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National Maritime Heritage Complex (NMHC)

Art & Culture

Why in news?

- Cabinet approves development of National Maritime Heritage Complex at Lothal, Gujarat.

Features of the project

- Mini-recreation of the Lothal site through immersive technology.
- **Four theme parks:** Memorial theme park, Maritime and Navy theme park, Climate theme park, and Adventure and Amusement theme park.
- World's tallest lighthouse museum.

About Lothal

- The southernmost site of the Harappan civilization is located in the **Bhal region of Gujarat.**
- Lothal was **nominated** in April 2014 as a **UNESCO World Heritage Site.**

Archaeological ndings at Lothal

- Divided into **Citadel** and Lower Town.
- **Twin** burial
- Centre of **bead industry**
- **Chess** board.
- Dockyard

Related Information

- The government also announced the development of museums at 5 other archaeological sites.
- The ve sites are **Rakhigari** (Haryana), **Hastinapur** (Uttar Pradesh), **Sivasagar**
- (Assam), **Dholavira** (Gujarat) and **Adichanallur** (Tamil Nadu).

Rani Durgavati

Art & Culture

Why in news?

- Madhya Pradesh Cabinet meets in tribal queen's capital on her **500th birth anniversary**

About Rani Durgavati

- **Birth and Dynasty:** Born in 1524, Rani Durgavati hailed from Mahoba's Chandela dynasty (present-day Uttar Pradesh, near the Madhya Pradesh border).
- **Marriage and Rule:** Married Dalpat Shah, son of Gond King Sangram Shah, and took over the rule of Garha-Katanga after he died in 1550.
- **Reign:** Ruled for 16 years with strength and wisdom, managing kingdom affairs with her generals.
- **Mughal Resistance:** Opposed the Mughal Empire's expansion, especially against Akbar's commander, Asaf Khan, and Sultan Baz Bahadur of Malwa.
- **Military Success:** Initially defeated Asaf Khan's forces but was later overwhelmed by the Mughal army.
- **Heroic End:** Refused to surrender and chose to sacri ce her life in battle.
- **Legacy:** Remembered as a symbol of India's self-determination, known for her beauty, grace, courage, and patriotism.
- **Historical Recognition:** Praised by Akbar's court historian, Abul Fazl, for her bravery and sacri ces.

State of Global Water Resource Report 2023

Environment

Why in the news?

- According to the State of Global Water Resource Report 2023, the year 2023 marked the driest year for global rivers in over three decades.

About State of Global Water Resource Report:

- It is an annual report published by the World Meteorological Organization (WMO) since 2021.
- It offers a comprehensive and consistent overview of water resources worldwide.
- It is based on input from dozens of National Meteorological and Hydrological Services and other organizations and experts.

Highlights of the 2023 Report:

- The year 2023 marked the driest year for global rivers in 33 years.
- The last five consecutive years have recorded widespread below-normal conditions for river flows, with reservoir inflows following a similar pattern.
- It notes that 2023 was also the second consecutive year in which all regions in the world with glaciers reported ice loss, the year in which "glaciers suffered the largest mass loss ever registered in 50 years.
  - More than 600 gigatons (Gt) of water were lost across all glaciated regions of the world.
- The report says that 6 billion people currently face inadequate access to water at least one month a year, and this is expected to increase to more than 5 billion by 2050.
- The world is far off-track with Sustainable Development Goal 6 on water and sanitation

EnviStats India 2024

Environment

Why in news?

- **The Ministry of Statistics and Programme Implementation (MoSPI) released the 7th edition of "EnviStats India 2024: Environment Accounts."** This publication follows the **System of Environmental-Economic Accounting (SEEA)** framework, which is an **internationally recognized standard for compiling environmental economic accounts.**

Key Features of the Publication

- **Ocean Accounts:** The **current report introduces a new section on Ocean Accounts, providing a framework for compiling data on ocean health and condition.**
- **Collaboration:** The report benefited from the **expertise of an Expert Group on Ocean Ecosystem Accounts**, which includes members from various ministries and organizations.
- **Energy Accounts:** It includes **Physical Asset Accounts and Physical Supply and Use Tables for Energy, utilizing data from several ministries.**
- **Soil Nutrient Index: Updated values for the Soil Nutrient Index are based on data collected for Soil Health Cards for 2023-24.**
- **Biodiversity Information:** The report covers taxonomic diversity, the **status of leopards and snow leopards, and genetic conservation efforts.**

Highlights from EnviStats India 2024

- **Protected Areas:** A **72% increase** in the **number of protected areas and a 16% increase in their total area from 2000 to 2023.**
- **Mangrove Coverage:** An **8% increase in mangrove coverage from 2013 to 2021. Mangroves are vital components of the ocean ecosystem.**
- **Biodiversity Data:** The report includes data on the diversity of flora and fauna in India and the status of threatened species based on the **IUCN Red List.**

About the System of Environmental-Economic Accounting (SEEA):

- **SEEA is an international statistical standard that describes the relationship between the economy and the environment,**focusing on the stocks and changes in environmental assets.
- **Components: SEEA has 2 main parts:**
  - **SEEA-Central Framework (SEEA-CF):** Concentrates on individual environmental components that support economic activities.
  - **SEEA-Ecosystem Accounting (SEEA-EA): Complements SEEA-CF by organizing data on habitats,** measuring ecosystem services, and linking this information to economic activities.

Global Framework on Chemicals fund

Environment

Why in news?

- **Recently, the Global Framework on Chemicals fund launched its first project, targeting the safe and sustainable management of chemicals and waste.**

About Global Framework on Chemicals (GFC)

- **About:** The Global Framework on Chemicals (GFC) is an international initiative designed to address the safe management of chemicals and hazardous substances on a global scale.
- **Stakeholders:** The Framework is a unique agreement involving diverse stakeholders such as government representatives, private sector entities, non-governmental and intergovernmental organizations, youth, and academia.
- **Adoption:** It was adopted in September 2023 during the fifth International Conference on Chemicals Management (ICCM5), the Framework provides a roadmap to address the environmental and health impacts of chemicals and waste.
- **Aim:** The framework aims to mitigate the risks associated with chemicals throughout their lifecycle, from production to disposal, to protect human health and the environment.
- **Objective:** The GFC outlines five strategic objectives and sets 28 targets to help countries and stakeholders manage chemicals throughout their entire lifecycle, including products and waste management.
- **Alignment:** It aligns with global sustainability goals, particularly the United Nations' Sustainable Development Goals (SDGs), specifically Goal 12 on responsible consumption and production, and Goal 3 on good health and well-being.

Key components of the Global Framework for Chemicals (GFC)

- **Strategic Approach to International Chemicals Management (SAICM):** It aims to achieve safe chemical management aligned with the 2030 Agenda. Focuses on minimizing adverse health and environmental impacts, fostering international cooperation, and building capacity.
- **Multilateral Environmental Agreements (MEAs):** It includes the Stockholm, Basel, and Rotterdam Conventions, which set international legal standards for regulating and phasing out hazardous chemicals and managing chemical waste.
- **Globally Harmonized System (GHS):** It provides a unified approach to classifying chemicals and sharing hazard information, enhancing global consistency and transparency.
- **Capacity Building and Technical Assistance:** It emphasizes support for developing countries through technical assistance, funding, and training to improve chemical safety frameworks.
- **Pollution Prevention and Control:** It encourages best practices in industries for pollution control, promoting safer alternatives, green chemistry, and sustainable production.
- **Chemical Safety in Consumer Products:** It focuses on regulating chemicals in consumer products to protect health, along with developing monitoring systems to track chemical exposure.
- **Research and Information Sharing:** It supports data collection on chemical risks and promotes global information sharing to improve risk assessment and policy-making.
- **Private Sector and Stakeholder Engagement:** It involves industries, NGOs, and academia to innovate in safer chemicals, advocate for stronger regulations, and raise awareness on chemical safety.

Coral Bleaching

Environment

Why in news?

- Recent observations by the National Oceanic and Atmospheric Administration **(NOAA)** indicate that since February 2023, coral reefs have experienced the **most widespread mass bleaching** ever recorded.

About Coral Reefs

- Coral reefs are underwater ecosystems created by **colonies of coral polyps.**
- Coral polyps **use calcium and carbonate** to form the reef structure.
- The corals' vibrant colors come from **symbiotic algae, zooxanthellae,** which provide them with energy.
- Example: **The Great Barrier Reef in Australia** hosts around 400 coral species, 1,500 fish types, 4,000 mollusc species, and six of the seven sea turtle species (UK's NHM).
- The **Coral Triangle in Southeast Asia** is the world's most biologically diverse ecosystem.

Coral Bleaching

- When stressed, corals **expel the algae** living in their tissues, exposing their white skeleton. This weakens corals, increasing risk of starvation and disease.
- **Main Cause:** Climate change and marine heatwaves, resulting in more intense and frequent marine heatwaves.
- Example: The 2014–2017 mass bleaching affected 75% of global reefs (US Office for Coastal Management).
- 91% of the Great Barrier Reef experienced bleaching during the typically cooler La Nina event in March 2022.

Coral Recovery

- **Recovery Potential:** Corals can recover if heat stress is short-lived, but prolonged exposure leads to higher mortality.
- **Outlook:** If warming exceeds 1.5°C, coral reefs are at risk of extinction.

Scientific and Global Initiatives

- **International Coral Reef Initiative:** Aims to raise $12 billion to support coral resilience and sustainable ocean practices.
- **World Economic Forum's Friends of Ocean Action:** Works on sustainable marine resource use.
- **Saudi Arabia'sRegenerative Blue Economy Challenge:** Promotes ecosystem-friendly economic practices.

Status of Renewable Energy in India

Environment

Why in news?

India has recently surpassed a significant milestone in its renewable energy journey, achieving over 200 GW of total renewable energy capacity.

- India's total renewable energy capacity has exceeded 200 GW, currently standing at 201.45 GW.
- Renewable energy accounts for 46.3% of India's total electricity generation capacity of 452.69 GW.

Key Initiatives/Schemes

- **National Green Hydrogen Mission:**
  - **Promote Green Hydrogen:** Encourage the production and use of green hydrogen to lower carbon emissions.
  - **Develop Infrastructure:** Establish infrastructure for the production, storage, and distribution of green hydrogen.
  - **Boost R&D:** Enhance research and development in green hydrogen technologies to improve efficiency and reduce costs.

  PM-KUSUM:
  - **Solar Power Promotion:** Encourages farmers to install solar panels on unused land and rooftops.
  - **Financial Support:** Offers financial assistance to help farmers reduce reliance on conventional energy and sell surplus power.
  - **Sustainable Agriculture:** Supports sustainable farming by providing reliable energy for irrigation.

- **PM Surya Ghar Scheme:**
  - **Rooftop Solar Installation:** Aims to promote the installation of rooftop solar panels on residential homes to generate clean energy.
  - **Subsidies and Incentives:** Provides financial subsidies and incentives to encourage homeowners to adopt solar energy.
  - **Energy Independence:** Enhances energy security and reduces electricity bills for households by promoting the use of renewable energy.

Investment and Infrastructure

- India allows **100% Foreign Direct Investment (FDI) under the automatic route.**
- There is a waiver of Inter-State Transmission System charges for certain projects until specific deadlines.
- Additionally, **Ultra Mega Renewable Energy Parks** are being established for large-scale projects.

Regulatory Framework

- The **Electricity (Rights of Consumers) Rules, 2020** were issued to facilitate net metering.
- The **Green Energy Open Access Rules, 2022** were launched to promote renewable energy, along with Standard Bidding Guidelines for tariff-based competitive bidding.

Elephant Census Report — Environment

Why in news?

- Since February, the release of the Environmental Ministry's "**Status of Elephant in India 2022-23**" report has been delayed. The **elephant census is conducted every five years by the Wildlife Institute of India** (WII), under the Ministry of Environment.

The finding of the report "Status of Elephant in India 2022-2023"

- The **elephant population has dropped by 20% over five years**, with a 41% decline in the Central Indian and Eastern Ghats regions compared to 2017 estimates.
- The unreleased report cites "**mushrooming developmental projects**," such as mining and infrastructure construction, as major threats to elephants.
- Southern West Bengal, Jharkhand, and Orissa saw the biggest losses in elephant numbers within the Central Indian and Eastern Ghats cluster, with declines of 84%, 68%, and 54%, respectively.
- The Western Ghats region also saw a population drop, with Kerala's elephant numbers down by 51%, a loss of nearly 2,900 elephants.
- The **report highlights the fragmentation of elephant populations in the Western Ghats**, from southern Maharashtra to Kerala, due to changing land use, such as commercial plantations, farmland fencing, human encroachment, and development projects.

Graded Response Action Plan (GRAP) — Environment

Why in news?

- As Delhi's Air quality deteriorates, **Stage 1 of GRAP** has been implemented.

About GRAP

- GRAP is a structured framework to combat air pollution in **Delhi and surrounding areas.**
- It was introduced as an emergency response mechanism, and its implementation is triggered **when the Air Quality Index** (AQI) **reaches "poor" levels.**
- It was notified in **2017** by the **Ministry of Environment, Forests and Climate Change (MoEFCC)** based on the plan submitted by the **Central Pollution Control Board (CPCB)**.
- It was approved by the **Supreme Court** in 2016 in its verdict on **M. C. Mehta vs. Union of India.**
- Implementing Agency is **Commission for Air Quality Management** in NCR & Adjoining areas (CAQM).
- **Different stages of GRAP:** GRAP consists of **four stages**, each **with targeted actions t**o be taken by the necessary authorities and agencies.

Air Quality Index (AQI)

- Air Quality Index (AQI) is a number, which is a **measure of air quality**.
- AQI value ranges from **0 to 500**. The higher the AQI, the worse the air.
- National AQI was **launched in India in 2014** by the Ministry of Environment, Forests and Climate Change (MoEFCC) as part of the Swachh Bharat campaign.
- The AQI scheme was recommended by **IIT Kanpur** and an **Expert Group**.
- AQI considers eight pollutants for which 24-hour average **National Ambient Air Quality Standards (NAAQS)** are prescribed. The pollutants are: **Particulate Matter (PM10), Particulate Matter (PM2.5), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2), Carbon Monoxide (CO), Ozone (O3), Ammonia (NH3), Lead (Pb)**.

Ecomark Rules - Mission LiFE

Environment

Why in news?

- Ministry of Environment, Forest and Climate Change notifies **Ecomark**
- **Rules under Lifestyle for Environment initiative.**

Ecomark Rules 2024

- Notified by the Ministry of Environment, Forest and Climate Change.
- **Part of the LiFE Mission** (Lifestyle for Environment) launched by PM Narendra Modi in 2021.
- Replaces the 1991 Ecomark Scheme.
- Implemented by **CPCB in partnership with BIS.**

Key Objectives

- **Promote Green Industries:** Encourage eco-friendly production and sustainability.
- **Consumer Awareness:** Help consumers make informed choices based on environmental impact.
- **Support Circular Economy:** Promote recycling and resource conservation.

Eligibility Criteria

- Must reduce pollution, minimize waste, or reduce emissions.
- Preference for recyclable products or those made from recycled materials.
- Reduce non-renewable resource use and consider environmental impact throughout the product life cycle.

Application & Verification

- Manufacturers apply to CPCB for Ecomark.
- Verification by CPCB or a designated verifier.
- Validity: 3 years or until criteria change, with renewal options.

Mission LiFE

- **Launch:** Mission LiFE was launched by Prime Minister Narendra Modi on October 20, 2022.
- **Concept:** Promotes an eco-friendly lifestyle focused on mindful and purposeful consumption, introduced at COP26 in Glasgow on November 1, 2021.
- **Objectives:**
  - Shift from a "use-and-dispose" economy to a **circular economy.**
  - Encourage **sustainable, environmentally conscious** living.
  - Motivate 1 billion people to take **actions for environmental protection** by 2028.
- **P3 Model:** Emphasizes the "**Pro Planet People" spirit.**
- **Core Principle:** Based on a 'Lifestyle of the planet, for the planet, and by the planet'.

Kaziranga National Park

Environment

Why in news?

- A recent study identified over 446 butterfly species in Kaziranga National Park, establishing it as **India's second hotspot for butterfly diversity**, following Namdapha National Park.

About Kaziranga National Park:

- **Location**: Situated in the Golaghat and Nagaon districts of Assam.
- **Establishment**: Declared a national park in 1974.
- **UNESCO Status**: Recognized as a UNESCO World Heritage Site.
- **Rhinoceros Population**: Home to two-thirds of the world's greater one-horned rhinoceros population.
- **Geographical Significance**: The largest undisturbed area in the Brahmaputra Valley floodplains.
- **Rivers**: The Brahmaputra flows along the northern boundary, with smaller rivers and streams such as Diphlu, Mora Diphlu, and Mora Dhansiri traversing the park.
- **Landscape**: Characterized by dense forests, tall elephant grass, rugged reeds, marshes, and shallow pools.
- **Fauna**: Hosts numerous endangered and threatened species, including the rhinoceros, tiger, eastern swamp deer, elephant, buffalo, hoolock gibbon, capped langur, and Gangetic river dolphin.
- **Vegetation**: A mix of eastern wet alluvial grasslands, semi-evergreen forests, and tropical moist deciduous forests.

About Butterflies

- **Classification:** Butterflies belong to the order Lepidoptera in the phylum Arthropoda, which includes moths.
- **Pollination Role:** They, along with bees, are essential for pollinating plants and crops.
- **Indicator Species:** Butterflies indicate environmental quality and community changes.
- **Ecological Importance:** A decline in their populations can harm predators like wasps, spiders, and birds due to loss of food.
- **Biodiversity Indicator:** Their abundance signifies rich biodiversity in a region.

Carbon-trapping Sedimentary Rock

Environment

Why in news?

- A study in Sedimentologika has identified a new sedimentary rock formed from coastal slag deposits in the U.K.

Sedimentary Rocks

- Sedimentary rocks are formed from the **accumulation and compaction of sediments,** which can include fragments of pre-existing rocks, minerals, and organic material from living organisms.
- **Characteristics:** They often exhibit distinct layering or bedding due to the gradual deposition of sediments over time.
- **Types:** Sedimentary rocks are categorized into:
  - **Clastic:** Made from fragments of other rocks (e.g., shale).
  - **Biogenic:** Formed from the remains of living organisms (e.g., limestone, chert).
- **Environmental Impact:** These rocks play a crucial role in Earth's geology and can contain valuable resources, such as fossil fuels and groundwater.

About Slag

- Slag is a composite material made up of **metal oxides and silicon dioxide.**
- It is generated during the **steelmaking process** in the iron and steel industries.
- Slag is a significant part of artificial ground.
- The **lithification process** converts industrial waste, including slag, into sedimentary rocks.
- Over time, these **sedimentary rocks weather and release sediments** into the environment.
- The sediments often contain toxic metals due to the industrial waste, leading to potential contamination of soil, water, and air.

Why in news?

- The Food and Agriculture Organization (FAO) report "The unjust climate" has warned about the negative impacts of climate change on the farming population in India.

About the report

- **Income Loss Due to Climate Stress**
  - **Poor households globally lose 5% of their total income in an average year due to heat stress and 4.4% due to floods,** which are significantly more than better-off households.
- **Widening Income Gap**
  - **Floods increase the income gap between poor and non-poor households in rural areas by approximately $21 billion annually, while heat stress contributes over $20 billion to this disparity.**
- **Backtrack to poverty**
  - **While the poverty rate of India dropped dramatically from 42.5 per cent in 2005/06 to just 8.6 per cent in 2022/24, according to the latest estimates from the India Policy Forum (Desai et al. 2024),** a significant portion of the population has been pushed back due to unpredictable life events, particularly extreme weather events driven by climate change.
- **Long-term Temperature Increases**
  - Long-term temperature rises lead to an increase in poor households' dependency on climate-sensitive agriculture relative to that of non-poor households. **A 1° C increase in average long-term temperatures leads to a 53% increase in the farm incomes of poor households and a 33% decrease in their off-farm incomes, relative to non-poor households.**
- **Gendered impact**
  - In low- and middle-income countries (LMICs), households headed by women in rural areas suffer significantly greater financial losses than those headed by men.
  - On average, **female-headed households lose 8 per cent more of their income due to heat stress and 3 per cent more due to floods compared to male-headed households.** This translates to a **per capita reduction of USD83 due to heat stress and USD 35 due to floods, totalling USD 37 billion and USD 16 billion respectively across all LMICs.**
  - **If the average temperature increases by just 1°C, women would face a 34 percent greater loss in their total incomes compared to men.**
- **Increase in child and unpaid labourers**
  - Extreme temperatures, meanwhile, worsen child labour and increase the unpaid workload for women in poor households.
- **Maladaptive coping strategies**
  - Extreme weather also compels impoverished rural households to resort to **maladaptive coping strategies such as reducing income streams, selling off livestock, and shifting spending away from their farms.**

Steps taken by government to safeguard farmers from the impact of climate change

- **National Innovations on Climate Resilient Agriculture (NICRA):**
  - The project aims at **strategic research on adaptation and mitigation, demonstration of technologies on farmers' fields and creating awareness among farmers and other stakeholders to minimize the climatic change impacts on agriculture.**
  - **In the strategic research, the main thrust areas covered are**
    (i) identifying the most vulnerable districts/regions,
    (ii) evolving crop varieties and management practices for adaptation and mitigation,
    (iii) assessing climate change impacts on livestock, fisheries and poultry and identifying adaptation strategies.
- **Contingency plan for all agriculture districts:**
  - The District Agricultural Contingency Plan (DACP) is a **technical document that helps farmers and line departments prepare for and implement measures to manage weather aberrations and extreme climatic events.**
  - The Government of India has **developed DACPs for 651 agriculturally important districts in the country.**

The DACPs cover a range of weather events, including Droughts, Floods, Unseasonal rains, Heat waves, Cold waves, Frost, Hailstorms, and Cyclones.

- The DACPs recommend location-specific climate-resilient crops, varieties, and management practices for farmers. The benefits of implementing DACPs include Climate change mitigation, Food production stability, and Nutritional and livelihood security for farming communities.

The National Mission for Sustainable Agriculture (NMSA):

- It aims to improve agricultural productivity, sustainability, and climate resilience in India. Its components are:
- **Rainfed Area Development (RAD)**
  - It has been developed on an area-based approach for the development and conservation of natural resources along with farming systems. **It is a combination of various aspects of agriculture such as crops, fishery, livestock, horticulture, forestry and other agro-based activities to act as a source of farmer's revenue.**
- **On-Farm Water Management (OFWM)**
  - It aims to enhance water use efficiency by promoting technological interventions like drip & sprinkler technologies, efficient water application & distribution systems, secondary storage etc.
- **Soil Health Management**
  - It aims to promote **Integrated Nutrient Management (INM) through the judicious use of chemical fertilisers in conjunction with organic manures and biofertilizers for improving soil health and productivity.**
  - It also provides for fertiliser testing facilities to improve soil test-based recommendations to farmers for improving soil fertility.
- **Climate Change and Sustainable Agriculture: Monitoring, Modeling and Networking (CCSAMMN)**
  - It aims to **create and disseminate knowledge and updated information on climate change.**
- **It supports pilot blocks for spreading rainfed technologies and coordinates with other schemes or missions like MGNREGS, NFSM, RKVY, IWMP, Accelerated Irrigation Benefit Program (AIBP), and NMAET.**

Per Drop More Crop (PDMC):

- It is a component of **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)** which mainly focuses on water use efficiency at the farm level through precision/ Micro Irrigation (Drip and Sprinkler Irrigation).

Promotion of organic farming:

- With the aim of assisting farmers to adopt organic farming, improve remunerations and improve climate resilience, the government has initiated various organic farming-related initiatives which include:

Mission Organic Value Chain Development for North East Region (MOVCD):

- It aims at the **development of models of excellence in organic farming through a mix of traditional wisdom and modern science in value chain mode to ensure long-term soil fertility buildup and resource conservation.**

Paramparagat Krishi Vikas Yojana(PKVY):

- it was launched to encourage chemical-free farming. It is **implemented in the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, during the 12th plan period. It aims to support the development of the entire value chain starting from inputs, seeds, and certification.**

Centre Issues Guidelines on Seaweed Import

Environment

Why in news?

- The recent notification by the Indian government concerning the import of live seaweeds marks a significant step towards enhancing the country's coastal economy and promoting sustainable practices in aquaculture.

Objectives of the Guidelines

- **Addressing Seed Shortages:** The main goal of these guidelines is to enable the introduction of quality germplasm of seaweed species. Today, India's seaweed industry still has challenges because of raw materials, particularly the seed for Kappaphycus, the most widely grown species. This policy seeks to help the government ensure that domestic farmers get access to better seed materials that would increase production yield.
- **Economic Upliftment:** They address the need to strengthen economic prospects where communities live particularly along the coast. As a major economic activity, the creation of seaweed enterprises aims to improve the soci-economic welfare of fisherfolk and other stakeholders. This is in line with other objectives under PMMSY with production aspires of 1.12 million tonnes of seaweed in 2025.

Regulatory Framework

- **Application Process:** Keeping live seaweeds for import is only allowed in India under very specific conditions which will require the importer to make an elaborate application to the Department of Fisheries. The National Committee on Introduction of Exotic Aquatic Species in Indian Waters shall assess this application rigorously. Upon approval an import permit will be issued within four weeks thereby simplifying the process of importing high quality germplasm.
- **Quarantine and Biosecurity Measures:** To prevent the invasion of undesirable species in the Indian marine environment, the guidelines contain very stringent measures on quarantine and biosecurity. These protocols are especially needed to avoid introducing new pests and diseases that may be fatal to aquatic life in that area. After import control measures, monitoring and risk assessment will also be implemented for the sustenance of the environment while pursuing TiO2 industry development.

Investment in Infrastructure

- The government has also produced significant efforts towards putting in place framework that will support this effort.
- ₹127.7 crore has been proposed to be spent for a Multipurpose Seaweed Park in Tamil Nadu to facilitate research and development of seaweed farming.
- This facility is believed to contribute significantly in the downstream processing industries hence generating more employment in the coastal villages.

Environmental Sustainability

- The guidelines emphasize **environmental sustainability**, ensuring that while economic growth is pursued, ecological balance is maintained.
- The government has articulated its commitment to uphold environmental protection standards throughout this initiative, recognizing that sustainable practices are vital for long-term success in aquaculture.

Living Planet Report 2024

Environment

Why in the news?

- Recently, 'Living Planet Report 2024' was released regarding the status of wildlife.

Living Planet Report:

- This is a biennial report
- It is released by the World Wildlife Fund (WWF)

Key findings of the report:

- According to the report, the average size of wildlife population has declined by 73% in the last 50 years during the year 1970-2020.
    - This decline was 69% in the report of the year 2022.

- The most rapid decline in wildlife population has been recorded in Latin America and the Caribbean (95%), Africa (76%), Asia-Pacific (60%).
- The highest decline in the report has been recorded in freshwater ecosystems at 85%.
- This is followed by a 69% decline in terrestrial ecosystems and a 56% decline in marine ecosystems.
- The report discusses the dire consequences of losing some of the most valuable ecosystems such as the Amazon rainforest and coral reefs.
- The report cites pollution as an additional threat to wildlife populations in Asia and the Pacific, which have declined by an average of 60%.
- The report says that when the population of a species falls below a certain level, that species is no longer able to perform its normal role in the ecosystem.
  - These include seed dispersal, pollination, grazing, nutrient cycling and many other processes that keep the ecosystem functioning.
- The biggest threat to wildlife populations worldwide is habitat loss and degradation.
- he report also highlights other risks including overexploitation, climate change, pollution, introduction of invasive species and introduction of new diseases.

World Wildlife Fund (WWF):
- It is an international non-governmental organization.
- It was founded in the year 1961.
- Headquarters - Gland (Switzerland)
- Its objective is to protect endangered species of wildlife and preserve natural habitats.
- Reports published by WWF –
  - Living Planet Report
  - Living Planet Index
  - Ecological Footprint Calculation

Global Ecosystems Atlas

Environment

Why in news?
- Global Ecosystems Atlas was launched at the ongoing 16th Conference of Parties (COP16) to the United Nations Convention on Biological Diversity (CBD).

Global Ecosystems Atlas(GEA)
- It has been developed by the **Group on Earth Observations (GEO) as the first global tool for ecosystem mapping and monitoring.**
- The atlas targets the major challenges such as biodiversity loss, climate change, and land degradation globally.

Objectives
- Its atlas aims to transform the understanding and protection of vital natural systems in the world.
- It will provide **crucial data on ecosystem health and risks associated with the ecosystem.**
- The atlas aims to enable countries in informed decision-making for sustainable management of ecosystems.
- Technology features used
  - GEA will utilise the **Earth observation, artificial intelligence, and field data to fill data gaps in ecosystem management.**
  - The atlas map has been aligned with the **Global Ecosystem Typology for consistency for the International Union for Conservation of Nature.**
- **Importance of the Atlas for Stakeholders**
  - **Governments:**
    - It is an essential tool for **countries, businesses, communities, and institutions for ecosystem conservation and planning.**
    - It supports the monitoring framework under the **Kunming-Montreal Global Biodiversity**

- **Framework.**
  - It also guides the countries in compliance with the Convention on Biological Diversity(CBD) obligations on ecosystem protection.
  - It will help governments to monitor ecosystems, fulfil international commitments, and track biodiversity indicators.
- **Businesses:**
  - Businesses and corporations can incorporate environmental risks into their business strategies.
- **Local Communities:**
  - Local communities can also access data for conservation and restoration in their areas.
- **Financial Institutions:**
  - The atlas helps FIs to make informed investments and align their projects with sustainability goals.
- **Academics and Researchers:**
  - Open data access of the Atlas will help academics and researchers for better research on ecosystems at global and regional levels.
  - Thus the atlas will prove to be an instrumental tool for Galba ecosystem management.

Why in news?

- **Sonam Wangchuk**, a well-known climate activist, was detained on the Delhi border while leading a protest aimed at pressuring the Central government to grant Ladakh inclusion in the **Sixth Schedule of the Indian Constitution**

Ladakh's Demand for 6th Schedule

- **Protection of Tribal Identity**: Given Ladakh's predominantly tribal population (over 90%), this status is sought to preserve the unique cultural and ethnic identity of its indigenous communities, such as the Buddhists and Muslims.
- **Autonomous Governance**: The 6th Schedule would grant Ladakh more autonomy enabling local decision-making on matters such as land, resources, and cultural affairs, which are crucial for Ladakh's tribal population.
- **Preservation of Land and Resources**: Granting 6th Schedule status would protect Ladakh's land and resources from external exploitation by giving local bodies control and preventing non-locals from acquiring land easily.
- **Protection of Cultural Heritage**: The 6th Schedule status would help preserve Ladakh's rich cultural heritage, languages, and traditional practices.
- **Concerns over Economic and Political Marginalization**: Seeking 6th Schedule status is seen as a way to mitigate fears of economic and political marginalization within the Union Territory structure.
- **Prevent Demographic Changes**: The status would help in controlling demographic changes, as it could restrict the migration of people from outside Ladakh into the region.
- **Local Development Priorities**: Ladakh people would be able to set their own development priorities, focusing on areas like education, healthcare, and infrastructure that align with the region's needs and traditional way of life.

Significant provisions of the Sixth Schedule:

- Autonomous districts and autonomous regions:
  - The tribal areas in the four states of Assam, Meghalaya, Tripura, and Mizoram are to be administered as Autonomous Districts.
  - If there are different Scheduled Tribes in an autonomous district, the Governor can divide the district inhabited by them into Autonomous Regions.
  - The Governor is empowered to organize and reorganize the autonomous districts. He can also increase, decrease the boundaries or alter the name of any autonomous district.
- Constitution of District Councils and Regional Councils:
  - There shall be a District Council for each autonomous district consisting of not more than 30 members, of whom not more than four persons shall be nominated by the Governor, and the rest shall be elected on the basis of adult suffrage.
  - There shall be a separate Regional Council for each area constituted an autonomous region.
- Powers of the District Councils and Regional Councils to make laws:
  - The District and Regional councils are empowered to make laws on certain specified matters like lands, management of forest (other than the Reserved Forest), inheritance of property, etc.
  - These councils also empowered to make law for the regulations and control of moneylending or trading by any person other than Scheduled Tribe residents in that Scheduled District.
  - However, all laws made under this provision require the assent of the Governor of the State.
- Administration of justice in autonomous districts and autonomous regions:
  - The District and Regional Councils are empowered to constitute Village and District Council Courts for the trial of suits and cases where all parties to the dispute belong to Scheduled Tribes within the district.
  - The High Courts have jurisdiction over the suits and cases which is specified by the Governor.
  - However, the Council Courts are not given the power to decide cases involving offenses punishable by death or imprisonment for five or more years.
- The District and Regional Councils are empowered to assess and collect land revenue and impose taxes on professions, trades, animals, vehicles, etc. The Councils are given the power to grant licenses or leases for the extraction of minerals within their jurisdiction.
  - The District Councils and Regional Councils are given the power to establish, construct or manage primary schools, dispensaries, markets, cattle ponds, fisheries, roads, road transport and waterways in the districts.

Section 6A of Citizenship Act

Polity

Why in news?

- The Constitution Bench of the Supreme Court **upheld the constitutionality**
- of Section 6A of the Citizenship Act, 1955, with a majority verdict of 4:1.

Background

- **Section 6A** of the Citizenship Act, 1955 grants citizenship to immigrants who entered Assam between January 1, 1966, and March 24, 1971, as part of the Assam Accord.
- It also provides that foreigners who entered Assam **before January 1, 1966**, and have been 'ordinarily resident' there will have the same rights and obligations as Indian citizens.

Issues Raised

- The cut-off date establishes a different citizenship standard for immigrants in Assam compared to the rest of India (July 1948), **violating the right to equality under Article 14 of the Constitution.**
- The provision also **violates** the rights of Assam's indigenous people under
- **Article 29** by altering the state's demographics.

Supreme Court's Judgment

- The Court stated that the presence of diverse ethnic groups in a state does not violate Article 29(1) of the Constitution, which protects minority interests.

ASSAM ACCORD

- The Assam Accord was an agreement among the **Central Government, Assam's State Government, and Assam Movement leaders**.
- It aimed **to stop illegal migration** from Bangladesh into Assam and its neighboring regions.
- **Section 6A** was added to the Citizenship Act of 1955, **specifically addressing Assam's migration issues.**
- This provision mandates **detecting and deporting foreigners who entered Assam after March 25, 1971**, post-Bangladesh's creation.
    - Section 6A addresses the humanitarian needs of migrants of Indian origin while balancing migration's economic and cultural impact on Indian states.

Marital Rape

Polity

Why in news?

- The Supreme Court of India is examining the constitutionality of Section 63, Marital Rape Exception (MRE) in the Bharatiya Nyaya Sanhita, 2023, which exempts husbands from rape charges involving their wives over eighteen.

Arguments for Criminalising Marital Rape

- **Marriage is not a license:** A marriage should not be viewed as a license for a husband to forcibly rape his wife with impunity.
- **Article 21 of Indian Constitution:** A woman is entitled to refuse sexual relations with her husband as the right to bodily integrity and privacy is an intrinsic part of Article 21 of the Constitution.
- **Article 14 of Indian Constitution:** Indian women deserve to be treated equally under article 14 and an individual's human rights do not deserve to be ignored by anyone, including by their spouse.
- **Global Precedent:** Many countries have already criminalized marital rape, recognizing it as a form of sexual violence. India, being a progressive democracy, should align with global standards on protecting women's rights.
- **National Family Health Survey-5 findings:** The National Family Health Survey-5 (2019-2021) reveals that nearly one-third of married women (18-49 years) in India have experienced physical or sexual violence from their husbands.

Arguments against Criminalising Marital Rape

- **Destabilize marriage as an institution:** It may create absolutely anarchy in families and destabilize the institution of marriage.
- **Misuse of law:** It may become an easy tool for harassing the husbands by misusing the law similar to the misuse of section 498A of the IPC.
- **Implementation issues:** Criminalizing marital rape will create issues like veracity of testimony, evidences in the courts etc.
- The **Ministry of Home Affairs** argued that being married does not take away a woman's right to give or refuse consent. There are other laws in place to protect a woman's consent within marriage under Indian Penal Code (IPC).

Judicial views

- **Karnataka High Court (2022):** Ruled that a husband can be prosecuted for raping his wife, emphasizing no legal exception should license crimes, citing the 2013 Justice J.S. Verma Committee report.
- **Delhi High Court (2022)**: Issued a split verdict. Justice Shakdher found the MRE unconstitutional, citing bodily autonomy. Justice Shankar upheld it, seeing marital sex as a "legitimate expectation."
- **Supreme Court (2022)**: Recognized marital rape in cases involving intimate partner violence, acknowledging that sexual assault by a husband could constitute rape.

New Statue of Lady Justice — Polity

Why in news?

- The Chief Justice of India unveiled a **new 'lady justice' statue** at the Supreme Court.

About the Lady Justice Statue

- Traces back to Greek mythology with Themis and Roman mythology with Justitia, traditionally depicted with a blindfold, scales, and a sword.
- Introduced during colonial rule and depicted in the Calcutta High Court (1872) and the Bombay High Court.
- It is often depicted alongside Prudentia, another allegorical figure representing wisdom and prudence.

New statue significance

- **Decoloniality**: The new statue replaces the Western attire with a saree, bringing the figure closer to Indian tradition, as a symbol of decolonization.
- **Open Eyes**: The removal of the blindfold signifies that the law sees everyone equally in the Indian context, addressing the social diversity and discrimination faced by underprivileged sections.
- **Constitutional Supremacy**: The sword has been replaced with the Indian Constitution, symbolizing that the Constitution is the ultimate source of authority and justice in India's legal system.
- **Impartiality Preserved**: The scales remain a central feature, symbolizing the continued commitment to impartiality in weighing evidence before delivering judgments.

NITI Aayog's Women Entrepreneurship Platform — Polity

Why in news?

- NITI Aayog has launched its maiden State Chapter of **Women Entrepreneurship Platform (WEP)** in association with WE Hub and the Telangana government.

About Women Entrepreneurship Platform (WEP)

- **This platform is aimed** at encouraging women to start and grow businesses by offering support in areas like digital skills, access to financial services, mentorship, and market opportunities.
- **WE Hub**, India's first incubation center created specifically to support women entrepreneurs, will manage the WEP in Telangana.
- The **'WE Bridge' initiative** was also launched, offering a one-stop platform where women entrepreneurs in Telangana can easily access funding, technology, and networking opportunities.

- **Objectives of the WEP Telangana Chapter:** The WEP Telangana Chapter has three main objectives-
  - **Empower women with digital and financial skills:** Helping women learn essential skills that will improve their business operations.
  - **Connect women entrepreneurs with industry leaders:** Offering mentorship from experienced business leaders to guide women in growing their businesses.
  - **Facilitate market access:** Helping women entrepreneurs connect with investors and find business opportunities that can help them succeed.

Global Hunger Index

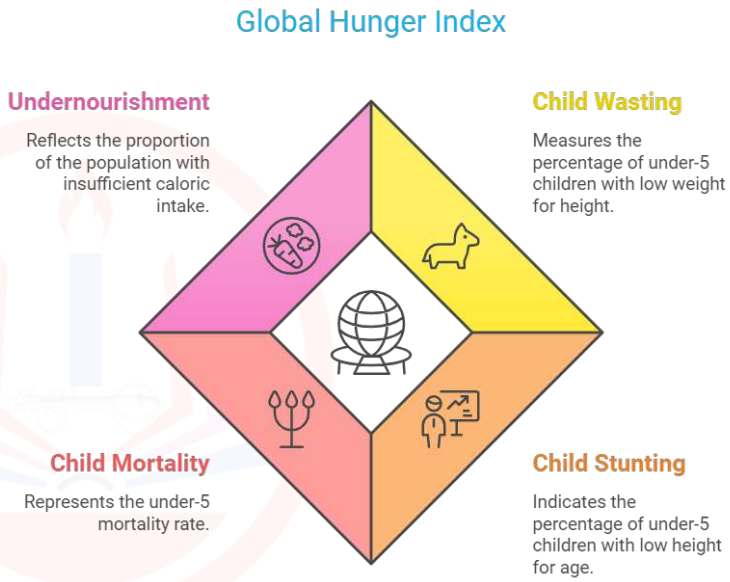
Polity

Why in news?

- Recently, the **Global Hunger Index (GHI) 2024** was released by **Concern Worldwide and Welthungerhilfe.**

About GHI

- Prepared jointly by Concern **Worldwide and German organisation Welt Hunger Life.**
- GHI scores are based on the values of **four indicators.**



India's Rank

- India scores 27.3, placing it at **105th out of 127 countries.**
- **Issues in the Methodology of the Global Hunger Index**
- **Unrepresentativeness**: **Three out of four indicators focus on the health of children under five**, which may not accurately represent the entire population's hunger status.
- **Methodological Concerns**: **The sample size of undernourishment** used in the study is quite small, consisting of **only 3,000 respondents.**
- **Irrelevant Questions**: The survey **fails to include factual questions** that are pertinent to the assessment, such as inquiries about government food support.
- **Uniform Caloric Benchmark**: A single calorie benchmark is applied **across diverse regions in India**, ignoring local variations in dietary needs.
- **Reference Year Issues**: The choice of the reference year for data collection raises questions about the relevance and accuracy of the findings.

Jal Hi Amrit Scheme

Social Issues

Why in news?

- Recently, the Minister of Housing and Urban Affairs has launched the "Jal Hi Amrit" scheme.

About Jal Hi Amrit scheme

- Launched under the **AMRUT 2.0 scheme.**
- Aimed at incentivizing States and UTs **to manage used water treatment plants (UWTPs/STPs) efficiently.**
- Ensures recyclable, good-quality treated water that meets environmental standards on a sustained basis.
- **Promotes competition among cities** and capacity building, encouraging them to achieve high-quality treated water at treatment facilities.
- **Focuses on capacity building** and incentivizing qualitative improvements in treated discharge effluent.
- Involves a **mid-course assessment** and water quality testing.
- The final assessment will result in the award of **Clean Water Credits** through a Star-rating (3 to 5 stars), valid for six months.

PM's Internship Scheme

Social Issues

Why in news?

- The Prime Minister's Internship Scheme, announced by the Union Finance Minister during the **Budget speech**, was launched on October 3.

Objective

- To equip India's youth with the tools they need to thrive in the job market.
- The Project aims for **1.25 lakh internships for the Financial Year 2024-25**.

Eligibility

- Youth aged **21 to 24 years**.
- Specifically for Indian nationals who are not employed full-time or engaged in full-time education.
- Candidates enrolled in **online or distance learning programs** are eligible to apply.

Ineligibility

- Graduates from IITs, IIMs, National Law Universities, IISER, NIDs, and IIITs.
- Holders of CA, CMA, CS, MBBS, BDS, MBA, or any master's/higher degree.
- Individuals in skill training, apprenticeships, internships, or student training under government schemes.
- Completers of apprenticeships under NATS or NAPS.
- Family income exceeding Rs 8 Lakh for FY 2023-24.
- Family members of permanent or regular government employees.

Criteria for partner companies

- Top 500 Companies identified based on average CSR expenditure over the last three years.
- Other companies can also participate with approval from the **Ministry of Corporate Affairs (MCA)**.

Financial Assistance

- **Monthly stipend of ₹5,000** throughout the internship.
- ₹500 contributed by partner companies and remaining ₹4,500 will be provided by the government via **Direct Benefit Transfer (DBT)**.
- Additionally, a **one-time grant of ₹6,000** after joining the internship.
- Insurance Coverage under **Pradhan Mantri Jeevan Jyoti Bima Yojana** and **Pradhan Mantri Suraksha Bima Yojana**, with the premium paid by the government.

Pradhan Mantri Garib Kalyan Anna Yojana

Social Issues

Context:

- Cabinet approves continuation of supply of free **Fortified Rice** under
- Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)

About PMGKAY

- The Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) was launched by the Indian **government in April 2020** as a response to the COVID-19 pandemic..
- PMGKAY is part of the broader Pradhan Mantri Garib Kalyan Package, aimed at offering relief to those adversely affected, particularly the poor and marginalized.
- In addition to subsidized rations under the **National Food Security Act, the scheme offers 5 kg of free food grains each month to eligible families.**

Eligibility Criteria

- Families in the Antyodaya Anna Yojana (AAY) and Priority Households (PHH) categories are eligible.
- PHH familiesareidentifiedbyStateGovernments/UnionTerritory Administrations based on state-specific criteria.
- AAY families are identified by States/UTs based on criteria set by the Central Government.

Eligible AAY Families Include

- Households headed by widows, terminally ill, disabled persons, or persons aged 60 years or more with no assured means of support.
- Widows, terminally ill, disabled persons, or persons aged 60+ with no family or societal support.
- Single women or men without family support
- Other eligible groups include primitive tribal households, landless agricultural laborers, marginal farmers, rural artisans (potters, tanners), slum dwellers port or assured means of subsistence.
- All citizens from Below Poverty Line (BPL) families are eligible for the scheme.

Fortification of Rice

- Fortification involves adding **Fortified Rice Kernels (FRK),** which contain FSSAI-prescribed micronutrients **(Iron, Folic Acid, Vitamin B12)**, to regular rice at a ratio of 1:100 (1 kg of FRK mixed with 100 kg of custom milled rice).
- Fortified rice is nearly identical to traditional rice in aroma, taste, and texture.
- The fortification process is carried out at rice mills during the milling of rice.
- It is a **cost-effective and culturally appropriate method** to address micronutrient deficiencies in countries with high per capita rice consumption.
- **According to FSSAI norms**, 1 kg of fortified rice contains 28-42.5 mg of iron, 75-125 micrograms of folic acid, and 0.75-1.25 micrograms of vitamin B12.
- The rice fortification process **involves two steps:** (1) production of Fortified Rice Kernels (FRK), and (2) blending FRK with regular rice.

Swachh Bharat Mission

Social Issues

Context:

- **Swachh Bharat Mission** completed **10 years of implementation** on 2nd October 2024.

About SBM

- **Launch Date:** October 2, 2014
- **Overall Aim:** To achieve a "Clean India" by October 2, 2019 (150th birth anniversary of Mahatma Gandhi). While the initial target date wasn't fully met for all aspects, the mission continues.
- **Key Components:**
  - **Swachh Bharat Mission (Gramin) – SBM-G:** Focuses on rural sanitation.

- **Swachh Bharat Mission (Urban) – SBM-U**: Focuses on urban sanitation.
- **Swachh Bharat Mission Phase II (SBM-II):**
- **Implementation Period:** 2020-21 to 2024-25.
- **Focus**: ODF Plus (ODF+), which includes ODF sustainability and solid and liquid waste management (SLWM).
- **Budget**: Approximately₹52,000crore(Centraland State combined).

Key Achievements

- **Open Defecation Free (ODF) Status:** As of October 2024, the SBM has successfully declared over **700,000 villages as Open Defecation Free (ODF**), and constructed approximately **100 million toilets** across India significantly improving rural sanitation.
- **Waste Management Improvements:** The SBM has made strides in solid and plastic waste management, with cities achieving waste processing rates of over **75%**. Door-to-door waste collection is now implemented in over **97%** of urban wards.
- **Economic Impact:** A UNICEF study indicated that achieving ODF status in villages has saved households around **₹50,000 annually** especially medical costs.
- **Global Recognition:** SBM has inspired international initiatives, such as Nigeria's Clean Nigeria Campaign, demonstrating its influence and leadership in sanitation practices.
- **Improved Health Facilities:** The World Health Organisation (WHO) reported a significant decline in diarrhoea-related fatalities, malaria cases, child wasting, stillbirth rates in India.
- **Enhanced Safety for Women:** A UNICEF report indicates that 93% of women feel safer after installing toilets in their homes.
- **Reduced Groundwater Contamination:** In villages declared ODF, the risk of groundwater contamination due to human waste is 12.7 times lower.

Challenges

- **Lack of Awareness:** Many communities lack awareness about hygiene practices and the importance of sanitation.
- **Behavior Change**: Changing long-standing habits and cultural practices regarding sanitation is difficult.
- **Infrastructure Development:** Inadequate infrastructure, especially in rural areas, hampers effective implementation.
- **Funding and Resources:** While government support exists, consistent funding is needed for ongoing initiatives, maintenance, and education programs.
- **Lack of Region Specific Strategy:** India's diverse geography means that solutions effective in one area may not work in another. Tailored approaches are necessary to address local needs.

Niti Aayog Report on Future Pandemic Preparedness

Social Issues

Why in news ?

- NITI Aayog has released an Expert Group report titled '**Future Pandemic Preparedness and Emergency Response —A Framework for Action'.**

About the report

- This report has provided a blueprint for the country to **prepare for any future public health emergency or pandemic and have a rapid response system in place.** The report **highlights the inevitability of new pandemics** due to dynamic planetary factors such as climate change, human-animal interactions, and ecological changes.

Key Recommendations

- **Enactment of Public Health Emergency Management Act (PHEMA)**
- **Existing laws like the Epidemic Diseases Act (1897) and National Disaster Management Act (2005) were found insufficient during Covid-19.** The Epidemic Diseases Act lacks definitions for "dangerous," "contagious," or "infectious" diseases, and doesn't outline processes for drug/vaccine dissemination or quarantine measures. Similarly, the NDMA does not focus on health-related disasters.
- PHEMA would address these gaps and **empower central and state governments to effectively manage not only pandemics but also other public health emergencies such as those arising from bioterrorism or non-communicable diseases.**

Creation of Empowered Group of Secretaries (EGoS)

- A committee led by the Cabinet Secretary would be established to prepare and monitor public health emergency preparedness during non-crisis periods. The **group would focus on governance, finance, R&D, surveillance, and collaborations, as well as develop Standard Operating Procedures (SOP) for pandemic response.**

Strengthening Disease Surveillance

- Surveillance systems must be improved, particularly for zoonotic diseases like those caused by bat-related viruses, which have been linked to numerous epidemics in recent history.
- **National Biosecurity and Biosafety Network**: The report recommends **a coordinated system of biosafety labs, genome sequencing centers, and research institutions to monitor and respond to biological threats**.
- **Emergency Vaccine Bank**: A reserve of vaccines would be maintained for immediate response to emerging threats.

Building an Epidemiology Forecasting Network

- A **forecasting and modelling network** would be developed to predict disease transmission dynamics and evaluate the effectiveness of countermeasures like vaccines.
- **Network of Centers of Excellence (CoE)** would focus on diagnostics, therapeutics, and vaccines for priority pathogens as identified by the World Health Organisation (WHO).
- **Independent Drug Regulatory Framework**
- India's clinical trial and regulatory framework must be strengthened for faster access to innovative public health solutions during emergencies. **The Central Drugs Standards Control Organisation (CDSCO) should be made independent with special powers to ensure its swift response in future health crises.**
- **Four Pillars of Pandemic Preparedness**
  - **Governance, Legislation, Finance, and Management**
  - **Data Management, Surveillance, and Early Warning Systems**
  - **Research, Innovation, and Capacity Building**
  - **Partnerships and Community Engagement**

100-Day Action Plan

- The report emphasizes the importance of the first 100 days in controlling an outbreak. It outlines a strategy for tracking, testing, treating, and managing outbreaks in this critical window to prevent widespread transmission. **The 100-Day Action Plan aims to establish clear roles for agencies, provide adequate resources, and ensure rapid decision-making.**

NAFIS 2021-22

Economy

Why in news?

- NABARD All-India Rural Financial Inclusion Survey (referred to as NAFIS 2021-22) is a national-level survey commissioned by the Department of Economic Analysis & Research (DEAR), NABARD.
- The survey covered all States of the country and Union Territories of Jammu & Kashmir (J&K) and Ladakh.

About NAFIS

- **Key highlights of NAFIS 2021-22**
- **Average monthly income of households increased** by 57.6% during the five-year period from Rs 8,059 in 2016-17 to Rs 12,698 in 2021-22.
- **Average monthly expenditure of households increased** during the five-year period from Rs 6,646 in 2016-17 to Rs 11,262 in 2021-22.
- The **share of food in the consumption basket of households declined** from 51% in 2016-17 to 47% in 2021-22.
- **Annual average financial savings made by households increased** to Rs 13,209 in 2021-22 from Rs 9,104 in 2016-17.
- The proportion of households who reported to have **outstanding debt moved up** from 47.4% in 2016-17 to 52.0 % in 2021-22.
- The **proportion of agricultural households that took loans from institutional sources only increased** from 60.5% in 2016-17 to 75.5% in 2021-22 (the corresponding increase for non-Agri households was from 56.7% in 2016-17 to 72.7% in 2021-22).
- The **proportion of Agri-households that took any loan from non-institutional sources only decreased** from 30.3% in 2016-17 to 23.4% in 2021-22.
- **Kisan Credit Card (KCC) coverage has increased significantly** during the last five years.
- The **proportion of households with at least one member having any type of insurance increased** from 25.5% in 2016-17 to 80.3% in 2021-22.
- The **proportion of households with at least one member receiving any type of pension** (old age, family, retirement, disability, etc.) **increased** from 18.9% in 2016-17 to 23.5% in 2021-22
- The **proportion of respondents indicating good financial literacy increased** by 17 percentage points, i.e., from 33.9% in 2016-17 to 51.3% in 2021-22.
- **Average size of landholding declined** from 1.08 hectare in 2016-17 to 0.74 hectare in 2021-22.

National Electricity Plan (Transmission)

Economy

Why in news?

- Union Ministry of Power launches National Electricity Plan (Transmission)

National Electricity Plan (NEP) (Transmission):

- Developed by – **Central Electricity Authority (CEA) under the Electricity Act 2003.**
- Transmission system links the source of generation to the distribution system and ultimately to the consumer.

Key Highlights of the Plan:

- Renewable Energy Goals – Aim to transmit 500 GW of renewable energy by 2030 and over 600 GW by 2032.
- Capacity Targets – Aiming to meet a peak demand of 458 GW by 2032
- Inter-regional Capacity – Planned increase from 119 GW currently to 168 GW by 2032.
- Innovative Integration – Includes 10 GW of offshore wind farms, 47 GW of battery energy storage systems, and 30 GW of pumped storage plants.
- Green Initiatives – Supports power needs for **Green Hydrogen and Green Ammonia** manufacturing hubs in coastal areas.
- Cross-border Interconnections – Plans to enhance connections with Nepal, Bhutan, Myanmar, Bangladesh, Sri Lanka, and potential links with Saudi Arabia and UAE.

Central Electricity Authority (CEA):

- Established under the repealed **Electricity (Supply) Act, 1948** (substituted by Electricity Act 2003)
- Members – **Not more than 14 members** including Chairperson
- Full-time members appointed by Central Government.
- Functions –
  - Advise Central Government on National Electricity Policy
  - Specify technical standards for construction of electric plants, electric lines and grid connectivity.

PM Gati Shakti National Master Plan — Economy

Why in news?

- The PM Gati Shakti National Master Plan (NMP) for **muti-modal connectivity**, launched in October 2021, completed three years having achieved signi cant milestones in transforming the country's infrastructure landscape.

About Gati Shakti Master Plan

- **Objective**: Aimed at integrated planning and coordinated execution of infrastructure projects to boost India's multimodal connectivity and reduce logistics costs.
- Developed by the Bhaskaracharya National Institute for Space Applications and Geoinformatics (BISAG-N), it serves as a **Digital Master Planning tool.**

PM Gati Shakti

- In October 2021, Prime Minister Narendra Modi launched a Rs 100 lakh crore Gati Shakti — national master plan for multi-modal connectivity that aims to develop infrastructure to reduce logistic costs and boost the economy.
- PM Gati Shakti targets to cut logistic costs, increase cargo handling capacity and reduce the turnaround time.
- Gati Shakti will bring ministries including railways and roadways together for integrated planning and coordinated implementation of infrastructure connectivity projects.

Significance of Gati Shakti

- Infrastructure creation in India had suffered for decades from multiple issues. There was a lack of coordination between various departments. For example, once a road was constructed, other agencies dug up the newly constructed road again for activities like laying of underground cables, gas pipelines, etc. This not only caused great inconvenience but was a wasteful expenditure.
- To address this, efforts were put in place to increase coordination so that all cables, pipelines, etc could be laid simultaneously.
- Steps have also been taken to address other issues like time-taking approval process, multiplicity of regulatory clearances, etc.
- PM Gati Shakti will address the past issues through institutionalising holistic planning for stakeholders for major infrastructure projects. Instead of planning and designing separately in silos, the projects will be designed and executed with a common vision.
- Logistics costs are 13 per cent that of India's GDP. Due to this figure, the competitiveness of Indian exports decreases. India needs to strengthen its last-mile connectivity.

Gati Shakti is based on six pillars:

- **Comprehensiveness:** It will include all the existing and planned initiatives of various ministries and departments with one centralised portal. Each and every department will now have visibility of each other's activities providing critical data while planning and execution of projects in a comprehensive manner.**2) Prioritisation:** Through this, different departments will be able to prioritise their projects through cross–sectoral interactions.
- **Optimisation:** The national master plan will assist different ministries in planning for projects after identification of critical gaps. For the transportation of the goods from one place to another, the plan will help in selecting the most optimum route in terms of time and cost.
- **Synchronisation:** Individual ministries and departments often work in silos. There is lack of coordination in planning and implementation of the project resulting in delays. PM Gati Shakti will help in synchronising the

activities of each department, as well as of different layers of governance, in a holistic manner by ensuring coordination of work between them.

- **Analytical:** The plan will provide the entire data at one place with GIS-based spatial planning and analytical tools having over 200 layers, enabling better visibility to the executing agency.
- **Dynamic:** All ministries and departments will now be able to visualise, review and monitor the progress of cross-sectoral projects, through the GIS platform, as the satellite imagery will give on-ground progress periodically and progress of the projects will be updated on a regular basis on the portal. It will help in identifying the vital interventions for enhancing and updating the master plan.

Key Achievements

- **Whole-of-Government Integration**: Uni ed 44 Central Ministries and 36 States/UTs on a single platform with 1600+ data layers, supporting the planning and execution of over 200 large infrastructure projects.
- **Social Sector Impact**: Extended to Social Sector Ministries to improve infrastructure planning for healthcare, education, and tribal development in underserved areas.
- **State Master Plans (SMPs)**: All 36 States/UTs developed State Master Plan (SMP) portals aligned with the National Master Plan, enabling better capital investment and mapping of 533 regional projects.
- **EXIM & Trade Facilitation**: In line with the National Logistics Policy (NLP), PM GatiShakti helped improve India's World Bank Logistics Performance Index rank from 44 (2018) to 38 (2023).
- **Regional Workshops & Stakeholder Engagement**: Conducted ve regional workshops for knowledge sharing and strengthened local adoption of the GatiShakti framework.
- **Sustainable, Data-Driven Development**: Utilizes GIS-based, real-time monitoring for informed, timely decisions, supporting India's Net Zero by 2070 goal with green infrastructure and sustainable logistics.
- **Training & Capacity Building**: Over 20,000 o cials trained, with courses on PM GatiShakti integrated across major Central Training Institutes (CTIs) and district-level training sessions conducted.
- **District-Level Expansion**: Development of the PM GatiShakti District Master Plan (DMP) for district-level collaboration, focusing on multi-modal infrastructure and smart city development, with BISAG-N support for advanced planning technology (AI, IoT).

Periodic Labour Force Survey 2024 — Economy

Why in news?

- The Periodic Labour Force Survey (PLFS) for the period between
- **July 2023 and June 2024** was released.

About PLFS

- Started in 2017
- Conducted and released by **National Statistical O ce (NSO)**, under Ministry of Statistics and Programme Implementation **(MoSPI)**
- Objective:
  - to estimate vital **employment and unemployment indicators** like the **Labour Force Participation Rate every three months** in urban areas.
  - Measure the dynamic of labor force participation and employment status using the **Current Weekly Status (CWS) approach.**
  - Measure labor force estimates for **both rural and urban areas** using Usual Status and CWS parameters.

Key Highlights of the PLFS Report 2023-24

- **Stagnant Unemployment Rate:** The unemployment rate for 2023-24 stayed at **3.2%**, **unchanged** from 2022-23.
- This is the **1st time** since the **PLFS began in 2017-18** that the **unemployment rate has not shown** a year-on-year **decline**.
- **Labour Force Participation Rate (LFPR) for persons of age 15 years and above:** The **LFPR increased** to **60.1%** in 2023-24, up from 57.9% in 2022-23 at the national level.
  - **Rural LFPR** rose to **63.7%** (50.7% in 2017-18) and **Urban LFPR** increased to **52%** (47.6% in 2017-18).
  - More people in rural areas are seeking work, possibly due to **reverse migration** or fewer urban job opportunities after the pandemic.

- **LFPR** reflects the proportion of people who are either employed or seeking work.

- **Increasing Trend in Worker Population Ratio (WPR) for persons of age 15 years and above:** In **rural areas**, WPR **increased** 62.1% in 2023-24 while for **urban areas** it **increased** 49.4%.
  - The **WPR reached 58.2%** in 2023-24 (56.0% in 2022-23).
    - **Male WPR increased slightly** to 76.3% (76% in 2022-23)
    - **Female WPR increased** to 40.3% (35.9 in 2022-23)
  - WPR measures the percentage of employed people in the total population.
- **Marginal Improvement in Job Quality:** A **slight improvement** in job quality was seen, with **salaried or regular wage workers** increasing by **0.8 percentage points** to **21.7%**.
- **Decreasing Trend in Unemployment Rate (UR): Rural unemployment rate increased** slightly to **2.5%** in 2023-24 from 2.4% in 2022-23.
  - **Urban unemployment rate improved**, dropping to **5.1%** from 5.4%.
  - The **overall Unemployment Rate (UR)** has **remained unchanged** at 3.2%.
  - **Female unemployment rate increased** to **3.2%**, up from 2.9% in 2022-23.
  - **Male unemployment rate** slightly **decreased** to **3.2%** from 3.3%.
- **Rise in Self-Employment and Unpaid Work:** The share of people involved in **self-employment** (including unpaid household work) **increased** to **58.4%** from 57.3% in 2022-23.
  - This includes both entrepreneurial ventures and informal work, making it a mixed indicator of job quality.

Nobel Prize in Economics

Economy

Why in news?

- The 2024 Nobel Prize in Economics was awarded to **Daron Acemoglu, Simon Johnson, and James A. Robinson** for groundbreaking research on **wealth inequality** among nations and the vital role of institutions in shaping prosperity.

About Nobel Prize in Economics

- Awarded to **Daron Acemoglu**, **Simon Johnson**, and **James Robinson**
- For research on **wealth inequality** between nations, focusing on the role of **political** and **economic systems**, especially those introduced by **European colonizers**.

Key Areas of Research:

- **Study of Institutions**: Analyzed how **political** and **economic institutions** influence national **prosperity** and development.
- **Impact of Colonialism**: Explored the long-term effects of **colonial systems** on **wealth inequality**.
- **Comparative Studies**: Example: The divided city of **Nogales** (U.S. and Mexico), showing how different institutional frameworks lead to **varying prosperity**.
- **Focus on Democracy**: Found that nations transitioning to **democracy** experience **faster economic growth**compared to non-democratic regimes.
- **Publications**: Acemoglu co-authored "**Why Nations Fail**," which investigates the **roots of economic disparity**.

Significance of Their Work:

- **Understanding Wealth Inequality**:
  - Explains why some countries **prosper** while others lag behind, based on differences in **institutions**.
- **Role of Institutions**:
  - Emphasizes the need for **inclusive political** and **economic institutions** for **sustainable growth** and reduced **inequality**.
- **Practical Implications**:
  - Offers insights into **institutional reforms** necessary in **poorer countries** to drive development.
- **Global Relevance**:
  - Findings are critical for narrowing the **income gap** between nations.
- **Support for Democracy**:
  - Highlights the positive impact of **democratic institutions** on **economic growth** and development.

Trade Receivables Discounting System (TReDS) — Economy

Why in news?

- The Trade Receivables Discounting System (TReDS), introduced nearly a decade ago by the **Reserve Bank of India**, has helped businesses reduce their cost of funds by 2.5 percentage points.

About Trade Receivables Discounting System (TReDS)

- The TReDS is an electronic platform designed to facilitate the **nancing and discounting of trade receivables** for Micro, Small, and Medium Enterprises (MSMEs) through a range of nanciers.
- This platform enables MSMEs to **discount invoices** issued to large corporations, government departments, and Public Sector Undertakings (PSUs), helping them to better manage their working capital by accessing **quicker payments.**
- While the RBI does not mandate participation for any buyer, seller, or nancier, the **government requires certain categories** of companies to register as buyers on TReDS platforms.

Participants

- TReDS has three main types of participants:
- **Sellers:** Only MSMEs are eligible to participate as sellers.
- **Buyers:** Corporates, government departments, PSUs, and other entities are permitted to participate as buyers.
- **Financiers:** Banks, NBFC-factors, and other nancial institutions authorized by the RBI can participate as nanciers.

Global Family Farming Forum — Economy

Why in news?

- Global Family Farming Forum (GFFF) was launched at Food and Agriculture Organization's World Food Forum (WFF)

Global Family Farming Forum (GFFF):

- Celebration of **essential role of family farmers** in building sustainable agrifood systems and addressing climate change.
- Marks the halfway point of the **United Nations Decade of Family Farming** (UNDFF) 2019-2028.
  - Declared by **UN General Assembly**, UNDFF provides a framework for countries to develop public policies and investments to support family farming.
- **Family Farming:**
  - Family farming involves agricultural, forestry, fisheries, pastoral, and aquaculture production managed and operated by a family, **relying predominantly on family labor**.
  - **Significance of Family Farming –**
    - **Food Security** – Backbone of food production with over 550 million farms worldwide.
    - **Nutritional Diversity** – Grows diverse, nutritious food and supports crop biodiversity, especially in low- and middle-income countries.
    - **Sustainable Stewardship** – Uses traditional methods and minimal external inputs to maintain soil health and build climate resilience
  - **Challenges Faced by Family Farming –**
    - Limited access to financial assistance and resources.
    - Limited access to advanced agricultural knowledge and genetic resources.
    - Small and fragmented land holdings
    - Difficulties in accessing markets.
    - Vulnerability to climate change impacts
    - Lack of support for **generational succession** in farming

Why in news?

- According to a recent report by the International Labour Organization (ILO), there has been a promising decline in **wage inequality in two-thirds of countries** since 2000.

Key Findings

- **Global real wage growth:**
  - It grew by **1.8% in 2023**, with projections for **2024** showing a **2.7%** increase.
- **Regional differences:**
  - **Emerging G20 economies** saw real wages rising by 6.0% in 2023.
  - **Advanced G20 economies** experienced a decline in real wages by 0.5% in 2023.
- **Global decline in wage inequality:**
  - It decreased at an **average annual rate of 0.5 to 1.7 %.**
- **Regional differences:**
  - **Low-Income Countries:** Significant reductions in wage inequality were seen, with annual decreases ranging from 3.2% to 9.6%.
  - **Wealthier Countries:** In high and upper-middle-income countries, reductions in wage inequality were slower, ranging from 0.3% to 1.3% annually.
- **Persistent wage disparities:**
  - The **lowest-paid 10%** of workers earn just **0.5% of the global wage bill,** while the **highest paid 10%** earn nearly **38%.**
  - **High-wage earners** saw a **higher rate of decrease in wage inequality** compared to low-wage earners.
  - Wage inequality highest in low-income countries, with **22%** of wage workers are classified as **low-paid.**
- **Decoupling between productivity and wages:**
  - Despite a **29% rise in productivity** in high-income countries between 1999 and 2024, **real wages have only risen by 15%,** highlighting a failure to share productivity gains equitably with workers.
- **Minimum Wage Adjustments:**
  - **Around 60% of countries** adjusted their minimum wage in 2022, but only about 25% of these increases kept pace with inflation.
  - In 2023, 55% of countries saw real increases in minimum wages, though many did not fully compensate for past declines.
- **Persistent gender wage gap:**
  - Women, especially in lower-middle-income countries, remain disproportionately affected by wage inequality due to overrepresentation in informal, precarious and low-paid work.
- **Indian Scenario:**
  - Between 2008 and 2018, the share of **low-paid wage workers** in India declined at an average annual rate of 6.3%, while low-paid non-wage workers decreased by 12.7%.
  - Combined, both categories saw a decline of 11.1% annually over the 10 years.
  - The share of low-paid wage workers — those earning less than 50% of the median hourly wage in the country — stands at **9.5% in India.** On the other hand, it is **Pakistan (9.4%), Nepal (10.5%), Bangladesh (11.2%), Bhutan (13.7%), and much higher in Sri Lanka (25.9%).**

International Labour Organization (ILO)

- **A specialized agency of the United Nations** promoting social justice, human rights, and labour rights.
- Created in **1919** as part of the **Treaty of Versailles** that ended World War I.
- It became the **first specialized agency** of the UN in **1946.**
- Its unique **tripartite structure** gives an equal voice to **workers, employers** and **governments** providing a unique platform for promoting decent work for **all women and men.**

Global Innovative Index (GII)

Economy

Why in news?

- India secured the **39th position** out of a total of **133 economies** in the recently released Global Innovative Index (GII) 2024.

Key Findings of the Index

- In the latest 17th edition, **Switzerland (67.5), Sweden (64.5), and the United States of America (62.4)** rank as the top three countries **in both the overall** Global Innovation Index list and the **high-income group.**
- Switzerland ranks first in the GII for the 14th consecutive year.
- **China,** ranked 11th in the GII 2024, **is the only middle-income economy within the GII top 30.**
- China, for a second consecutive year, leads with the most clusters (26) in the top 100. The United States follows, with 20 clusters, then Germany with eight.

India's Ranking

- India with a score of **38.3 (out of 100) ranked 39th,** indicating a slight improvement from last year when India's score was **38.1 and was ranked 40th** out of 132 countries.
- India emerged as one of the fastest-rising economies alongside China and Turkey.
- Furthermore, India ranks **4th globally** in the **Science & Technology (S&T) Cluster Ranking,** with 4 clusters (Mumbai, Delhi, Bengaluru, and Chennai) listed among the World's top 100 S&T clusters.
- India ranks **first among 38 lower-middle-income economies.**
- India also ranks **first among the 10 economies in Central and Southern Asia.**

About the Global Innovation Index (GII)

- The **Global Innovation Index (GII)** is an annually released report by the **World Intellectual Property Organization (WIPO).**
- It serves as a benchmark for evaluating innovation trends globally.
- It was launched in 2007 by INSEAD and World Business, a British magazine. **WIPO has co-published the GII with Cornell University and INSEAD since 2021.**
- The GII report is based on over 80 indicators, compiled under **seven parameters:**
  - Institutions, Human Capital and Research, Infrastructure, Market Sophistication, Business Sophistication, Knowledge and Technology Outputs, and Creative Outputs.
- The Global Innovation Tracker 2024 addresses these crucial questions by assessing **four key stages** in the innovation cycle.
  - science and innovation investment;
  - technological progress;
  - technology adoption; and
  - the socioeconomic impact of innovation.

Windfall Tax

Economy

Why in news?

- The government has r**educed the windfall tax** on **domestically produced crude oil** to zero per tonne. This tax, known as the Special Additional Excise Duty (SAED), is adjusted biweekly based on average oil prices.

About Windfall Tax

- A windfall tax is a tax imposed by governments on certain industries that experience **unusually high profits** due to favorable economic conditions.
- These taxes are typically **aimed at commodity-based industries** that benefit most significantly from the economic upswing.
  - The goal of windfall taxes is to **redistribute excess profits** to fund broader social programs or initiatives for public benefit.
  - Though intended for the **greater good,** the concept of windfall taxes can be controversial as it targets specific profit surges.

- Some individual **taxes, like inheritance taxes or taxes on lottery or game-show winnings**, can also be considered windfall taxes since they are levied on unexpected gains.

Special Additional Excise Duty (SAED):

- The Special Additional Excise Duty (SAED) is a tax applied to the export of speci c products, such as **petrol, diesel, and aviation turbine fuel (ATF).**
- It aims to regulate their import and export, boost domestic supply, and mitigate the effects of rising international prices.

National Mission on Edible Oils – Oilseeds (NMEO-Oilseeds) | Economy

Why in news?

- The Union Cabinet, chaired by the Prime Minister Shri Narendra Modi, has approved the National Mission on Edible Oils – Oilseeds (NMEO-Oilseeds),

About NMEO

- The newly approved NMEO-Oilseeds will focus on enhancing the production of key primary oilseed crops such as Rapeseed-Mustard, Groundnut, Soybean, Sunflower, and Sesamum, as well as increasing collection and extraction efficiency from secondary sources like Cottonseed, Rice Bran, and Tree Borne Oils.
- The mission aims to increase primary oilseed production from 39 million tonnes (2022-23) to 69.7 million tonnes by 2030-31.
- Together with NMEO-OP (Oil Palm), the Mission targets to increase domestic edible oil production to 25.45 million tonnes by 2030-31 meeting around 72% of our projected domestic requirement. This will be achieved by promoting adoption of high-yielding high oil content seed varieties, extending cultivation into rice fallow areas, and promoting intercropping. The Mission will harness ongoing development of high-quality seeds by using cutting-edge global technologies such as genome editing.
- To ensure the timely availability of quality seeds, the Mission will introduce an Online 5-year rolling seed plan through the 'Seed Authentication, Traceability & Holistic Inventory (SATHI)' Portal, enabling states to establish advance tie-ups with seed-producing agencies, including cooperatives, Farmer Producer Organizations (FPOs), and government or private seed corporations. 65 new seed hubs and 50 seed storage units will be set up in public sector to improve the seed production infrastructure.
- Additionally, over 600 Value Chain Clusters will be developed across 347 unique districts, covering more than 10 lakh hectares annually. These clusters will be managed by value chain partners such as FPOs, cooperatives, and public or private entities. Farmers in these clusters will have access to high-quality seeds, training on Good Agricultural Practices (GAP), and advisory services on weather and pest management.
- The Mission also seeks to expand oilseed cultivation by an additional 40 lakh hectares by targeting rice and potato fallow lands, promoting intercropping, and promoting crop diversification.
- Support will be extended to FPOs, cooperatives, and industry players to establish or upgrade post-harvest units, enhancing recovery from sources such as cottonseed, rice bran, corn oil, and Tree-Borne Oils (TBOs).
- Furthermore, the Mission will promote awareness of recommended dietary guidelines for edible oils through an Information, Education, and Communication (IEC) campaign.
- The Mission aims to significantly enhance domestic oilseed production, advancing the goal of Atmanirbharta (self-reliance) in edible oils, thereby reducing import dependency and conserving valuable foreign exchange while boosting farmers' incomes.
- This mission will also accrue significant ental benefits in the form of low water usage and improved soil health and making productive use of crop fallow areas.

Why in News?

- THE BUREAU of Indian Standards (BIS) has begun the process of formulating a National Agriculture Code (NAC), on the lines of the existing National Building Code and National Electrical Code.

About the NAC

- The BIS is the national body which sets standards for different products across various economic sectors.
- In agriculture, it has already set standards for machinery (tractors, harvesters, etc.) and various inputs (fertilisers, pesticides, etc.) However, many areas are not covered under BIS standards.
- For example, there is no standard for practices like the preparation of fields, micro irrigation or water use.
- The NAC will cover the entire agriculture cycle, and will also contain a guidance note for future standardisation.
- It will serve as a guide for farmers, agriculture universities, and officials in the sector.

The code will have two parts.

- **The first** will contain **general principles for all crops**, and
- **The second** will deal with **crop-specific standards for paddy, wheat, oil seeds, and pulses.**

What will the NAC cover?

- In addition to standards for agriculture machinery, the NAC will cover all agriculture processes and post-harvest operations, such as crop selection, land preparation, sowing/transplanting, irrigation/drainage, soil health management, plant health management, harvesting/threshing, primary processing, post-harvest, sustainability, and record maintenance.
- It will also include standards for input management, like use of chemical fertilisers, pesticides, and weedicides, as well as standards for crop storage and traceability.
- The NAC will cover new and emerging areas in agriculture such as the use of Internet of-Things (IoT).
- Essentially, it is a network of physical objects—"things"— that are embedded with sensors, software, and other technologies for connecting and exchanging data with other devices and systems over the internet.
- In agriculture, this would include technologies like precision farming, in which farmers get real-time soil, crop, and weather information that can be used to adjust their inputs.

Objectives

- **According to the BIS, the objectives are**:
- To create an implementable national code covering recommendations for agriculture practices taking agro climatic zones, crop type, socio economic diversity of the country and all aspects of agri food value chain into consideration;
- To act as an enabler of quality culture in Indian agriculture by providing the required reference to policy makers, agriculture departments and regulators for incorporating the provisions of NAC in their schemes, policies, or regulations;
- To create a comprehensive guide for the farming community to ensure effective decision making in agricultural practices;
- To integrate relevant Indian Standards with recommended agricultural practices.
- To address the horizontal aspects of agriculture such as SMART farming, sustain ability, traceability and documentation; and
- To aid in the capacity building program organized by agriculture extension services and civil society organisations.

What is the proposed time line?

- The BIS has already formulated a strategy to standardise practices.
- It has formed working panels for 12-14 specifically identified areas, which will include university professors and R &D organisations.
- These panels will draft the code, with a tentative deadline for the NAC set as October 2025.
- After this, the BIS plans to provide training to farmers on the NAC and its standards.

What are Standardised Agriculture Demonstration Farms?

- Apart from drafting the NAC, the BIS has also taken initiative to setup 'Standardised Agriculture Demonstration Farms' (SADFs) in selected agriculture institutes in the country.
- SADFs will serve as experimental sites for testing and implementing various agricultural practices and new technologies, in accordance with the NAC.
- For the development of these specialised farms, the BIS plans to sign Memorandum of Understanding (MoUs) with premier agricultural institutes.

Energy Efficiency Hub

Economy

Why in the news?

- Recently the Union Cabinet has approved India's joining the International Energy Efficiency Hub.

International Energy Efficiency Hub:

- The establishment of the Energy Efficiency Hub was proposed by Germany during the G-20 summit in Hamburg in 2017 to strengthen intergovernmental cooperation on energy efficiency.
- It was established in 2020 as the International Partnership for Energy Efficiency Cooperation (IPEEC).
- Objective -
  - To provide greater visibility and stronger presence internationally for energy efficiency.
  - To enhance members' cooperation with the International Energy Agency and other international organizations.
  - To share information and best practices between countries, international organizations and the private sector.
- Current President - Dr. Tudor Constantinescu of European Commission
- Its secretariat is located at International Energy Agency (IEA) (Paris)
- Currently International Energy Efficiency Hub comprises 16 member countries
- Bureau of Energy Efficiency (BEE) has been designated as the implementing agency for it in India.

Bureau of Energy Efficiency (BEE):

- Government of India established Bureau of Energy Efficiency (BEE) on 1 March 2002 under the provisions of Energy Conservation Act, 2001.
- Its objective is to assist in developing policies and strategies with emphasis on self-regulation and market principles under the provisions of Energy Conservation Act, 2001.
- To carry out the functions assigned under Energy Conservation Act, 2001, BEE coordinates with designated consumers, designated agencies and other organizations.
- BEE also performs regulatory and promotional functions under Energy Conservation Act, 2001.

Shanghai Cooperation Organization

International Relations

Why in news?

- The **23rd Meeting of the Shanghai Cooperation Organisation (SCO)** Council of Heads of Government (CHG) was held in Islamabad, Pakistan. This marks the first visit by an Indian foreign minister to Pakistan in nine years.

About SCO

- SCO is a **permanent intergovernmental international organisation**, created in June 2001 in Shanghai (China).
- Founding members: **Kazakhstan, China, Kyrgyzstan, Russia, Tajikistan**.
- In 2001, the **Shanghai Five** inducted Uzbekistan into the group and named it the SCO outlining its principles in a charter that **promoted what was called the Shanghai spirit of cooperation**.
- **Official working languages:** Chinese, Russian
- **SCO Secretariat:** Beijing, China
- **Members & Observers: 10 member states–** Founding Members + Uzbekistan, **India (2017), Pakistan (2017), Iran** (2023 under chairmanship of India) and **Belarus (2024).**
  - **2 Observer members –** Afghanistan, Mongolia
- **Organizational Structure of SCO**
  - **The Heads of State Council (HSC)** is the supreme decision-making body in the SCO.
  - **The Council of Heads of Government (Prime Ministers) (CHG)** meets once a year to discuss the strategy of multilateral cooperation and priority areas within the Organization
- The Organization has 2 standing bodies — **the Secretariat in Beijing** and the **Executive Committee of the Regional Anti-Terrorist Structure (RATS) in Tashkent**.

BRICS

International Relations

Why in news?

- Recently, the **16th BRICS Summit** was held in Kazan, Russia.

About BRICS

- BRICS started in 2001 as BRIC, an acronym coined by Goldman Sachs for Brazil, Russia, India, and China. South Africa was added in 2010.
- **New Joinees of BRICS**: Iran, UAE, Saudi Arabia, Egypt and Ethiopia.
- **New Development Bank:**
  - It is a multilateral development institution, headquartered at Shanghai. It is conceived as an **alternative to existing financial institutions** like IMF and World Bank which are dominated by the western powers.
  - It emerged through the **Fortaleza declaration**, signed during the 6th BRICS summit.
  - Membership is **open to United Nations members,** including both borrowing and non-borrowing members.
  - The bank allows new members to join but the **"BRICS" countries share capital can not fall below 55%.**

Significance of BRICS

- **Multipolar Global Order:** BRICS promotes a multipolar world with economic parity, representing 41% of global population, 28% GDP.
- **Global South Representation:** BRICS empowers global south countries, like Egypt and Argentina, to influence international agendas.
- **Alternative to Bretton Woods:** BRICS initiatives like the New Development Bank address developing economies' concerns outside Western frameworks.
- **Economic Decoupling:** BRICS promotes de-dollarization by using local currencies, representing 23% of GDP, 18% world trade.
- **Oil Trade Engagement:** BRICS-Plus, with six top oil producers, offers an alternative platform outside OPEC+

Challenges faced by BRICS

- **Chinese Push for Favorable Expansion:** China's expansion aims to make BRICS China-centric, adding debt-trapped nations like Belarus.

- **Failure to Bring Impactful Reform:** BRICS has not reformed IMF, World Bank, or succeeded in de-dollarizing their economies.
- **Nature of Grouping:** BRICS faces a choice between staying finance-focused or becoming a larger geopolitical coalition.
- **Chinese Dominance:** China holds 38% of BRICS exports, fueling its dominance and stoking economic nationalism in others.

De-dollarization

- **BRICS Collective's Common Currency**: BRICS nations aim to establish a common currency, reducing reliance on the US dollar and challenging its dominance in the global financial system. **De-Dollarization in Response to Western Sanctions:** Russia and China advocate for de-dollarization to decrease vulnerability to Western sanctions and assert economic independence.

- **Challenges to the Dollar's Dominance**
  - **Rule of Law Concerns:** The conviction of Donald Trump and potential seizure of Russian assets have led to questions about the U.S. legal system's reliability. Some see these actions as undermining the pillars that support the dollar's status as the world's reserve currency.
  - **Sanctions and Debt:** The U.S. has significantly increased its use of sanctions as a foreign policy tool, coupled with a growing national debt. This has caused concerns among global investors about the sustainability of the dollar's dominance.
  - **Global Reaction:** Financial services executives and global investors express growing concern over U.S. policies. Despite efforts, no credible alternative to the dollar has emerged, and geopolitical tensions further complicate the situation.

- **Current State and Future Prospects**
  - **Central Bank Reserves:** Despite the concerns, central banks plan to increase their dollar holdings over the next 12-24 months, driven by global geopolitical tensions and a need for liquidity.
  - **Dollar's Core Strengths:** The dollar's dominant role is supported by the U.S.'s democratic principles, economic size, market depth, and institutional strength. Despite current challenges, these fundamentals continue to underpin its global appeal.
  - **Investor Sentiment:** Investors, both in the U.S. and abroad, recognize the messiness of the U.S. democratic system but remain confident in its overall stability and strength compared to other options.

- **Key Points of Concern**
  - **Federal Reserve Authority:** Any potential threats to the Federal Reserve's authority could significantly impact the dollar's credibility.
  - **Sanctions and Safe Haven Status:** The extensive use of sanctions and discussions about seizing sovereign assets, such as the $300 billion of Russian assets, have raised questions about the U.S.'s status as a financial safe haven.
  - **Legal System Independence:** Cases like ByteDance's challenge to the U.S. ban on TikTok are closely watched as indicators of the independence and reliability of the U.S. legal system.

ASEAN Summit 2024

International Relations

Why in news?

- Prime Minister Narendra Modi announced a comprehensive 10-point plan to strengthen India-ASEAN relations during the 21st India-ASEAN Summit

Point Plan for India-ASEAN Relations

- **ASEAN-India Year of Tourism (2025)**: India will allocate **USD 5 million** for collaborative tourism-related activities between India and ASEAN countries.
- **Celebration of a Decade of Act East Policy**: Key events will include a Youth Summit, Start-up Festival, Hackathon, Music Festival, and the Delhi Dialogue, highlighting 10 years of the policy.
- **Women Scientists Conclave**: The conclave will be organised under the **ASEAN-India Science and Technology Development Fund**, promoting collaboration among women scientists.

- **Increased Scholarships for ASEAN Students**: India will double the scholarships available at **Nalanda University** and introduce **new scholarships at its Agricultural Universities** for ASEAN students.
- **Review of the Trade in Goods Agreement**: The agreement is set to be reviewed by 2025 to boost trade relations and facilitate smoother economic exchanges.
- **Disaster Resilience Support**: India will contribute **USD 5 million** to assist ASEAN countries in strengthening disaster resilience efforts.
- **Health Ministers' Track**: A new mechanism will be established to enhance cooperation on health resilience among India and ASEAN nations.
- **ASEAN-India Cyber Policy Dialogue**: Regular dialogues will be held to improve digital and cyber security cooperation between India and ASEAN.
- **Green Hydrogen Workshop**: A workshop will be conducted to explore the potential of green hydrogen as a sustainable solution for both India and ASEAN.
- **Plant a Tree for Mother Campaign**: India will invite ASEAN leaders to participate in this environmental campaign aimed at promoting climate resilience through tree planting.

Five Eyes Alliance

International Relations

Why in news?

- US, UK, Australia, and New Zealand urge India to cooperate with Canada regarding the **Nijjar case.**

About Five Eyes Alliance

- Often abbreviated as FVEY, is an **intelligence alliance** comprising **Australia, Canada, New Zealand, the United Kingdom, and the United States.**
- These countries are bound by the **multilateral UKUSA Agreement,** a treaty for joint cooperation in signals intelligence.
- **Post-World War II Origins:** The alliance's origins trace back to the post-World War II era and the Cold War, formalized in 1946 with the UKUSA Agreement between the US and the UK for sharing signals intelligence.
- **Key Aspects of the Alliance:** Intelligence Sharing, Deep Integration and Collaboration, Secrecy and Confidentiality.

Areas of Convergence

- **Counterterrorism:** India's geographical location and historical experiences with terrorism make it a valuable partner in the Five Eyes' efforts to combat extremist organizations.
- **Cyber security**: India and the Five Eyes countries recognise the importance of information security and collaborating on cyber threat intelligence sharing, technological advancements, and joint exercises will only enhance the capabilities of both parties.
- **Maritime security:** Cooperation in maritime domain awareness, naval exercises, and anti-piracy operations strengthens the collective ability to safeguard vital sea lanes and maritime interests.
-
- **Areas of Divergence**
- **Strategic autonomy:** One of the pillars of India's foreign policy doctrine emphasizes strategic autonomy and non-alignment, which often conflicts with the objectives of the Five Eyes alliance.
- **Regional dynamics**: India's complex relationships within its immediate neighborhood, particularly with countries like China and Pakistan, can create divergent interests with the Five Eyes alliance.
- **Data privacy and sovereignty**: India's regulatory frameworks, such as data localisation laws and restrictions on foreign technology companies, may clash with the alliance's push for open data flows and liberal market access.

Why in news?

- The Department of Science & Technology (DST) launched BharatGen, an initiative to make generative AI available to citizens in different Indian languages.
- Union Science and Technology Minister Jitendra Singh said it was the world's first government-funded project of its kind.

Highlights of BharatGen initiative:

- Spearheaded by IIT Bombay under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), the initiative will create generative AI systems that can generate high-quality text and multimodal content in various Indian languages.
- BharatGen initiative is focused on creating efficient and inclusive AI in Indian languages.
- A key element of BharatGen is its open-source foundational models, which will help democratise AI across India.
- By making AI more accessible, a collaborative ecosystem would be created, where researchers and developers can work together to build innovative solutions.
- The project is expected to be completed in two years along with plans to benefit several government, private, educational, and research institutions.
- A core feature of BharatGen is its focus on data-efficient learning, particularly for Indian languages with limited digital presence.
- Through fundamental research and collaboration with academic institutions, the initiative will develop models that are effective with minimal data, a critical need for languages under served by global AI initiatives.

Generative AI

- Generative AI (GenAI) is an Artificial Intelligence (AI) technology that automatically generates content in response to prompts written in natural language conversational interfaces.
- Rather than simply curating existing webpages, by drawing on existing content, GenAI actually produces new content.
- The content can appear in formats that comprise all symbolic representations of human thinking: texts written in natural language, images (including photographs to digital paintings and cartoons), videos, music and software code.
- GenAI has been an active area of research for a long time. Joseph Weizenbaum developed the very first chatbot, ELIZA, in the 1960s. However, GenAI as we know it today was heralded by the advent of deep learning based on neural networks.
- GenAI is trained using data collected from webpages, social media conversations and other online media. It generates its content by statistically analysing the distributions of words, pixels or other elements in the data that it has ingested and identifying and repeating common patterns (for example, which words typically follow which other words).
- While GenAI can produce new content, it cannot generate new ideas or solutions to real-world challenges, as it does not understand real-world objects or social relations that underpin language.
- In November 2022, OpenAI released ChatGPT (Chat Generative Pre-trained Transformer) to the public, which greatly increased public enthusiasm for GenAI. More than one million people signed up to use ChatGPT in just five days.
- The ChatGPT release has been described by many as an "iPhone moment" for GenAI. This is partly because the platform made it easier for users to access advanced GenAI models.
- GenAI is a cutting-edge technology that is poised to disrupt various economic, social, and cultural sectors, and it extends far beyond simple human-like text generation using chatbots.

The Nobel Prize in Physics

Science & Technology

Why in news?

- **John J. Hopfield and Geoffrey E. Hinton** has been awarded the 2024 Nobel Prize in Physics for their foundational contributions to **artificial neural networks (ANNs) and machine learning (ML).**

About the awardees

- **John Hopfield** is renowned for developing the Hopfield network, a type of recurrent neural network (RNN) that has played a crucial role in the fields of artificial neural networks (ANN) and artificial intelligence (AI).
- **Geoffrey Hinton** built on Hopfield's work in the 2000s by developing a learning algorithm for Restricted Boltzmann Machines (RBMs), which facilitated deep learning through the stacking of multiple layers of neurons.
- Their work has had significant implications across multiple fields, including physics, biology, finance, medicine, and artificial intelligence (AI) applications, such as OpenAI's ChatGPT (Generative Pre-trained Transformer).

The Nobel Prize in Chemistry

Science & Technology

Why in news?

- The **2024 Nobel Prize in Chemistry** was awarded to **David Baker**, **Demis Hassabis**, and **John Jumper** for their groundbreaking work in **protein science.**
  - Google DeepMind researchers Demis Hassabis and John Jumper were recognized for developing artificial intelligence (AI) program called **AlphaFold 2 that predict proteins' 3D shapes.**
  - David Baker, from the University of Washington, received half of the prize for his contributions to **computational protein design.** His work allows scientists to **design entirely new proteins with functions not found in nature**, offering significant potential in areas like medicine, vaccines, and nanotechnology.
- **Computational protein design** involves using computer algorithms to design novel proteins with specific structures and functions.
  - **Objective**: Create new proteins not found in nature, tailored for specific tasks like medical treatments or industrial processes.
  - **Process**: Scientists start by visualizing the desired 3D structure of a protein and then calculate the amino acid sequence that would form it.
  - **Key Tool**: Programs like **Rosetta, developed by David Baker**, optimize sequences by predicting how they will fold into the required structure.
  - **Applications**: These designed proteins can act as drugs, vaccines, sensors, and enzymes, among other uses

Significance of the discovery

- **Understanding Biological Processes**: Scientists can better understand complex processes like metabolism, cell signaling, and immune responses.
- **Custom-designed proteins** can act as highly specific drugs, targeting diseases more precisely than traditional drugs, for instance, by blocking viruses or inhibiting cancer growth.
- **Vaccines**: Designed proteins may be used to create more effective vaccines by mimicking pathogens.
- **Biotechnology and Environmental Impact**: Novel proteins can be engineered for industrial applications, such as enzymes that break down plastic waste or create sustainable biofuels.

About Proteins

- Proteins are large, complex molecules that play critical roles in the body.
- They are made up of **amino acids**, which are linked together in chains.
- There are 20 different types of amino acids, and the sequence in which they are arranged determines the structure and function of each protein.
- Proteins fold into specific 3D shapes, which are critical for their function. Misfolded proteins can lead to diseases such as Alzheimer's or cystic fibrosis.

The Nobel Prize in Medicine

Science & Technology

Why in news?

- Nobel Prize in Medicine 2024 is awarded to **Victor Ambros and Gary Ruvkun** for their discovery of **microRNA.**

About the discovery

- Ambros and Ruvkun studied **C. elegans** (a nematode species) to investigate tissue development.
- They focused on **mutant strains lin-4 and lin-14**, which exhibited genetic programming abnormalities.
- Ruvkun identified that some **microRNAs are found throughout** the animal kingdom.
- These discoveries revealed that microRNAs are abundant and **critical for gene regulation** in multicellular organisms.

MicroRNA

- **Protein Synthesis:**
  - Protein production involves two main steps: **transcription and translation.**
  - **Transcription:** A DNA sequence is copied into mRNA in the nucleus.
  - **Translation:** mRNA leaves the nucleus, attaches to a ribosome, and tRNA brings amino acids to form proteins.

Neutrino Fog

Science & Technology

Why in news?

- Recently, the **LUX-ZEPLIN (LZ) experiment** emphasized that as it progresses in the search for dark matter, the challenge posed by neutrino fog has become increasingly prominent.

About Neutrinos particles

- Neutrinos are **tiny, ghost-like particles** that pass through almost everything unnoticed, making them **difficult to detect** due to their **minimal interaction with matter.**
- They are produced in vast numbers by the Sun and Earth's atmosphere.
- They **interact with matter through the weak force**. The property that matter is almost transparent to neutrinos is a result of this force's weakness.
- They are **electrically neutral**.
- They are produced both in fusion (as in Star) and **decay** (as in Reactor).

What is Dark Matter and Dark Energy?

- **Dark matter** and **Dark energy** constitute approximately **95% of the universe.**
- **Dark Matter:** Dark matter is a **non-luminous substance** in the universe, detectable through gravitational effects. It **comprises approximately 27% of total mass-energy content,** influencing galaxy formation and motion. Despite its significant presence, dark matter remains elusive and undetected directly by instruments.
- **Dark Energy:** Dark energy is a repulsive or anti-gravity force driving the **accelerated expansion of the universe**. It constitutes about **68% of the cosmos**, opposing gravitational attraction.

Global Strategic Preparedness, Readiness and Response Plan (SPRP)

Science & Tech

Why in news?

- Recently, the Global Strategic Preparedness, Readiness and Response Plan (SPRP) to tackle dengue and other Aedes-borne arboviruses was launched by the World Health Organisation
- About Global Strategic Preparedness, Readiness and Response Plan (SPRP):
- The goals of the Global Strategic Preparedness and Response Plan also include reducing the global burden of diseases caused by Aedes-borne arboviral infections, such as dengue, Zika, and chikungunya. It encourages coordination and integration in the global response for managing outbreaks.

Key Components:

- **Emergency Coordination**: To provide leadership and coordination for an effective response.
- **Collaborative Surveillance**: Developing and using surveillance tools for early detection, control, and field investigations of outbreaks.
- **Community Protection**: Engaging local communities in adopting preventive measures, including mosquito population control.
- **Safe and Scalable Care**: Ensuring health services can manage and prevent deaths through necessary care.
- **Access to Countermeasures**: Promoting research and development of new treatments and vaccines.
- **Implementation and Alignment**: The plan will be implemented until September 2025. It integrates with global efforts, including the Global Vector Control Response (2017–2030) and the Global Arbovirus Initiative (2022), focused on strengthening vector control and addressing arboviruses with epidemic consequences.

Future Circular Collider

Science & Technology

Why in news?

- **CERN** needs to finance the construction of the **Future Circular Collider** as its existing particle accelerator — Large Hadron Collider (LHC) — edges toward the end of its useful life.

About Future Circular Collider (FCC)

- The FCC would have a circumference of **80 to 100 kilometers** (50 to 62 miles), making it significantly larger than the LHC.
- The FCC is proposed to be built at **CERN**, near Geneva, Switzerland.
- Objective:
  - Provide insights into the nature of **dark matter, dark energy, and the matter-antimatter imbalance** in the universe.
  - Study the **Higgs boson** in greater detail, potentially revealing new particles or interactions.
  - Help test theories of **supersymmetry**, which hypothesize that each fundamental particle has a heavier "superpartner" particle, offering solutions to unanswered questions in particle physics.

About Higgs Boson

- The Higgs boson, often referred to as the "**God particle**", is a fundamental particle associated with the Higgs field, which gives mass to other particles.
- It was predicted by the Standard Model of particle physics in 1964 by physicists Peter Higgs and others.
- The Higgs boson was discovered in 2012 at the **Large Hadron Collider (LHC)** at CERN.
- The Higgs boson has a mass of approximately **125 GeV/c^2**, making it one of the heaviest known particles.

About Large Hadron Collider (LHC)

- It is the **world's largest and most powerful particle accelerator with a circumference of 27 kilometers (17 miles)**.
- It was designed to **collide protons** (or heavy ions) at extremely high energies to study the fundamental particles of matter and their interactions.

Wayanad X-band Radar

Science & Technology

Why in news?

- After **devastating floods and landslides** killed more than 200 people in **Kerala's Wayanad** district in July 2024, the Union Ministry of Earth Sciences approved an **X-band radar** to be installed in the district.

About Radars

- Radar is short for '**radio detection and ranging**'. The device uses radio waves to determine the distance, velocity, and physical characteristics of objects around the device.

X-band radar

- X-band radar operates in the frequency range of **8 to 12 GHz**, making it notable for its **high resolution and accuracy** while using **smaller antennas** compared to lower frequency radars.
- A radar trying to 'see' smaller particles like rain droplets or fog will need to use radiation of lower wavelengths, like in the X-band.
- This technology is widely utilized in various applications, including **marine navigation, weather monitoring, and military uses.**

Doppler Radars

- Weather radar, also known as a **Doppler radar**, is a common application of this device. The Doppler effect is the change in frequency of sound waves as their source moves towards and away from a listener.
- In meteorology, Doppler radar can detect cloud speed and direction by measuring how the cloud's motion alters the frequency of reflected radiation.
- A **pulse-Doppler** radar can measure the intensity of rainfall.

NISAR

- **NASA** and the **Indian Space Research Organisation (ISRO)** are currently developing a satellite called NISAR, short for '**NASA-ISRO Synthetic Aperture Radar**'.
- It will use radar imaging to produce a high-resolution map of the earth's landmasses.
- Its payload consists of an **L-band radar** (1.25 GHz, 24 cm) built by NASA and an **S-band radar** (3.2 GHz, 9.3 cm) built by ISRO.
- Expected to be launched onboard an **ISRO GSLV Mk II** rocket in 2025.

Fluorescent Nanodiamonds (FNDs)

Science & Technology

Why in news?

- Researchers at Purdue University successfully **levitated nanodiamonds** in a vacuum and spun them at ultra-high speeds, paving the way for new industrial and research applications.

About Fluorescent Nanodiamond (FND)

- FNDs are nanometre-sized diamonds made of **carbon nanoparticles**.
- They are produced in a high temperature and high pressure process.
- FNDs are stable under light and **aren't toxic to living things**, so they have many applications in **high-resolution imaging, microscale temperature sensing, and correlative microscopy**, among others.
- In biology, scientists use FNDs to track cells and their progeny over long periods.

Fluorescence Property of FNDs

- Fluorescence is the ability of certain materials to emit light of a lower frequency when exposed to higher frequency light.
- Unlike many other nano-scale fluorescent materials, **FNDs do not blink during prolonged irradiation.**
- FNDs have a fluorescence lifespan exceeding 10 nanoseconds, which is relatively long.
- This long lifespan makes **FNDs superior to quantum dots**.

Quantum spin

- Spin is a fundamental property of matter's building blocks, like electrons and nuclei, characterized by two states: "up" and "down.".
- In quantum computers, manipulating the spin of particles performs operations, with each particle referred to as a "**spin qubit**".

Application in Industry

- Levitated fluorescent nanodiamonds (FNDs) are highly sensitive to acceleration and electric fields, making them **ideal sensors for critical industries**.
- The Berry phase from FND rotation can be utilized to create **advanced gyroscopes for precise rotation sensing**.

Haber Bosch Process

Science & Technology

- **Context:** One hundred million tonnes of **nitrogen** are extracted from the atmosphere and **transformed into fertilizer** through the Haber-Bosch process, adding 165 million tonnes of reactive nitrogen to the soil.

Haber Bosch Process

- The Haber-Bosch process is an industrial chemical reaction that produces
- **ammonia (NH3) from nitrogen (N2) and hydrogen (H2) gasses.**
- It was developed by **Fritz Haber** and later industrialized by **Carl Bosch**, providing a solution to this problem by creating an artificial method for nitrogen fixation.

Process and Requirements:

- Chemical Equation: $N2 + 3H2 \rightleftharpoons 2NH3$
- Conditions:
  - High Pressure: Around 200 atmospheres (atm) - favors forward reaction
  - High Temperature: 400-500 degrees Celsius (°C) - needed to overcome the activation energy of the reaction
  - Catalyst: An iron-based catalyst - to speed up the reaction.
- Reversible Reaction: The double arrow ($\rightleftharpoons$) indicates that the reaction is reversible, meaning it can proceed in both forward (producing ammonia) and reverse (breaking down ammonia) directions.

Positive Impact of Haber Bosch Process

- **Increased Crop Yields:** The Haber-Bosch process, through increased food production, is estimated to sustain approximately 40% of the world's population.
- **Food Security:** According to one estimate, one-third of the world's population—around two billion people—would be without food if the Haber process for nitrogen fixation did not exist.
- **Scale of Production**: Ammonia produced via the Haber-Bosch process, at a rate of 275 billion lb per year, is among the highest volume chemicals currently made.
- **Economic Significance:** The global fertilizer market was valued at $190.95 billion in 2022 and is expected to grow to $240.63 billion by 2030.
- **Increases Fertilizer Supply:** By producing ammonia on an industrial scale, it ensures the availability of nitrogen fertilizers, essential for enhancing soil fertility and increasing crop yields.

Nanodiamonds (Nds)

Science & Technology

Why in news?

- **Scientists have successfully recorded the Berry phase by the rotation of spin qubits inside the nanodiamonds at ultra-high speeds.**

Nanodiamonds (Nds)

- Nanodiamonds (NDs) are **carbon nanomaterials with a size of a few nanometers to micrometres that have many potential applications.**
- They are produced in a high-temperature and high-pressure process.

- They **can be doped with nitrogen atoms to form nitrogen-vacancy (NV) centres, which host electron spin qubits.**
- Just like a binary bit is the basic unit of information in classical (or traditional) computing, a **qubit (or quantum bit) is the basic unit of information in quantum computing.**

Properties of Nds:

- Fluorescence and non-blinking
- Fluorescence is the **property of some materials to emit light of a lower frequency when irradiated with light of a higher frequency.** But unlike many other nano-scale fluorescent materials, NDs don't blink when irradiated for a long time.

Stability

- Their fluorescence **lifespan is greater than 10 nanoseconds (ns), a relatively long duration, which makes them better than quantum dots.**
- They are stable under light, non-toxic, and capable of maintaining fluorescence for long periods.

Quantum Spin

- Spin is **one of the basic features of the building blocks of matter, like electrons and nuclei.**
- At any given moment, its value is a combination of two states called up and down.
- If the down component is zero, the spin will be up, and vice versa.
- **A computer can map these values to 0s and 1s and use the electrons to encode information. Manipulating the spin forms the basis of quantum computing.**

Berry Phase

- The Berry phase concept was **introduced by physicist Michael Berry in 1986, following earlier work by Indian physicist S. Pancharatnam.**
- The Berry phase is a **geometric phase acquired throughout a cycle when a system's parameters are varied and then returned to their original values.**
- Electrons exhibit both particle and wave characteristics. As waves, they possess properties such as frequency, wavelength, and phase, which can change depending on external conditions.
- **The Berry phase reflects changes in an electron's wave phase when cycled through different quantum states.**
- Electrons can be manipulated by altering energy levels through magnetic fields. **This allows researchers to create a cycle of states, which helps in the measurement of the Berry phase.**
- The Berry phase generated by the rotation of the FNDs could be applied to create a gyroscope for rotation sensing.

Applications

- NDs are **stable under light and aren't toxic to living things, so they have many applications in high-resolution imaging, microscale temperature sensing, and correlative microscopy, among others.**

Progeny tracking

- In biology, scientists use NDs to track cells and their progeny over long periods.

Biomedicine

- NDs are biocompatible and can be used for cell labelling and imaging, targeted drug delivery, and cancer therapy.

Electronic applications

- NDs are used in thin-film electronics, photovoltaic devices, energy storage devices, and electrochemical sensors.

Quantum engineering

- Nds are used in quantum optics and nano-magnetometry.

Line of Actual Control (LAC) Deal

Defence & Security

Why in news?

- India and China have agreed on new patrolling arrangements at the LAC, aiming to resolve remaining military stand-offs at **Demchok and Depsang.**

Key Points of India-China LAC Agreement

- **Restoration of LAC Status:** India and China agreed to revert the LAC to its pre-May 2020 position, allowing both sides to resume patrols, marking a significant diplomatic step in de-escalating tensions.
- **Diplomatic Progress:** External Affairs Minister S. Jaishankar highlighted this as a result of "patient diplomacy," easing tensions that began in 2020.
- **Patrolling Resumed**: Soldiers from both nations will now patrol as per pre-2020 norms, addressing years-long stalled patrols.
- **Heavy Military Presence:** Both countries had stationed over 50,000 troops, and the agreement seeks to lower tension in this militarized zone.
- **Unresolved Details:** Some questions remain about the full scope of patrol rights and the status of buffer zones.
- **Strategic Timing:** The agreement, ahead of PM Modi's BRICS visit, could boost India's global positioning, though concerns persist about China's wider intentions.

Significance of the India-China Agreement

- **Restoring Diplomatic Ties:** The agreement brings hope for renewed India-China relations, with China now open to discussing previously contentious standoff points.
- **Strategic Depsang Plains:** Depsang Plains, near the Daulat Beg Oldie post, holds military value due to its flat terrain that could be used for offensive operations.
- **Importance of the Bottleneck:** The Bottleneck, a rocky outcrop along the DSDBO road, connects key areas in the Depsang Plains and is critical for military access and logistics.

THAAD Missile Defence System

Defence & Security

Why in news?

- US to send missile defence system THAAD to **Israel.**

About THAAD

- The Terminal High Altitude Area Defense (THAAD) is a **U.S. missile defence system.**
- It is designed to **intercept and destroy short, medium, and intermediate-range ballistic missiles** inside and outside the Earth's atmosphere during their terminal phase of flight.
- THAAD intercepts missiles using a **"hit-to-kill" approach** i.e. destroying the target by colliding with it at extremely high speeds.

Patriot Missile System

- USA's surface-to-air missile system for air defence against aircraft and to intercept tactical ballistic missiles (TBMs).
- It has a **lower altitudinal range than THAAD.**
- Recently, the USA sent Patriot Missiles to Ukraine.

Malabar Exercise

Defence & Security

Why in news?

- Recently, the **Indian Naval Ship Satpura** in Visakhapatnam hosted the Opening Ceremony of MALABAR 2024, organized by the Eastern Naval Command.

About Malabar Exercise

- Initiated in 1992 as a bilateral exercise between India and the **United States. Japan and Australia** later joined, making it a multi-national maritime engagement.
- It takes place annually in the **Indian Ocean and Pacific Oceans alternatively.**

nations, fostering regional stability and strategic alignment.

- **Promotes Indo-Pacific Security:** The exercise improves maritime domain awareness, ensuring a rules-based order in the Indo-Pacific region.
- **Enhances Interoperability:** It boosts naval cooperation, allowing participating forces to work seamlessly in multilateral operations, including humanitarian assistance.
- **Counterbalance to China's Influence:** Malabar signals collective regional deterrence against China's expanding maritime assertiveness in contested Indo-Pacific waters.
- **Fosters Diplomatic Ties:** By enhancing military collaboration, Malabar deepens diplomatic relations between participant countries, contributing to broader geopolitical stability.

S-400 Missile

Why in news?

- Russia is set to deliver the remaining two regiments of the S-400 Triumf surface-to-air missile systems to India by next year.

About S-400

- The S-400 Triumf (SA-21 Growler) is a long-range surface-to-air missile (SAM) system developed by **Russia.**
- The S-400 stands out for its sophisticated radars, long-range missiles, high mobility, flexibility, adaptability, and networking capabilities.

Features

- **Wide area detection and track capability:** S-400 radars can maintain 300 target tracks while engaging 36 threats.
- **Long-range missiles:** It can intercept threats well before they reach protected assets, and force enemy aircraft to stand off.
- **Mobility and Rapid deployment:** Components such as Launchers, radars and command posts can be mounted on wheeled vehicles: mounted on trucks for easy transport.
- **Flexibility and adaptability**: It can protect high-value targets or deny access to larger areas. It can intercept terrain-hugging cruise missiles to exo-atmospheric ballistic missiles.
- **Networking and integration:** Command posts coordinate sensors and launchers across wide areas. Networked sensors and launchers increase redundancy and resistance to electronic attack.

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