves at other IVC sites, no mortal remains of humans have been discovered at Dholavira.

Topic 46. THE PATTERNS OF GLOBAL WARMING ARE MORE IMPORTANT THAN ITS LEVELS

Important for the subject: Geography

Rising global temperature:

A recent study has **reignited debates about whether the Earth's surface temperature has surpassed the 1.5 degrees Celsius warming threshold above pre-industrial levels**.

- This research, conducted by scientists in **Australia** and **the U.S.,** utilized **palaeo-thermometry** to **estimate past temperatures,** suggesting that the **average global temperature has indeed exceeded the 1.5 degrees Celsius mark**.
- However, the **study's findings** are based on data from a **single location**, which the researchers then extrapolated to reflect global temperature trends, presenting a significant limitation.

What is Palaeo-thermometry?

- **Palaeo-thermometry,** or **'palaeo proxies,'** is a **method** that relies on **chemical evidence** found in **organic materials** like **corals, stalactites,** and **stalagmites** to estimate

past temperatures.

- Although this **technique** offers **valuable insights** into **historical climate conditions,** it provides **indirect evidence** and **does not measure actual temperatures**.
- These **proxies** indicate **past temperature deviations** rather than **direct temperature measurements,** utilizing the relationship between **specific chemical compounds in biogenic materials** and the **local temperatures at the time of their formation.**
- By analyzing the **chemical composition of ancient biogenic materials** and the **decay rate of certain isotopes,** scientists can infer **local temperature anomalies** from the past.
- However, these findings represent **highly localized temperature changes** and cannot be used to make precise claims about minor deviations in past global temperatures compared to instrumental records

No explanations for patterns:

- The discourse surrounding the **crossing of the 1.5 degrees Celsius global warming threshold** lacks clear explanations for **exceptional warming** and its connection to specific **climatic events** or **disasters**.
- Moreover, there is a **significant gap in understanding the warming patterns associated with exceeding this threshold,** as well as **global warming at any level**.
- This knowledge is **crucial** for **effectively managing the disasters linked to global warming**.
- Additionally, the dynamics of the **2023 monsoons**, including their **amount** and **distribution,** remain unexplained, especially regarding the **interactions** between **the El Niño phenomenon, its atypical pattern,** and **global warming**.
- Interestingly, the **Indian subcontinent experienced notable cooling in 2023**.

El-Nino as a warming paradigm:

- The **tropical Pacific Ocean** alternates between **absorbing heat during normal and La Niña years** and **releasing it during El Niño years,** resulting in **temporary global warming effects** known as **teleconnections.**
- These effects **demonstrate** the importance of **warming patterns,** as the **location of El Niño warming**—whether in the **eastern Pacific** or near the **international dateline**—significantly **influences** its **impact on the monsoon** and other global regions.
- Moreover, the **El Niño teleconnections** themselves **alter the warming pattern, contributing to different climatic outcomes**.
- For example, droughts may influence temperature changes more significantly than floods in some cases.

- The current **heavy rainfall** and **snowfall** in **California**, driven by **El Niño,** are likely **intensified by global warming,** with these **precipitation levels** further **affecting local and global temperatures.**
- Similarly, the **broader pattern of global warming,** triggered by **human-made greenhouse gases,** results in **amplified warming in the Arctic and Middle East deserts** but **reduced warming over the eastern Pacific and northern Atlantic oceans**.
- The specific effects of **local warmings and coolings,** along with their **magnitudes,** determine the **combined impact of natural variability** and **global warming** in any given area.

Topic 47. SCIENTISTS SAY TECTONIC PLATE TEARING APART UNDER PACIFIC OCEAN FROM JAPAN TO NEW ZEALAND

Important for the subject: Geography

Scientists have discovered that several **rigid tectonic plates** beneath the **Pacific Ocean** are undergoing separation.

- **Earth's outer shell,** the **lithosphere**, is composed of these plates, which float atop the **semi-fluid asthenosphere,** with their **movement** being a **fundamental aspect of plate tectonics**.
- Researchers from the **University of Toronto** identified **extensive undersea faults within these plates,** stretching **hundreds of kilometres in length** and **reaching depths of thousands of meters**.
- This finding was unexpected, as **geological deformation**, typically associated with the **interiors of continental plates away from plate boundaries,** was also observed within the **oceanic plates**.

There is a gap in the understanding of ocean plates' behaviour.

- The **Pacific plate,** covering the **majority of the Pacific Ocean floor,** is **moving westward.**
- Descending into **Earth's mantle** through **subduction zones** that extend from **Japan** to **New Zealand** and **Australia**.

The tectonic plate gets dragged inside Earth's mantle like tablecloth:

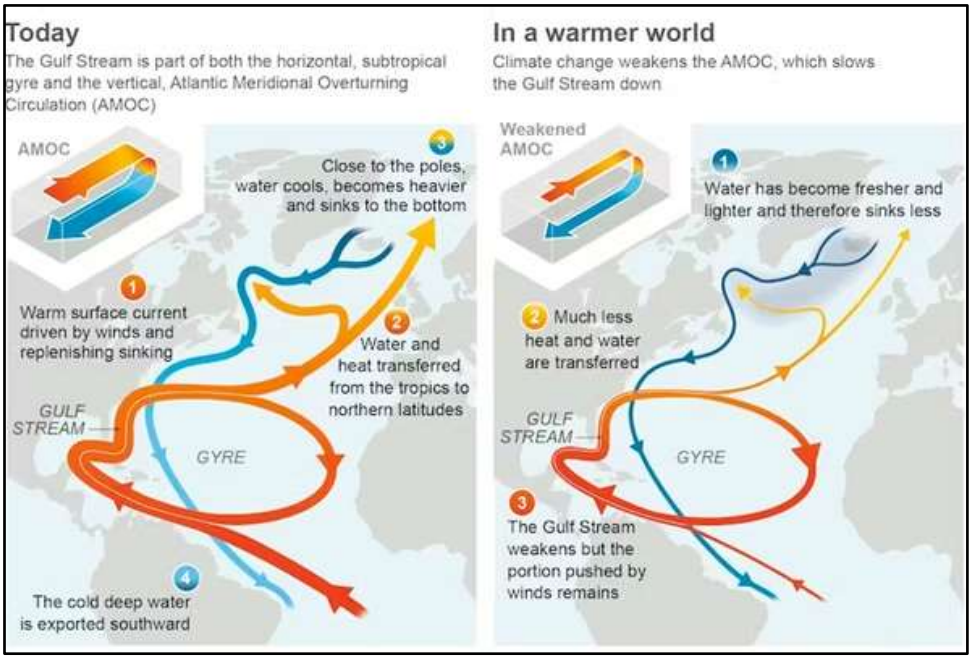
- Scientists have found that as a **plate's western edge is pulled into Earth's mantle,** the **rest of the plate follows,** akin to a tablecloth being yanked off a table.
- Contrary to previous beliefs that **sub-oceanic plateaus,** due to their **thickness,** would be **stronger,** research including models and seismic data indicated these plateaus are **weaker**.
- This study focused on **four plateaus** in the **western Pacific Ocean: Ontong Java,**

Shatsky, Hess, and **Manihiki,** covering a vast area between **New Zealand, Hawaii, Japan,** and **Australia**.

- Utilizing a supercomputer, the scientists developed a model based on existing data, leading to significant insights into tectonic behaviour.
- These findings challenge long-held understandings of Earth's dynamics, revealing new mysteries about the planet's evolution.

Topic 48. ATLANTIC IS HEADED FOR A TIPPING POINT − ONCE MELTING GLACIERS SHUT DOWN GULF STREAM, WE WOULD SEE EXTREME CLIMATE CHANGE WITHIN DECADES, STUDY SHOWS

Important for the subject: Geography



Atlantic Meridional Overturning Circulation (AMOC):

T**he AMOC** is **essential for distributing heat from the tropics to northern latitudes**.

Observations since **2004** indicate that the **AMOC** has **slowed down to potentially its weakest in nearly a thousand years,** with studies warning that it could reach a **tipping point** leading to **irreversible decline** due to **global warming** and **melting glaciers and ice sheets.**

Recent research utilizing advanced climate models simulated the **impact of fresh water flow on the AMOC** until it reached this **tipping point.**

- The study concluded that the **AMOC** could **completely cease within a century after reaching this critical juncture,** leading to a **significant drop in average temperatures**

across North America, Asia, and **Europe,** alongside severe **global consequences**.

- Moreover, the study identified a **physics-based early warning signal** that could alert the world when the **AMOC** is approaching its **tipping point**, offering a **valuable tool for monitoring** and **potentially mitigating this grave threat**.

The ocean's conveyor belt:

- **Ocean currents** are **propelled by** a **combination of wind, tides,** and **differences in water density.**
- In the **Atlantic, warm, salty water** from the **equator moves towards Greenland,** passing through the **Caribbean Sea** and the **Gulf of Mexico,** then along the **US East Coast** before crossing the **Atlantic**.
- This **flow,** part of the **Gulf Stream**, is **essential for transporting heat to Europe**.
- As the **water cools on its northward journey,** it becomes **denser** and begins to **sink** upon reaching **Greenland**. This **sinking motion** draws more water from the **Atlantic,** perpetuating a **cycle** akin to a conveyor belt.
- However, an **influx of fresh water** from **melting glaciers** and the **Greenland ice sheet** can **disrupt this process by diluting the ocean's salinity**.
- **Reduced salinity prevents the water from sinking,** which in turn **weakens the oceanic conveyor belt.**
- This **diminished conveyor belt** then **transports less heat northward** and **allows less dense water to reach Greenland,** further **weakening the system.**
- If the **conveyor belt** reaches a **critical tipping point,** it can **shut down rapidly,** disrupting this vital **oceanic circulation**

What happens to the climate at the tipping point?

- The **findings of the research** revealed that upon reaching the **tipping point,** the **conveyor belt** could **halt within a century,** significantly **reducing heat transport to the north and prompting sudden climate changes**.

The result: Dangerous cold in the North

- When the **Gulf Stream's circulation halts**, regions dependent on it for **warmth,** particularly **North America** and **Europe,** experience **significant cooling** by a few degrees.
- The experiment revealed that **Europe, heavily influenced by the Gulf Stream,**
- Could **see temperature drops more than 5 degrees Fahrenheit (3 degrees Celsius) per decade**, much **faster** than the current **global warming rate of about 0.36 F (0.2 C) per decade**.

- Specifically, parts of **Norway** could see **temperature decreases exceeding 36 F (20 C)**, whereas some **Southern Hemisphere** areas might **warm by a few degrees**.
- The **cessation of the conveyor belt** would also disrupt **sea levels** and **precipitation patterns**, potentially pushing **ecosystems** like the **Amazon rainforest,** which is **sensitive to reduced rainfall,** toward their **tipping points.**
- Such **transitions** could **transform forests into grassland, releasing carbon into the atmosphere** and **eliminating a crucial carbon sink**, thereby exacerbating climate change.
- Historically, the **Atlantic circulation** has significantly slowed during glacial periods as **melting ice sheets** introduced fresh water into the ocean, leading to major climate oscillations.

Consequences:

- The **potential abrupt halt of the Atlantic conveyor belt** would have **dire consequences,** including **significant changes in temperature, sea levels,** and **precipitation patterns,** which would profoundly impact human society.
- These climate shifts would be **irreversible** on human timescales.

Topic 49. SHRI SHANTANU THAKUR TO FLAG-OFF THE 1ST TRIAL CARGO VESSELS FROM MAIA INLAND CUSTOMS PORT ON 12TH FEBRUARY 2024

Important for the subject: Geography

The first trial movement of vessels between **Maia Port i**n India and Sultanganj Port in Bangladesh on **Indo Bangladesh Protocol (IBP) Route no. 5 & 6** is set to take place on February 12, 2024.

- The vessels will be flagged off by the **Minister of State for Ports, Shipping, and Waterways, Shri Shantanu Thakur, from Maia Inland Customs Port in West Bengal at 10:30 AM.**
- This development is in line with the A**ct East Policy of the Hon'ble Prime Minister Shri Narendra Modi's government.**

Importance of the port:

- The waterway route from **Maia (IBP route) to Dhubri (NW-2) via Aricha** will reduce the distance by around 930 kilometers compared to the existing waterway route from **Dhulian-Maia-Kolkata-IBP-Dhubri.**
- The riverine distance between **Port of Call Maia in India and Port of Call Sultanganj in Banglades**h is 16 kilometers, out of which 4.5 kilometers of waterways are in India and the rest 11.5 kilometers are in Bangladesh.

Other projects:

- Agreement has been made to implement the decision to start riverine services under the Protocol on Inland Water Transit and Trade (PIWTT) routes **5 & 6 (Dhulian to Rajshahi extension to Aricha)** and **9 & 10 (Daudkandi to Sonamura).**

About Port of Call:

- It is an intermediate port where ships anchor for **refueling, watering, taking food, repairs, or transhipment of cargo**

Important Places:

- **Maia port, Dhulian port : West Bengal**
- **Dhubri port: Assam**
- **Sonamura port: Tripura**
- **Aricha port, Rajshahi port, Daukandi port and Sultanganj port: Bangladesh**

Topic 50. INDIA'S STANCE AT WTO BALANCES FISHERIES SUBSIDIES FOR ARTISANAL FISHERS AND SECTORAL GROWTH

Important for the subject: International Relations

India is set to prioritize the welfare of its **artisanal fishers** and the development of its **fishing sector** at the upcoming **13th Ministerial Conference (MC13)** of the **World Trade Organisation (WTO)** in **Abu Dhabi**.

- The conference will focus on negotiations around the **regulation of fisheries subsidies,** which are known to **contribute to overfishing** by supporting activities like **vessel construction, fuel purchases,** and more.
- A significant point of discussion will be the **WTO's draft text** from December 2023, aiming to **limit subsidies that lead to overcapacity and overfishing, requiring member countries to prove sustainability in their fishing practices.**
- The draft **exempts least-developed and certain developing countries,** while imposing stricter scrutiny on the **top 20 subsidy providers.**
- Experts, however, believe that the proposed terms may **disproportionately benefit developed countries** with **large industrial fishing fleets,** as they can more easily comply with sustainability requirements, leaving **developing countries** at a disadvantage.
- This disparity could **hinder developing nations like India** from **building significant industrial fishing capabilities,** as they struggle with stringent documentation and sustainability demonstration requirements.
- **India** argues for the application of the p**rinciple of common but differentiated responsibilities (CBDR) and respective capabilities (RC)** in the agreement, advocating

for **strong regulations on industrial fishing fleets** to address the root cause of overfishing historically facilitated by substantial government subsidies in developed countries.

- **India** is pushing for a **25-year transition period** for **developing countries** that are neither covered by the **de minimis** (a global share of marine catch not greater than 0.8%) nor considered **least developed countries (LDCs)**.

Evolving negotiations:

- In **2001,** during the **Doha Ministerial Conference, World Trade Organization (WTO)** members agreed to address the issue of fisheries subsidies, a commitment further elaborated in **2005** at the **Hong Kong Ministerial Conference.**
- Here, the **focus** was on **controlling subsidies** that **contribute to overcapacity and overfishing,** while acknowledging the need for **special and differential treatment for developing and least developed countries,** given the sector's role in **development, poverty reduction, livelihoods,** and **food security.**
- The negotiations were propelled forward with the adoption of the **United Nations' Sustainable Development Goals (SDGs) in 2015,** particularly **Goal 14.6,** which **aims** to **eliminate harmful fisheries subsidies by 2020**, thus **targeting overcapacity, overfishing, and illegal fishing subsidies.**

Debate over fisheries subsidy:

- The **International Institute for Sustainable Development (IISD)** reported a significant **increase** in **India's fisheries subsidies** from **Rs. 15.5 billion** in **2016** to **Rs. 22.25 billion** in **2019,** marking a **43% growth.**
- **Fuel subsidies,** in particular, were noted for **disproportionately benefiting wealthier fishers** who can afford more **subsidized fuel,** thus favouring **larger-scale fishing activities.**

Global Fisheries Subsidies:

- Estimated at **$35.4 billion** in **2018; $22.2 billion** for **capacity-enhancing subsidies.**
- **The UN General Assembly** tasked **WTO** to deliver an agreement against harmful fisheries subsidies.

Fisheries Sector in India:

- Recognized as a powerful income and employment generator.
- 3rd largest fish-producing and 2nd largest aquaculture nation globally.
- **Pradhan Mantri Matsya Sampada Yojana (PMMSY) focuses on the sustainable development of the fisheries sector.**

Related Government Initiatives in India's Fisheries Sector:

Fishing Harbours:

- Development of **major Fishing Harbours (Kochi, Chennai, Visakhapatnam, Paradip, Petuaghat).**
- Transformation into hubs of economic activity to support the fisheries industry.

Seaweed Park in Tamil Nadu:

- Establishment of a **Multipurpose Seaweed Park in Tamil Nadu.**
- Center for the production of high-quality seaweed-based products, utilizing a hub-and-spoke model.

Pradhan Mantri Matsya Sampada Yojana (PMMSY):

- Objective: **Creation of direct employment for 15 lakh fishers, fish farmers, etc.**
- Indirect employment opportunities expected to be three times the direct employment.
- Aims to double the incomes of fishers, fish farmers, and fish workers by 2024.

Palk Bay Scheme:

- Launched in 2017 as a Centrally Sponsored Scheme.
- **Part of the umbrella Blue Revolution Scheme.**
- Focus on **diversification of trawl fishing boats from Palk Straits into deep-sea fishing boats.**

Special and Differential Treatment (S&DT):

Definition:

- S&DT is a set of provisions in international trade agreements **that offers preferential treatment to developing countries, recognizing their unique challenges and needs.**

Objective:

- To **address the developmental, financial, and trade-related constraints** faced by developing nations.

Key Features:

- **Flexibilities:** Provides flexibility in meeting certain commitments or obligations, considering the developmental stage of the country.
- **Transitional Periods:** Allows extended timelines or transition periods for implementing certain provisions.
- **Technical Assistance:** Includes support in capacity building, technology transfer, and

financial assistance.

- **Market Access:** Grants preferential market access, including tariff reductions and exemptions.

Topic 51. ISRAEL ARMY TO EVACUATE GAZA'S RAFAH

Important for the subject: International Relations

Israeli Prime Minister Benjamin Netanyahu on Friday said he has ordered the military to prepare a plan to evacuate civilians from Rafah ahead of an expected Israeli invasion of the densely populated southern Gaza city.

Rafah

- Rafah is a Palestinian city in the southern Gaza Strip.
- Rafah is the site of the Rafah Border Crossing, the sole crossing point between Egypt and the State of Palestine. The crossing is controlled by Egypt.
- Gaza's only airport, Yasser Arafat International Airport, was located just south of the city.
- Rafah had a pre-war population of roughly 2,80,000, and as per the UN is now home to 1.4 million additional people.
- It is the only exit that does not lead to Israeli territory.

There are only two other border crossings in and out of Gaza:

- **Erez**is located in the north and is used by people in Israel.
- **Kerem Shalom**, in the south, which is exclusively for commercial goods.
- **Both Erez** and **Kerem Shalom** controlled by Israel are currently closed.

Topic 52. A GLOBAL ALLIANCE TO BRIDGE THE GENDER EQUITY GAP

Important for the subject: International Relations

India launched a landmark Initiative "**Alliance for Global Good – Gender Equity and Equality"** at WEF 2024.

- The commitment is underscored by the **adoption of the New Delhi Leaders' Declaration during India's presidency at the G-20.**

About the Alliance

- The multi-stakeholder initiative positions India at the forefront of accelerating the socio-economic cause with a sustained global impact.
- The Alliance transitions the concepts of equity and equality into actionable agendas for stakeholders worldwide.

Adopted Basic tenets of G-20 Declaration

- The declaration emphasizes prioritizing inclusion in key focus areas such as socioeconomic empowerment, bridging the digital gap, climate action, and ensuring food security, nutrition, health, and well-being.
- It advocates for a growth agenda driven by women-led development.

Government Commitment to Gender Equality

- Mainstreaming gender equality and equity has been a priority for the Government of India for over a decade.
- The passage of the **Women's Reservation Bill** last year is a groundbreaking step, ensuring one third of seats for women in Parliament and State Assemblies.
- This legislative measure is seen as a revolutionary tool for **women's empowerment,** contributing significantly to enhancing India's governance processes.

Financial Commitment to Women-Led Development –

- The government's commitment is evident in the allocation of **nearly $27 billion under the gender budget in 2023-24.**
- This substantial financial commitment reflects the dedication to advancing women-led development initiatives.

Positive Trends in Female Participation

- India has experienced a notable increase in the female labor force participation rate, rising from 23.3% in 2017-18 to **37% in 2022-23** according to data from the annual Periodic Labour Force Surveys.

- Female enrollment in higher education has witnessed a significant 28% increase over the last decade.

Empowering Women in STEM (science, technology, engineering, mathematics courses):

- The share of women's enrollment is an impressive **43%, marking one of the highest rates globally.**
- Rural India showcases active participation, with over nine crore women engaged in 83 lakh self-help groups, contributing to the improvement of socio-economic conditions in rural areas.

We-Lead Lounge at Davos:

- The We-Lead Lounge, established by the Ministry of Women and Child Development (MWCD) and the Confederation of Indian Industry (CII) at Davos, generated significant global interest and curiosity.
- It provided a platform for meaningful discussions on how the world can contribute to, join,and drive inclusive development efforts.

Alliance for Global Good – Gender Equity and Equality

- Anchored by the **CII Centre for Women Leadership** and guided by the Minister of Women and Child Development, Government of India and Supported by the Bill and Melinda Gates Foundation.
- It will establish a global network of experts, thinktanks, industry leaders, and country leadership to drive collective actions for women empowerment.
- The World Economic Forum's partnership as a network partner underscores the initiative's global relevance and resolve to promote inclusive and equitable growth.

Its Focus Areas and Objectives

- To foster the sharing and development of scalable and practical solutions to promote women-led development.
- Key areas include ed-tech, medical capacity building, health interventions for women, learning and skill development, agrotech, and women enterprise development.
- To mobilize capital to enhance gender outcomes, capitalizing on India's reputation as the "pharmacy of the world" and its acknowledged digital expertise

Opportunities for Global Industry

- This presents an opportunity for industries worldwide to share developed practices aimed at advancing women's entry and growth in the workplace.
- It offers a chance to invest in proven programs and initiatives, facilitating their scalability, and collaborate to integrate inclusion into business dialogues

Engagement and Leadership Development

- It also provides an opportunity to collaborate with the global community, including industry, think tanks, and investors, to enhance engagement and leadership of women in the economy.
- The focus lies on increasing access to healthcare, educational opportunities, and economic prospects for women.

India's Commitment to Global Harmony

- With India's enduring commitment to **'VasudhaivaKutumbakam – One Earth, One Family, One Future'** and its ongoing efforts toward **'Sabka Saath, Sabka Prayaas, Sabka Vikaas'**, the Alliance for Global Good – Gender Equity and Equality is positioned to significantly impact all gender-related issues.

Topic 53. WHAT DID TRUMP SAY ABOUT NATO FUNDING AND WHAT IS ARTICLE 5?

Important for the subject: International Relations

NATO is a "sacred commitment" for the US, President Joe Biden has said as he slammed his predecessor Donald Trump for his recent remarks encouraging Russia to attack certain nations.

- Former **US President Donald Trump** raised a storm of criticism from the White House and top Western officials for suggesting he would not defend NATO allies who failed to spend enough on defense and would even **encourage Russia to attack certain nations of the 74-year-old military alliance by calling the comments "dangerous" and "un-American".**
- Trump took his criticism to a new level at a campaign rally on Saturday in Conway, **South Carolina, when he recounted what he said was a conversation with the "president of a big country".**

What is NATO?

- **NATO was founded in 1949** to counter the **Soviet Union with Cold War** tensions rising, the **North Atlantic Treaty Organization is a political and military alliance of countries from North America and Europe.**
- Enshrined in **Article 5 of its founding treaty** is the principle of collective defense – the idea that an attack on one member is considered an attack on all of them.
- **NATO** takes decisions by consensus but the political and military strength of the **United States means that it is by far the most powerful country** in the alliance, with its nuclear arsenal seen as the ultimate security guarantee.

Which countries are in NATO?

- **NATO currently has 31 members – most of them European nations, plus the United States and Canada.**
- The newest member is **Finland**, which joined last April in reaction to Russia's 2022 invasion of Ukraine.
- **Sweden applied to join along with Finland** but is waiting for Hungary to ratify its application as the final major step before membership.
- During the Cold War, NATO's main focus was protecting **Western Europe from the Soviet Union.**
- After the 1989 fall of the Berlin Wall,NATO expanded to take in former communist bloc countries from Central and Eastern Europe.
- **NATO's members range from large countries such as Britain, France, Germany and Turkey to small nations such as Iceland and Montenegro.**

What is Trump's view about NATO?

- Trump always lambasted **NATO and members such as Germany** and accused them of not paying enough for their own defense and relying on Washington to protect them.
- He openly questioned the **collective defense principle of NATO.**
- Other US administrations have also accused Europeans of not spending enough on defense, but in less strident terms

How is NATO funded?

- Trump has often accused other **NATO members of not paying their dues, giving the impression that the alliance is like a club with membership fees.**
- **NATO** has **some common funds, to which all members contribute.**
- Vast bulk of its strength comes from members' own national defense spending – to maintain forces and buy arms that can also be used by **NATO.**
- However, **NATO members have committed to spending at least 2% of their Gross Domestic Product (GDP) every year on defense** and most of them did not meet that goal last year.

How many NATO members meet the defense spending target?

- According to **NATO estimates** from July last year, 11 members were expected to meet the 2% target in 2023.
- Those members were **Poland, the United States, Greece, Estonia, Lithuania, Finland, Romania, Hungary, Latvia, Britain and Slovakia. Germany, Europe's economic heavyweight**, was estimated at 1.57%.
- The lowest spenders as a share of national **GDP were Spain, Belgium and**

Luxembourg, according to the NATO figures.

What is NATO's Article 5?

- In **Article 5 of the founding treaty, NATO members** declared that an **armed attack against one or more of them in Europe or North America "shall be considered an attack against them all".**
- They agreed they would **"assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action as it deems necessary, including the use of armed force".**
- **Article 5 stops short of a commitment** to an **automatic military response** to help an ally under attack.
- That means the strength of **Article 5 depends on clear statements from political leaders that it will be backed up by action.**

Topic 54. CHINA MOVES ITS NATIONALS INTO ITS VACANT 'DEFENSE VILLAGES' ALONG LAC

Important for the subject: International Relations

Chinese nationals have started occupying several of their model "Xiaokang" border defense villages across India's north-eastern borders which the country has been building along the Line of Actual Control (LAC) since 2019.

- Senior officials said the Chinese in the last few months, have started occupying a couple of these villages built on its side of the **LAC across from Lohit Valley and the Tawang sector of Arunachal Pradesh.**
- While the exact nature of these villages is unclear, the dwellings are understood to be **"dual-use infrastructure" for both civil and military purposes.**
- These are seen as a **Chinese assertion of its territorial claims along the LAC.** They have thus remained a **concern for the military.**
- In the last few months Chinese nationals have been moving in — **it's not known if the occupants are civilians or military personnel.**

About the Recent Developments:

- China has been constructing 628 such **"well-off villages"** along India's borders with the **Tibet Autonomous Region, including Ladakh and Arunachal Pradesh** for over five years now.
- Sources said the Chinese are building infrastructure all along the **LAC bordering the northeast, even as the LAC remains far off** from most inhabited areas or areas of importance except for **Tawang and the Siliguri Corridor.**

- The Chinese have built sufficient infrastructure along the **LAC at Tawang.** Even in other areas such as **Siang valley of Arunachal Pradesh**, we have been seeing rapid development of Chinese infrastructure," an official said.
- According to official sources,**Chinese have consistently improved their existing infrastructure** including improving their connectivity through passes, constructing roads and bridges and their model villages.
- China has also been c**onstructing infrastructure, including border villages, in Bhutanese territory.**
- In the **last three to four years**, India has also stepped up work on its border infrastructure which includes improving forward connectivity, constructing alternate routes to the **LAC as well as connecting them.**

About the Vibrant Villages Programmes:

- Under the **Vibrant Villages programmes,** India plans to develop **663 border villages into modern villages with all amenities in the first phase.**
- Of them, at least **17 such villages along the borders with China in Ladakh, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh**, have been selected for development as a pilot project under the programme.
- In **Arunachal Pradesh, villages in the eastern part of the state** and in the T**awang region have been identified such as Zemithang, Taksing, Chayang Tajo, Tuting and Kibithu.**

In Arunachal Pradesh, three major highways are at different stages of construction:

- **the Trans-Arunachal Highway;**
- **the Frontier Highway; and**
- **the East-West Industrial Corridor Highway.**
- There are plans to improve connectivity to Tawang with the construction of at least two alternate axes — in addition to the existing one connecting **Guwahati and Tawang**.
- Earlier, in **Arunachal Pradesh's Dibang valley**, there were roads just till a little ahead of **Anini, but now roads are being constructed at all sides of the valley.**

Topic 55. OVER 3 LAKH ASHAS APPLY FOR CENTRE'S HEALTH COVER

Important for the subject: Schemes

The **Indian government** has **decided** to **extend** the **Ayushman Bharat free public health cover scheme** to include **Accredited Social Health Activists (ASHAs)**, as well

as **Anganwadi workers and helpers**.

- The **Health Ministry** has already collected **Aadhaar details** for **23 lakh Anganwadi personnel** and over **three lakh ASHA workers** from different states.

Key component:

- The **Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana (AB-PMJAY)** extends health coverage up to **₹5 lakh annually to poor and vulnerable families.**
- Recently expanded to include **healthcare workers** as announced by Finance Minister during the **interim Union Budget 2024-25**.
- The **ASHA program,** pivotal in **community health**, has significantly contributed to **healthcare access** and played a **crucial role** during the **COVID-19 pandemic**.
- As of December 31, 2023, **India** had over **13 lakh Anganwadi workers, over 10 lakh helpers, and 9.83 lakh ASHAs,** making it the **largest community volunteer program globally.**
- Currently, **55 crore individuals** across **12 crore families** benefit from **AB-PMJAY**, with **states/UTs** expanding this at their expense.
- Up to December 20, 2023, about **28.45 crore Ayushman cards** have been issued, leading to **6.11 crore hospital admissions valued at ₹78,188 crore,** including **1.7 crore admissions in 2023 worth over ₹25,000 crore**.
- The scheme has also achieved **gender equity** in **healthcare access**, with **women** making up about **49%** of **Ayushman cardholders** and **48%** of **hospital admissions,** across **26,901 empanelled hospitals,** including **11,813 private ones**.

Accredited Social Health Activists (ASHA):

- The **ASHA program** was launched in **2005-06** as part of the **National Rural Health Mission,** initially in **rural areas**.
- It was later **extended to urban settings** with the introduction of the **National Urban Health Mission in 2013.**
- The **ASHA programme** was introduced as a **key component** of the **community process intervention** and now it has **emerged** as the **largest community health worker programme in the world** and is considered a **critical contribution to enabling people's participation in health.**
- As of June **2022,** there are over **10.52 Lakh ASHAs** in **all states/UTs** (except Goa).

Role of ASHA:

- **ASHA** is a **community-level worker** whose **role** is to function as a **health care**

facilitator, and a **service provider** and to generate awareness on **health issues.**

- Besides delivering **key services** to **maternal child health and family planning**, they also render important services under the **National Disease Control Programme.**
- **ASHA workers, all women,** serve populations of **approximately 1,000** in **rural areas** and **2,000 in urban settings,** with **room for local adjustments**.
- Generally, there is **"1 ASHA per 1000 population".** However, this **norm** can be relaxed in **tribal, hilly** and **desert areas** to **"1 ASHA per habitation"** depending upon the workload.

Selection of ASHA:

- **ASHA** must primarily be a **woman resident** of the **village married/ widowed/ divorced,** preferably in the **age group of 25 to 45 years**.
- She should be a **literate woman** with due preference in selection to those who are qualified **up to 10 standard** wherever they are interested and available in good numbers.
- This may be relaxed only if **no suitable person** with this qualification is available.
- **ASHA workers** are **not recognized** as the **government's "workers",** but are instead classified as holding an **"honorary/volunteer" position**.

Topic 56. 'SWATI' (SCIENCE FOR WOMEN-A TECHNOLOGY & INNOVATION) PORTAL LAUNCHED IN NEW DELHI TO CREATE A SINGLE ONLINE PORTAL REPRESENTING INDIAN WOMEN AND GIRLS IN STEMM (SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS & MEDICINE)

Important for the subject: Schemes

Principal Scientific Advisor to the Government of India Prof Ajay Kumar Sood today launched **"Science for Women-A Technology & Innovation (SWATI)" Portal**.

- The Portal is launched on the occasion of International Day of Women and Girls in Science at Indian National Science Academy (INSA), New Delhi.
- The database o**f SWATI Portal will serve in policy making to address the challenges of Gender-gap.**
- The Portal is a complete interactive database and the first-of-its-kind in India which is developed, hosted and maintained by the **National Institute of Plant Genome Research (NIPGR), New Delhi.**
- The portal is aimed at creating a single online portal representing **Indian Women and Girls in STEMM (Science, Technology, Engineering, Mathematics & Medicine).**
- This was highlighted that this is probably the **world's first Interactive Portal of its kind.**

- The event was organized with a view to focusing on the importance of **"Science for Women & Women in Science"** as well as emerging opportunities and inclusiveness of women in S&T endeavors.

Objectives of Swati portal:

- The portal is beneficial towards **dissemination of knowledge, new advances in fundamental science and role/importance of innovation and entrepreneurship development in strengthening the backbone of Atmanirbhar Bharat.**
- This would also provide an opportunity to discuss and evolve a roadmap for **'Women in Science' & 'Science for Women'.**

The other objectives of the SWATI Portal include

- To scale up the effort exponentially to **include each and every Indian woman in science.**
- **Across all career stages and Important for the subjects, spanning both Academia and the Industry enabling reliable and statistically significant long term research on the issues of equality, diversity and inclusivity in India**;
- **Inclusion of each and every Indian WiS, career stages, Important for the subjects, spanning both Academia and the Industry**;
- Enabling **reliable and statistically significant long term research on the issues of equality, diversity and inclusivity in India**, developing an **active search engine and searchable database.**

Various sections under the portal:

- The various Sections in the portal include Icons –

- **Awardees (Padma / Shanti Swarup Bhatnagar / Stree Shakti Science Samman) & Directors, Secretaries Academy Presidents**;
- Faculty- **Indian Universities, Autonomous organizations including S&T Ministry/ CSIR/ DBT/ DST/ CSIR/ MHRD/ UGC/ GATI/ KIRAN**;
- Research fellows- **Postdocs, JRFs, SRFs, technical Staff; Students-PhD Scholars, Research Interns, Graduates, Post graduates, Undergraduates**;
- **WiS Entrepreneurs, Startups, Business & Science Admini**strators;
- STEMM background professionals in **alternate careers (e.g. Science, Journalism etc)**.

About STEMM:

- **Science, technology, engineering, and mathematics (STEM)** is an umbrella term used to group together the distinct but related technical disciplines of science, technology,

engineering, and mathematics.

- **STEMM stands for Science, Technology, Engineering, Math, and Medicine.**
- **STEMM is important because technology** is expanding into every area of our lives.
- **VAIBHAV Fellowship Programme announced to connect Indian STEMM diaspora with Indian Higher Educational Institutions**
- The Government has **launched a new fellowship programme to connect the Indian STEMM diaspora with Indian academic and R&D institutions** for collaborative research work leading to sharing of knowledge, wisdom, and best practices in the frontier areas of science & technology.

Topic 57. PRITHVI VIGYAN (PRITHVI) SCHEME

Important for the subject: Schemes

Union Minister of Earth Sciences, Shri Kiren Rijiju in a written reply in the Lok Sabha had described the **objectives of the PRITHvi VIgyan (PRITHVI) Scheme.**

- The Union Cabinet Chaired by the Prime Minister, Shri Narendra Modi has approved the overarching scheme **"PRITHvi VIgyan (PRITHVI)" of the Ministry of Earth Sciences**, for implementation during the period from 2021-26 at an overall cost of Rs. 4,797 crore.

The scheme encompasses five ongoing sub-schemes namely:

- **"Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)", "Ocean Services, Modelling Application, Resources and Technology (O-SMART)",**
- **"Polar Science and Cryosphere Research (PACER)", "Seismology and Geosciences (SAGE)" and "Research, Education, Training and Outreach (REACHOUT)".**
- The research & development and operational (services) activities of MoES are carried out by ten Institutes of MoES, viz.
- **India Meteorological Department (IMD), National Centre for Medium Range Weather Forecasting (NCMRWF), Centre for Marine Living Resources and Ecology (CMLRE), National Centre for Coastal Research (NCCR),**
- **National Centre for Seismology (NCS), National Institute of Ocean Technology (NIOT), Indian National Centre for Ocean Information Service (INCOIS), Hyderabad, National Centre for Polar and Ocean Research (NCPOR), Goa, Indian Institute of Tropical Meteorology (IITM), Pune and National Centre for Earth Science Studies (NCESS).**
- A fleet of oceanographic and coastal research vessels of the **Ministry provide required**

research support for the scheme.

Objectives of the scheme:

- **Augmentation and sustenance of long-term observation**s of the atmosphere, ocean, geosphere, cryosphere and solid earth to record the vital signs of the Earth System and change
- **Development of modeling systems for understanding and predicting weather**, ocean and climate hazards and understanding the science of climate change
- Exploration polar and high seas regions of the **Earth towards discovery of new phenomena** and resources;
- **Development of technology for exploration and sustainable harnessing** of oceanic resources for societal applications
- **Translation of knowledge and insights from Earth systems** science into services for societal, environmental and economic benefit.

Topic 58. NITI AAYOG LAUNCHES GREENING INDIA'S WASTELANDS WITH AGROFORESTRY (GROW) REPORT AND PORTAL

Important for the subject: Schemes

Greening and Restoration of Wasteland with Agroforestry (GROW) report and portal was launched today by Prof Ramesh Chand, Member, NITI Aayog at NITI Aayog.

- This multi-institutional effort led by **NITI Aayog utilized remote sensing and GIS to assess agroforestry suitability** across all districts in India.
- Using thematic datasets, **an Agroforestry Suitability Index (ASI)** was developed for national-level prioritization.
- The **report provides state-wise and district-wise analysis, supporting government departments and industries** for greening and restoration projects.
- Current report **underscores the potential benefits of converting underutilized areas,** especially wastelands, for agroforestry.
- Presently, **agroforestry covers 8.65% of India's total geographical area, encompassing approximately 28.42 million hectares.**
- It was shared **fallow land and culturable wastelands** can be converted to productive use through agroforestry.
- Approximately**96% of the Total Geographical Area (TGA) is wasteland,** requiring transformation for productive use.
- **Geospatial technologies and GIS are employed** to map and prioritize these wastelands

for agroforestry interventions.

About Greening and Restoration of Wasteland with Agroforestry (GROW) report and portal:

- The GROW initiative includes the launch of the **"Greening and Restoration of Wasteland with Agroforestry (GROW)-Suitability Mapping" portal** on 'Bhuvan',**ensuring universal access to state and district-level data.**
- This portal is expected to **significantly boost the promotion of agroforestry** initiatives by government bodies.
- The **GROW initiative aligns with national commitments, aiming to restore 26 million hectares** of **degraded land** by **2030** and create an **additional carbon sink of 2.5 to 3 billion tonnes** of carbon dioxide equivalent.

About National Agroforestry Policy in 2014:

- India is the pioneer of the **National Agroforestry Policy in 2014** and aims to **enhance productivity, profitability, and sustainability through this agro ecological land use system**.
- **Agroforestry integrates trees, crops, and livestock, addressing food, nutrition, energy, employment, and environmental challenges.**
- This aligns with global commitments like the **Paris Agreement, Bonn Challenge, UN Sustainable Development Goals, United Nations Convention on Combating Desertification (UNCCD), Doubling Farmers Income, Green India Mission.**

Topic 59. PM ANNOUNCES SURYA GHAR MUFT BIJLI YOJANA

Important for the subject: Schemes

The Prime Minister, Shri Narendra Modi announced the launch of rooftop solar scheme for free electricity – **PM Surya Ghar Muft Bijli Yojana.**

- The scheme was first announced by **finance minister Nirmala Sitharaman** during the Interim Budget 2024-25.

About the scheme:

- The scheme **Surya Ghar Muft Bijli Yojana, with an investment of over Rs. 75,000 crores**, aims to light up 1 crore households by providing up to 300 units of free electricity every month.
- The scheme aims to incentivise the adoption of solar energy among **residential consumers, promoting sustainability and reducing reliance on conventional energy sources**.
- It is a **grid connected rooftop sola**r PV system, where the **DC power generated from a**

solar panel converted to AC power using a power conditioning unit/Inverter and is fed to the grid.

- **All stakeholders** will be integrated into a **National Online Portal.**
- In order to popularize this scheme at the grassroots, **Urban Local Bodies and Panchayats** shall be incentivised to promote rooftop solar systems in their jurisdictions.
- The scheme will lead to more **income, lesser power bills and employment generation for people.**
- Under the scheme, **subsidies will be given directly to people's bank accounts.**
- The government has appointed **eight central public sector undertakings (CPSUs**) to implement the scheme across all states and union territories of the country.
- These include **NTPC, NHPC, EESL, PowerGrid, Grid-India, THDC, SJVN and NEEPCO.**
- These CPSUs will be responsible for installation of rooftop solar in one crore households.
- Under **rooftop installation, solar photovoltaic (PV) panels are fixed atop a building, home, or a residential property**

Topic 60. 390-YEAR-OLD LAMP POST IN NALGONDA UNRAVELS TRADE LINKS OF TELANGANA

Important for the subject: History

A **390-year-old Deepastambham (lamp post)** discovered on the **River Krishna's** edge in **Nalgonda district, Telangana,** highlights **early medieval trade ties**.

About Deepastambham (lamp post):

- The **20-foot tall pillar,** with hollows for lamps and a **multi-lingual inscription**, was found in **Mudimanikyam village.**
- The **discovery** was made by **Ashok Kumar** from the **Public Research Institute for**

History, Archaeology & Heritage, indicating a unique find in the **Krishna River valley.**

- Unlike the common **Dhwajasthambham (flag pole)** in **temple architecture**, **lamp posts** are **rare** in the **Deccan region.**
- The **inscription**, dated **June 1635** and written in **Telugu mixed with Tamil,** suggests the **pillar** was dedicated to **Kasi Viswanatha** and possibly served as a **lighthouse for riverine trade**.
- The village's proximity to **Hyderabad,** ruled by **Qutb Shahi** rulers during the period, and references by **European travellers,** including **Tavernier,** suggest the importance of **riverine trade routes alongside land trade**.

Topic 61. PM MODI TO INAUGURATE BAPS TEMPLE IN UAE

Important for the subject: History

Prime Minister Narendra Modi inaugurated the **BAPS Mandir**, a stunning architectural marvel which is **Abu Dhabi's first Hindu temple.**

- **Prime Minister Narendra Modi** inaugurated the sprawling Hindu temple in Abu Dhabi, built by the **Bochasanwasi Akshar Purushottam Swaminarayan Sanstha** or the BAPS society.
- **Built on 27 acres of land**, this will be the first Hindu stone temple in Abu Dhabi which features a unique blend of **Indian culture and the United Arab Emirates's (UAE) identity.**
- The inauguration of the temple in **Abu Dhabi** also redefines multiculturalism, which remains a contested concept in the Islamic world.
- **Pramukh Swami Maharaj, the tenth spiritual guru and head of the sect**, on **April 5, 1997** had envisioned a Hindu temple in the desert sands of Abu Dhabi which could bring countries, communities and cultures together.
- The **Indian diaspora is almost 3.3-million strong in UAE**, a huge percentage of the

country's population.

What are the features of the temple?

- The **Abu Dhabi temple** is a **traditional stone Hindu temple with seven shikhars.**
- Built in the traditional **Nagar style, the temple's front panel depicts universal values, stories of harmony from different cultures, Hindu spiritual leaders and avatars.**
- Spread over **27 acres, the temple complex is on 13.5 acres**, with a parking area of 13.5 acres that can accommodate around 1,400 cars and 50 buses.
- The **13.5 acres of land was gifted by Sheikh Mohammed Bin Zayed Al Nahyan,** the President of the UAE in 2019. The height of the temple is **108 ft, length 262 ft and width 180 ft.**
- While the external facade uses **pink sandstone from Rajasthan, the interior uses Italian marbles.**
- A total o**f 20,000 tonnes of stones and marble was shipped in 700 containers** for the temple. More **than Rs 700 crore was spent on the temple's construction.**
- The temple has **two central domes, Dome of Harmony and Dome of Peace,** emphasizing human coexistence through the carvings of **earth, water, fire, air, and plants.**
- A **Wall of Harmony, one of the largest 3D-printed walls in the UAE**, features a video showcasing key milestones of the temple's construction.
- The word **'harmony' has been written in 30 different ancient and modern languages.** The **seven shikhar's (spires)** are representative of the seven **Emirates of the UAE.**
- Other amenities include an assembly hall with a capacity of 3,000 people, a community center, exhibitions, classrooms, and a majlis venue.

What are the key architectural features?

- The temple was judged the **Best Mechanical Project of the Year 2019 at the MEP Middle East Awards**, and the **Best Interior Design Concept of the Year 2020.**
- Among the **key architectural features are 96 bells and gaumukhs installed around the path leading to the temple.** These 96 bells are a tribute to **Pramukh Swami Maharaj's 96 years of life.**
- **Nano tiles have been used**, which will be comfortable for visitors to walk on even in the hot weather.
- On the top left of the temple is a stone carving of the scene of **Pramukh Swami Maharaj envisioning the temple in Abu Dhabi in 1997.** Non ferrous material (which is more vulnerable to corrosion) has been used in the temple.

- While many different types of pillars can be seen in the temple, **such as circular and hexagonal, there is a special pillar, called the 'Pillar of pillars',** which has around 1,400 small pillars carved into it.
- Buildings surrounding the **temple are modern and monolithic, with their color resembling sand dunes.**
- Deities from all four corners of India have been featured in the temple.
- These include **Lord Ram, Sita, Lakshman and Hanuman, Lord Shiv, Parvati, Ganpati, Kartikeya, Lord Jagannath.**
- **Lord Radha-Krishna, Akshar-Purushottam Maharaj (Bhagwan Swaminarayan and Gunatitanand Swami), Tirupati Balaji and Padmavati and Lord Ayappa.**
- The temple also has some special features, like a **'holy river' surrounding it,** for which waters from **Ganga and Yamun**a have been brought in.
- The river Saraswati has been depicted in the form of white light. A **Varanasi-like ghat has been created where the 'Ganga' passes.**
- Apart from 15 value tales from Indian civilisation, stories from the **Maya civilisation, Aztec civilisation, Egyptian civilisation,**
- **Arabic civilisation, European civilisation, Chinese civilisation and African civilisation** have been depicted.

What is the significance of the temple?

- **A Muslim king** donated land for a **Hindu Mandir, where the lead architect is a Catholic Christian, the project manager a Sikh, the foundational designer a Buddhist, the construction company a Parsi group, and the director comes from the Jain tradition. Gujarat, especially Ahmedabad and Gandhinagar**, has recently seen increasing interest from and presence of realtors from the UAE.

What is BAPS?

- The temple has been built by the B**ochasanwasi Akshar Purushottam Swaminarayan Sanstha (BAPS), a denomination of the Swaminarayan Sampradaya**, a Vaishnav sect of Hinduism.
- BAPS has a network of around 1,550 temples across the world, including the **Akshardham temples in New Delhi and Gandhinagar, and Swaminarayan temples in London, Houston, Chicago, Atlanta, Toronto, Los Angeles, and Nairobi.**
- It also runs 3,850 centers and 17,000 weekly assemblies globally.