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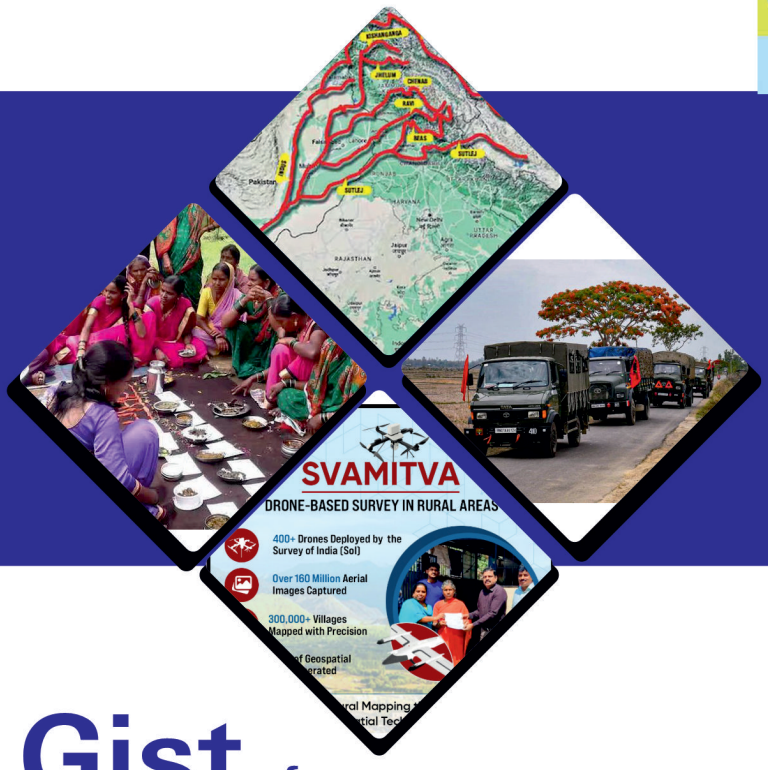

- Indus Water Treaty
- Mahadev Koli Tribe
- Article 355 of the Indian Constitution
- Cabinet Committee on Security(CCS)
- 5 Years of SVAMITVA Scheme

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INDEX

CURRENT AFFAIRS

ENVIRONMENT & ECOLOGY

Karimpuzha Wildlife Sanctuary

Why in the news?

A recent faunal survey conducted by the Forest Department, has reported 63 new species of odonates, butterflies, and birds in the Karimpuzha Wildlife Sanctuary.

About Karimpuzha Wildlife Sanctuary:

- It lies in the Malappuram district in Kerala.
- Spanning approximately 227.97 sq.km, the sanctuary is situated on the western slopes of the Nilgiri Hills.
- The forest areas of Karimpuzha WLS forms part of the Nilgiri Biosphere Reserve (NBR), recognized under the Man and Biosphere Programme of UNESCO.
- Karimpuzha WLS shares a boundary with Mukurthi NP (Tamil Nadu) on the eastern side and Silent Valley NP (Kerala) on the southern side.
- The name 'Karimpuzha' is derived from the Karimpuzha River, a tributary of the River Chaliyar.
- The sharp topographical gradient of the hills ranging from 40 m to 2550 m is the primary reason for the unique biodiversity of the Karimpuzha WildLife Sanctuary.
- The area merges with landscapes of Tamil Nadu and Kerala.
- Steep hills, deep valleys, marshy lands, grasslands, and shola forests with hillocks, and perennial water sources combined with altitudinal variations make it an ideal habitat for a variety of flora and fauna.
- The nomadic tribe cholanaikans, cavemen of Kerala, are living inside the Karimpuzha WLS.
    - They are classified as Particularly Vulnerable Tribal Groups (PVTGs) by the Government of India.
- Flora: It is the state's only forest stretch where seven forest types found in the state are all present, including evergreen rainforest, semi-evergreen forest, moist deciduous forest, sub-tropical hill forest, sub-tropical savannah, montane wet temperate forest and montane wet grasslands.
- Fauna: It is home to a variety of fauna endemic to the Western Ghats, including the Nilgiri Tahr, Lion-tailed macaque, slender loris, tiger, gaur.

Source: The Hindu

Naini Lake

Why in the news?

The Naini Lake, one of Nainital's key attractions, recently recorded a water level of 4.7 feet — marking a five-year low.

About Naini Lake:

- It is a natural freshwater lake of tectonic origin, located amidst Nainital city of Uttarakhand.
- Discovered in the early 1800s by the British, the Naini Lake also finds mention in the Skanda Purana as Tri-Rishi-Sarovar.
- The lake is in crescent or kidney shape, and has an outlet at the southeastern end.
- It covers a perimeter of 2 miles with

a depth from 6m to 28 m.

- It is one of the four lakes in the Kumaon hills, the three others being Sattal Lake, Bhimtal Lake, and Naukuchiyatal Lake.
- Balia Nala is the main feeder stream of the lake. Other than this, 26 major drains, including the three perennial ones, feed it.
- Mallital is the name of the lake's north end, while Tallital is the name of the southern one, which has a bridge with Gandhi's statue and a post office on its sides.
    - It is the world's only post office on a lake bridge.

Source: Indian Express

Euphaea Wayanadensis

Why in the news?

A new species of damselfly, Euphaea wayanadensis, has been discovered in the Wayanad region of the Western Ghats, Kerala.

About Euphaea wayanadensis

- Classification: Belongs to the family Euphaeidae.
- First sightings: Initially observed in 2013 at the Kalindi River, Thirunelli, in Wayanad district, Kerala.
- Further sightings occurred from 2013 to 2019 in Wayanad, followed by more observations from 2019 to 2023 in Aralam (Kannur, Kerala) and the western slopes of Coorg (Karnataka).

Identification challenges:

- Initially misidentified as Euphaea pseudo dispar, a species from Maharashtra.
- Later confirmed as a distinct species through detailed morphological study and genetic analysis.

Key Morphological Features

- Distinctive hind wing: Features a longer black patch compared to related species.
- Striking colouration: Males display broader and uninterrupted humeral and antehumeral stripes.
- Unique genital structure: The male genital vesicle exhibits structural traits that differ from closely related species.

Habitat and Distribution:

- Prefers fast-flowing streams with rocky beds and aquatic vegetation.
- Thrives in evergreen and semi-evergreen forest regions along stream banks.
- Active throughout the year, except in the dry seasons of March and April.
- Shows highly restricted distribution, making it vulnerable to habitat loss and climate change.

Source: The Hindu

Theobaldius konkanensis

Why in the news?

A team of researchers from India and the U.K. recently discovered a species of land snail from the Konkan region of Maharashtra and named it, 'Theobaldius konkanensis'.

About Theobaldius konkanensis:

- It is a new species of land snail discovered from the Konkan region of Maharashtra.
- It is endemic to the northern Western Ghats.
- The species was principally found in tropical evergreen and semi-evergreen forests.
- The live specimens were found on the forest floor in leaf litter and on damp fallen branches from June to September, and at other times of the year only shells were observed.

Features of the Theobaldius konkanensis:

- It is active during the day and night, with live individuals being easily found in the afternoon in well-shaded places under the forest canopy.
- It co-occurs with other ground-living land-snail genera.
- It is unique for its slightly flattened shell and raised centre.
- Also near the snail's neck, where the shell begins, a triangular-shaped outline of the shell is jutting out, and the protective cover has a raised edge and tiny spines.

- The shell is corneous yellow with brown striations, and the body is stout and rounded.

Source: The Hindu

De-Extinction

Why in the news?

A US-based bioscience company, Colossal Biosciences, has recently made headlines by announcing the birth of three genetically modified grey wolf pups.

What is De-Extinction?

- De-extinction refers to the scientific process of reviving extinct species by using their genetic material, often through gene editing and cloning techniques. It involves reconstructing the genome of an extinct species and modifying the DNA of a closely related living organism to resemble the extinct one.

About Dire Wolf

- The dire wolf (Aenocyon dirus) was a large prehistoric canine that once roamed across southern Canada and the United States. It became extinct around 13,000 years ago.
- Although they resembled modern grey wolves (Canis lupus), dire wolves were larger, with thicker white coats, and hunted large prey like bison, horses, and even mammoths.
- Their extinction is believed to be linked to the disappearance of their prey species, possibly accelerated by human hunting activities.

Scientific Process: How Was It Done?

- The de-extinction process followed by Colossal involved the following steps:
    - DNA extraction: Scientists obtained DNA from two ancient dire wolf specimens: a 13,000-year-old tooth and a 72,000-year-old skull. The petrous bone from the skull, known for its preserved DNA, was crucial in this process.
    - Genome reconstruction: The DNA was sequenced to recreate the complete genome of the dire wolf. This was then compared with genomes from closely related canids like coyotes, jackals, dholes, and particularly, grey wolves, which were found to share 5% of their DNA with dire wolves.
        - Gene editing: Using gene editing tools, scientists made 20 unique changes to 14 genes in the grey wolf genome.
    - Surrogacy and Birth: The genetically modified embryos were implanted into surrogate dog mothers, leading to the birth of the pups.

Source: Down to earth

Arctic Biome

Why in the news?

The 2024 Arctic Report Card by the US NOAA confirms this trend, noting that frequent fires and fossil fuel pollution are turning the Arctic tundra into a carbon source.

The Arctic Tundra Biome

- The Arctic tundra is a treeless plain with permafrost within a meter of the soil surface. Summers cause only the top layer to thaw, limiting plant growth and root penetration.
- Despite its rocky, nutrient-poor soil, the tundra holds large amounts of carbon in peat (decayed moss) and humus (organic matter), making it a critical carbon sink.
- The Arctic tundra biome spans 5 million km², covering land north of the Arctic Circle, including parts of Canada, Greenland, Iceland, and Eurasia.
- The climate here is extremely cold, with temperatures from -60°C in winter to 15.5°C in summer. Annual precipitation is low (150–250 mm), mostly in snow and sleet form.
- Vegetation is herbaceous, including grasses, lichens, mosses, and low shrubs like dwarf willows, adapted to cold, wind, and poor soil.
- Animal life includes caribou, polar bears, arctic foxes, musk ox, and migratory birds like

loons and snow geese. Insects like mosquitoes flourish in summer due to melting snow.

- Human habitation is limited, mainly to coastal areas, with indigenous communities like the Eskimos living semi-nomadic lives and relying on fishing and hunting.
- Resource extraction has increased in recent decades. Examples include gold mining in Alaska, petroleum in Kenai Peninsula, and iron ore in Labrador, Canada, and Kiruna, Sweden.
- Infrastructure like railways and Arctic ports have enabled the transport of minerals, timber, and furs, especially from Siberia, assisted by modern icebreakers

Source: The Hindu

Typhloperipatus williamsoni

Why in the news?

A team of researchers recently reported rediscovering a long-lost species of the velvet worm, named Typhloperipatus williamsoni, one of the oldest living fossils in the world, after 111 years.

About Typhloperipatus williamsoni:

- It is an ancient velvet worm species (phylum Onychophora), one of the oldest living fossils in the world.
  - Onychophora is a very old group, easily older than 350 million years.
  - It has only two families and not more than 200 species. The diversity is very less.
  - These were evolving almost simultaneously with dinosaurs. When the mass extinction happened, probably a lot of them were wiped out.
  - What we see today is mostly those species which escaped extinction.
- T. williamsoni was rediscovered after 111 years from the Siang Valley in Arunachal Pradesh.
  - T. williamsoni was first collected during the "Abor expedition" by Stanley Kemp, the erstwhile superintendent of the Indian Museum, Calcutta, and his team in December 1911 in Siang Valley.
  - Since Kemp's discovery, there have been no documented records of it from India.
- The molecular data from williamsoni indicated that South Asian onychophoras split from their neotropical (Central and South America), including southern parts of Mexico and the Caribbean and only African relatives around 237 million years ago.
- Interestingly, the Asian onycophora were found to have no relatives in Australian onychophoras.
- This is unusual given that invertebrates found in Southeast Asia and India are usually related to those in Australia.
- Asian Onychophora is one of the few exceptions to this relationship.

Source: The Hindu

Asian Hornet

Why in the news?

In 2025, sightings of the hornet have surged dramatically, with evidence of the species breeding and overwintering in the UK for the first time, as confirmed by DNA studies.

About the Asian Hornet

- The Asian hornet (Vespa velutina), also known as the yellow-legged hornet, is an invasive species originally native to Southeast Asia.
- It is not the same as the Asian Giant Hornet (Vespa mandarinia), often wrongly labeled the "murder hornet." While both are bee predators, the Asian hornet (Vespa velutina) is smaller but equally destructive in ecological terms.
- These hornets are predatory insects, feeding primarily on social bees and wasps, especially honeybees, which are critical pollinators in ecosystems.
- The Asian hornet's specialised hunting tactics make it a lethal threat to honeybee colonies, as it can wait

at hive entrances and kill bees mid-flight.

Invasion History and Spread:

- The Asian hornet was first introduced to Europe in 2004, most likely via a shipment of Chinese pottery that brought a fertilised queen to France.
- Since then, the species has spread to 15 European countries, with France alone hosting over 500,000 nests.
- Britain recorded its first official detection of the Asian hornet in 2016.

Source: Down to earth

Leptobrachium aryatium

Why in the news?

New frog species 'Leptobrachium aryatium' discovered in Assam

Key facts about the species:

- A new species of frog, named Leptobrachium aryatium, has been officially identified after a 21-year-long study.
- The frog was first studied in 2004 but was originally misidentified as Leptobrachium smithi.
- This species was found in the Garbhanga Reserve Forest, located on the southwestern edge of Guwahati, Assam, bordering Meghalaya.
- It lies adjacent to Deepor Beel, a Ramsar site, and forms a crucial part of the Garbhanga-Rani-Deepor Beel elephant corridor, highlighting its importance in regional wildlife movement.
- The frog has been named after Arya Vidyapeeth College, a prominent educational institution in Guwahati, in recognition of its role in transforming the local area from a liquor brewing hub to an educationally respected zone.

Key Biological Features of Leptobrachium aryatium

- Leptobrachium aryatium belongs to the Leptobrachium genus, which includes stocky frogs with broad heads, short hind limbs, and distinctively coloured eyes.
- This new species is notable for its fiery orange-and-black eyes, a reticulated throat pattern, and a rhythmic dusk-time call.
- Scientific confirmation of its status as a new species was done through morphological examination, DNA analysis, and bioacoustic studies (study of call patterns).

Source: The Hindu

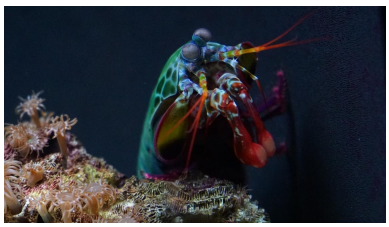
Mantis Shrimp

Why in the news?

A joint US-French research team discovered that the mantis shrimp's powerful strike is made possible without self-injury due to a specialized microstructure in its club.

About Mantis shrimp:

- The mantis shrimp is a small, colorful ocean creature, about 10 cm long.
- It is known for its fearsome predatory abilities despite its unassuming appearance.



- It lives in warm, shallow waters in the Indian and Pacific oceans.
- It is a powerful ocean predator which uses a specialized hammer-like appendage called the dactyl club to strike prey at speeds of 23 m/s.
- This powerful strike not only generates shockwaves but also avoids causing recoil damage to the shrimp itself.

Latest Discovery on Mantis shrimp

- Researchers discovered that the club's specialized microstructure uses phononic shielding to absorb and redirect recoil energy. .
- The mantis shrimp's club has three layers: a hard outer layer of hydroxyapatite and two inner layers with biopolymer fibers arranged in patterns that resist damage and manipulate shockwave propagation.
- The internal structure acts as a phononic bandgap, blocking certain frequencies of energy waves and preventing damage.

Importance of the Mantis shrimp

- This natural design mirrors metamaterials, previously thought to be man-made, and opens doors to bio-inspired innovations like better protective gear and energy-trapping materials.
- These insights may inspire biomimetic materials for protective gear, reducing injuries from blasts in military and sports.

Source: The Hindu

Colossal Squid

Why in the news?

Marine scientists recently captured the world's first footage of a colossal squid swimming freely in its natural habitat - nearly a century after the species was first identified.

About Colossal Squid:

- It is one of the largest and most elusive invertebrates on Earth.
- Scientific Name: Mesonychoteuthis hamiltoni
- Distribution: It is found in the icy depths of the Southern Ocean near Antarctica.

Features of the Colossal Squid:

- This soft-bodied marine animal is somewhat like an octopus, but with a much bulkier frame and far greater length.
- It has a tube-shaped body, huge eyes, and arms and tentacles with suckers to grab food.
- It can reach lengths of up to 7 metres (around 23 feet) and weigh as much as 500 kilograms.
- When they're young, these creatures are almost see-through, giving them the glassy, ghost-like look that's typical of many deep-sea juveniles.
- As they grow, their appearance changes drastically, taking on a deep red or purplish colour and developing thick, muscular arms.
- Fully grown, they are believed to be the largest invertebrates on Earth, meaning they have no bones but can still grow to massive sizes.
- What really sets the colossal squid apart, though, are the sharp, swivelling hooks on its tentacles, something no other squid species has.
- It's also known for having the largest eyes of any animal ever discovered, believed to help it detect prey and predators in the pitch-black ocean depths.
- Conservation Status:
- IUCN Red List: Least Concern

Source: The Hindu

Alamosaurus

Why in the news?

In a remarkable find at Big Bend National Park, United States of America, geology students recently uncovered a rare and nearly complete fossil of the Alamosaurus.

About Alamosaurus:

- Alamosaurus is one of the largest dinosaurs known to have existed.
- Native to North America during the late Cretaceous period (100.5 to 66 million years ago), Alamosaurus is an herbivorous sauropod with armoured spikes on its back that protect it from predator attacks.

    - The sauropods were not only the largest dinosaurs but also the largest land animals ever to evolve.
- Alamosaurus is the only known sauropod in North America from the Upper Cretaceous.
- It was the largest terrestrial animal in North America during the Upper Cretaceous.
- Standing at least 11 meters (36 feet) tall, 30.5 meters (100 feet) long, and weighing 38-80 metric tons, it rivals the size of the biggest sauropods like Argentinosaurus, which lived in Argentina, South America around 97-92 million years ago.
- It has a long neck, tail, and pillar-like limbs characteristic of its family.
- Alamosaurus died out in the Cretaceous-Paleogene extinction event, making it one of the last non-avian dinosaurs to ever walk the Earth.

Source: Down to earth

Labeo uru and Labeo chekida

Why in the news?

Labeo uru and Labeo chekida, two new species of freshwater Rohu fish, have been discovered in the Western Ghats region of India.

About Labeo uru and Labeo chekida

- Labeo uru and Labeo chekida are newly identified freshwater fish species belonging to the Rohu group (genus Labeo), discovered by ICAR-NBFGR scientists in the Western Ghats.
- Labeo uru was found in the Chandragiri River and is named for its distinctive sail-like dorsal fin.
- Labeo chekida, locally known as 'kaka chekida', is a small, dark-bodied fish discovered in the Chalakkudy River.
- The discovery resolves the long-standing taxonomic confusion with Labeo nigrescens, first described in 1870, by confirming the distinct identities of all three species based on unique morphological traits.
- This breakthrough highlights the rich and previously undocumented fish biodiversity of the Western Ghats, a recognised global biodiversity hotspot.

Source: The Hindu

Bone Collector' Caterpillar

Why in the news?

A new carnivorous caterpillar has been discovered on the Hawaiian island of Oahu, earning the nickname "bone collector" because of its unusual behavior.

About Bone Collector' Caterpillar

- The "Bone Collector" is a newly discovered carnivorous caterpillar found exclusively on the Hawaiian island of Oahu.
- It constructs a protective case using body parts of its prey, such as ant heads and fly wings, along with silk.
- Habitat: The bone collector is found in a small, isolated patch of mountain forest on Oahu, which is also threatened by invasive species.
- The caterpillar's evolutionary lineage is estimated to be at least six million years old, older than the formation of the Hawaiian islands themselves.
- This caterpillar feeds on insects caught in spider webs and adorns its silk case using the body parts of its prey, such as ant heads and fly wings.

About Hawaii:

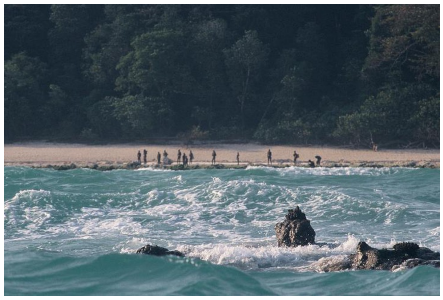
- Hawaii is a S. state located in the Pacific Ocean and is made up of an archipelago formed by volcanic activity.
- It comprises eight main islands: Hawaii (Big Island), Maui, Oahu, Kauai, Molokai, Lanai, Niihau, and Kahoolawe.
- The capital city is Honolulu, situated on Oahu.
- The islands feature diverse landscapes, including active volcanoes, rainforests, beaches, and dramatic cliffs.
- The Hawaiian Islands originated from a hotspot in the Earth's mantle, which continues to create volcanic formations across the Pacific.

Source: The Hindu

North Sentinel Island

Why in the news?

A U.S. national was recently arrested in the Andaman and Nicobar Islands for allegedly entering the prohibited tribal reserve area of North Sentinel Island.



About North Sentinel Island:

- It is one of the Andaman Islands - an archipelago in the Bay of Bengal - and part of the Indian Union Territory of Andaman and Nicobar Islands.
- It is located west of the central cluster of the Andaman Islands.
- The island measures approximately 8 kilometers (5.0 mi) in length and 7 kilometers (4.3 mi) in width, covering an area of about 60 square kilometers (23 sq mi).
- The island is densely covered in tropical rainforest.
- It's also circled by a shallow reef.
- It harbours one of the world's last secluded tribes — the Sentinelese.
    - They are believed to be direct descendants of the first humans who migrated out of Africa around 60,000 years ago.
    - The tribe has lived in voluntary isolation for thousands of years, fiercely resisting contact with the outside world.
- The island falls under the Andaman and Nicobar Protection of Aboriginal Tribes Act, 1956, making it illegal to approach closer than 5 nautical miles.
- According to a 2011 census effort, and based on anthropologists' estimates, there are probably somewhere between 80 and 150 people on North Sentinel Island, although it could be as many as 500 or as few as 15.

Source: The Hindu

Heard & Mcdonald Islands

Why in the news?

The US President imposed a 10% tariff on imports from the Heard and McDonald Islands, despite the islands having no known exports to the US.

About Heard and McDonald Islands:

- The Heard and McDonald Islands are a remote sub-Antarctic volcanic island group, located in the southern Indian Ocean, about 4,100 km southwest of Perth (Australia) and 1,600 km north of Antarctica.
- They are one of Australia's seven external territories and are governed directly by the Australian government.
- The islands are volcanic in origin, with Big Ben volcano on Heard Island reaching 2,745 meters (Mawson Peak), making it Australia's highest mountain outside mainland and Tasmania.
- McDonald Island is much smaller but has shown recent volcanic activity, with eruptions in the late 1990s and 2000s doubling its size.
- They are the only volcanically active sub-Antarctic islands, making them a natural laboratory for studying earth's crustal processes, oceanic and atmospheric warming, and glacial dynamics.
- The islands are part of a UNESCO World Heritage Site (since 1997) due to their pristine sub-Antarctic ecosystem, managed as a strict nature reserve (IUCN Category Ia).
- They support large populations of marine birds and mammals, including penguins, elephant seals, and seabirds.
- Importantly, the islands are free of invasive species, making them ideal for biodiversity and evolutionary studies.

Source: Indian Express

Hadean Proto Crust

Why in the news?

A new international study led by Macquarie University, Australia, suggests that the chemical

signatures attributed to plate tectonics were already present in the Hadean proto crust.

What is the Hadean Proto Crust?

- The Hadean protocrust refers to the earliest known crust of the Earth—its outermost solid layer—that formed during the Hadean aeon, the planet's first geologic era, which began around 6 billion years ago.
- This period is named after 'Hades', the Greek god of the underworld, due to the extremely hot, hostile, and unstable conditions that prevailed on early Earth.

Geological conditions during the Hadean Aeon

- The Earth, within its first 200 million years, had a surface that was partially molten, with widespread volcanic activity and constant meteorite bombardment from space.
- During this time, the magma ocean—a vast reservoir of molten rock covering Earth's surface—began to cool gradually.
- As the surface cooled, early fragments of solid

crust began to form. These fragments were not stable and often broke off, while new layers solidified, creating a flaky, unstable crustal layer.

- Some thicker segments of this primitive crust eventually consolidated into the first proto-continents, floating on the underlying asthenospheric mantle—a semi-fluid layer extending up to 400 km beneath the surface.

Birth of Plate Tectonics

- As these crustal plates drifted across the mantle, they began to interact in various ways: colliding, sliding past, or subducting (diving under) one another.
- These early plate movements laid the foundation for plate tectonics, a key process in shaping the Earth's geological features.
- Over time, these interactions left distinct chemical signatures in the Earth's crust, enabling scientists to reconstruct the history of tectonic activity.

Source: The Hindu

Blue Washing

Why in the news?

The Central Pollution Control Board (CPCB) has recently introduced a new category of industries called the 'Blue Category', which falls under Essential Environmental Services (EES).

What is Blue Washing?

- 'Blue Washing' refers to the practice of portraying polluting industries as environmentally friendly by categorising them under less polluting or cleaner industry labels.
- This term is now used to describe the reclassification of highly polluting Waste-to-Energy (WTE) incineration industries by the Central Pollution Control Board (CPCB) into the new 'Blue Category'.

About the Blue Category

- The 'Blue Category' is introduced as part of a subset of EES activities like composting, biogas plants, sewage treatment, and material recovery facilities.
- Waste-to-Energy (WTE) incineration, previously under the 'Red Category' with a Pollution Index (PI) of 6, is now reclassified as a 'Blue Category' industry.

What is WTE Incineration?

- WTE incineration burns mixed municipal solid waste (MSW) to produce heat and electricity.
- It generates energy through turbine-driven steam, similar to coal plants, but emits more CO_2

About Pollution Index (PI)

- The Union Ministry of Environment, Forest and Climate Change (MoEFCC) introduced a PI to categorise industries based on pollution levels.
- PI is calculated on the basis of emissions (air pollutants), effluents (water pollutants), hazardous waste, and resource consumption.
- PI ranges from 0 to 100, with industries classified as:
  - White Category (0–20): Least polluting

- Green Category (21–40)
- Orange Category (41–59)
- Red Category (60–100): Most polluting.

Source: Down to earth

Sunbird

Why in the news?

Sunbird is a nuclear fusion-powered rocket being developed by Pulsar Fusion, a British startup, to revolutionise interplanetary travel.

About Sunbird

- Sunbird could potentially reach speeds of up to 805,000 km/h, which is faster than the Parker Solar Probe (692,000 km/h), currently the fastest human-made object.
- This technology, if successful, could enable missions to Pluto in just 4 years and cut travel time to Mars by nearly half.
- It aims to revolutionize interplanetary travel by drastically reducing travel time to distant planets like Mars and Pluto.
- An orbital demonstration is scheduled for 2027, marking a major milestone in space propulsion technology.

What is Nuclear Fusion?

- Nuclear fusion replicates the energy generation process of stars, fusing atoms to release energy.

- Unlike fission, fusion is cleaner and offers higher energy output with lower radioactive waste.

Source: Indian Express

Bullseye Galaxy

Why in the news?

The Bullseye Galaxy (LEDA 1313424) was recently discovered by an international team of researchers using the Hubble Space Telescope and W.M. Keck Observatory.

About Bullseye Galaxy

- The galaxy's distinct ringed structure is believed to have formed approximately 50 million years ago due to a head-on collision with a blue dwarf galaxy.
- This head-on collision is believed to have caused rippling gas waves, leading to star formation in ring-like patterns.
- This discovery was termed "serendipitous" as ringed galaxies usually have only two or three rings.
- GLSB galaxies are believed to be rich in dark matter, and their unusual mass distribution challenges the Standard Model of Cosmology.
- These galaxies display a uniform central mass instead of a dense core, suggesting discrepancies in current models.

Observed Through Multiple Telescopes:

- The Hubble Space Telescope confirmed eight rings.
- The M. Keck Observatory in Hawaii confirmed a ninth ring, revealing the full structure.
- The Bullseye Galaxy spans 250,000 light-years in diameter — nearly 5 times larger than the Milky Way. Despite a current separation of 130,000 light-years, a thin trail of gas still connects it to the colliding dwarf galaxy.
- The Bullseye may evolve into a Giant Low Surface Brightness (GLSB) Galaxy, a rare, massive galaxy type believed to hold clues about dark matter.

Giant Low Surface Brightness (GLSB) Galaxy features:

- Composed of diffuse, low-density stellar disks.
- Contain large amounts of neutral hydrogen but exhibit low star formation rates.
- Include examples like Malin 1, which is 5 times wider than the Milky Way.

Source: The Hindu

Cloudburst

Why in the news?

Recently, the Ramban district of Jammu and Kashmir witnessed torrential rainfall and hail, resulting in severe damage.

Key Point:

- The India Meteorological Department (IMD) reported 9 mm of rainfall in 24 hours, marking a 575% increase from the normal 2.5 mm.

What is a Cloudburst?

- A cloudburst is a localised and extremely intense rainfall event, defined by rainfall of 10 cm or more within one hour over an area of approximately 10 km × 10 km.
- Even 5 cm of rain in 30 minutes over the same area qualifies as a cloudburst.
- Cloudbursts are more common in mountainous regions due to a process known as orographic lift. In this phenomenon:
    - Warm air ascends the mountain slope and expands due to lower atmospheric pressure at higher altitudes.
    - As it expands and cools, the air releases its moisture in the form of precipitation.
    - When large volumes of warm, moist air keep rising and accumulating moisture without releasing it, it can lead to a sudden, violent downpour.
- Because of their localised nature, cloudbursts are difficult to forecast and can overwhelm drainage systems, resulting in flash floods and landslides.

What is a Flash Flood?

- A flash flood is a sudden and rapid inundation that occurs when excessive rainwater enters streams, drains, or rivers, often overwhelming the natural or built drainage capacity.
- These are more frequent in mountainous regions where the rocky terrain absorbs little water, causing more surface runoff.
- Unlike riverine floods in plains that cause long-term property damage, flash floods tend to be more deadly, often catching people off guard and leading to loss of life.

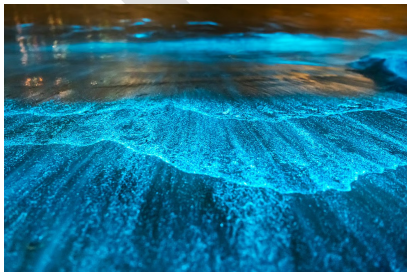
Source: Indian Express

CLIMATE

Bioluminescent Backwaters

Why in the news?

Recently, bioluminescent blue waves were observed in the backwaters of Kochi, Kerala, attracting tourists but raising concerns among ecologists and fishers due to underlying environmental degradation.



About Bioluminescence

- Bioluminescence refers to the natural emission of light by organisms such as bacteria, fungi, and algae triggered by mechanical disturbances in coastal and estuarine waters.
- The species most commonly responsible is Noctiluca scintillans, a type of dinoflagellate plankton, also known as “sea sparkle”.
- This glow results from chemical reactions inside specialized structures called scintillons and appears primarily blue but can also show red or brown hues depending on species concentration.
- The phenomenon is commonly observed from March to May, locally termed as "Kavaru" in Malayalam.

Scientific Background

- Eutrophication—caused by nutrient overload (especially nitrates and phosphates) from industrial runoff and sewage discharge—is a major driver.

- Salinity levels between 30-35 ppt, rising temperatures, and reduced rainfall contribute to their
- When concentrations exceed 500,000 organisms per litre, it leads to red tides, which can severely disrupt marine ecosystems.

Ecological and Economic Impacts

- Plankton, while a key part of marine food chains, in large numbers release substances like dimethyl sulphide, ammonium, and dissolved organic carbon, causing Harmful Algal Blooms (HABs).
- HABs lead to hypoxia (oxygen depletion), resulting in mass fish mortality and affecting biodiversity and aquaculture
- Fishing communities experience significant losses as fish migrate away from bloom-affected zones, leading to declining catches and reduced income.
- Toxins such as domoic acid and those from Alexandrium can cause amnesic or paralytic shellfish poisoning, harming both marine life and human health.

Source: Down to earth

Modernization of Command Area Development and Water Management (M-CADWM) Scheme

Why in the news?

The Union Cabinet recently approved the 'Modernisation of Command Area Development and Water Management (M-CADWM)' as a sub-scheme of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

About Modernization of Command Area Development and Water Management (M-CADWM) Scheme:

- It is a sub-scheme of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).
- This initiative, with an initial outlay of ₹1,600 crore, is set to run from 2025-2026 and is designed to significantly enhance the irrigation infrastructure in India.
- The key goal of the M-CADWM is to modernise the irrigation water supply network, ensuring that irrigation water reaches the designated farming clusters from existing canals or other water sources.
- This will help farmers with small land-holdings, by improving water-use efficiency through the use of advanced technologies such as SCADA (Supervisory Control and Data Acquisition) and the Internet of Things (IoT).
- These technologies will assist in better water accounting and management, directly contributing to increased Water Use Efficiency (WUE) at the farm level.
- A key feature of the M-CADWM scheme is the implementation of underground pressurised, piped irrigation systems, extending up to 1 hectare per farm.
- This infrastructure will be developed to enhance micro-irrigation practices, enabling farmers to use water more effectively and ultimately increasing agricultural production and productivity.
- In addition to modernising the irrigation systems, the scheme aims to build sustainable farming practices.
    - It proposes the Irrigation Management Transfer (IMT) to Water User Societies (WUS), empowering these communities to manage irrigation assets independently.

    - To ensure long-term success, these societies will receive support for the next five years, helping them connect with Farmer Producer Organisations (FPOs) or Primary Agricultural Cooperative Societies (PACS).
    - This is expected to profitably improve sustainable water management
- The M-CADWM scheme also seeks to make agriculture more appealing to youth by encouraging the adoption of modern irrigation techniques, creating new opportunities for young people in the agricultural sector.

Source: The Hindu

Atmospheric Rivers

Why in the news?

Recently, a large part of the United States experienced heavy rain, strong winds, and severe thunderstorms caused by an atmospheric river.

Atmospheric rivers:

- They are narrow, fast-moving bands of moisture and wind—like rivers in the sky—that transport large amounts of water vapor from tropical oceans to land.
- They typically span 402 to 606 km in width and over 1,600 km in length.
- They often resemble hurricanes in intensity and are most common in mid-latitudes.
  - A famous example is the Pineapple Express, which carries moisture from Hawaii to the U.S. and Canadian West Coasts.
  - However, the recent storm in the U.S. originated from the Caribbean.

Importance and Threats

- Most atmospheric rivers are weak and beneficial, supplying vital rain and snow
- They can also cause severe weather such as heavy rain, strong winds, flooding, and mudslides.

Study:

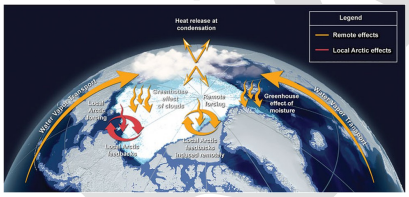
A NASA study predicts that future atmospheric rivers will be longer, wider, and more intense, increasing the risk of severe flooding.

Source: Indian Express

Arctic Amplification

Why in the news?

According to the 2024 European State of the Climate Report, Europe has warmed nearly twice as much as the global average, with far-reaching climatic and ecological consequences.



What is Arctic Amplification?

- Arctic amplification is a phenomenon where temperature changes in the polar regions, especially the Arctic, are more intense than the global average temperature change.
- It is a form of polar amplification, which occurs when changes in Earth's atmosphere lead to a greater rise in temperatures near the poles than in other parts of the world.
- This effect is measured against the average temperature rise of the planet and is particularly pronounced in the northern polar regions, hence the term Arctic amplification.
- The phenomenon is primarily driven by changes in the net radiation balance of the atmosphere, especially due to the increase in greenhouse gases like CO_2 and methane, which trap more heat in the Arctic region.
- The major contributing factors to Arctic amplification are: Ice-Albedo Feedback, Lapse Rate Feedback, Water Vapour Feedback & Ocean Heat Transport.

Key Highlights from the 2024 European State of the Climate Report:

Warming trends in Europe vs. Global Averages:

- The global average temperature has risen by approximately 3°C above pre-industrial levels (1850–1900 baseline).
- In 2024, the planet crossed the critical 5°C threshold for the first time ever.
- Europe's average temperature has increased by about 4°C, making it one of the fastest-warming regions on Earth.
- This accelerated warming has led to extreme weather events, including intense heat waves, heavy rainfall, and flooding.

Regional climatic contrasts within Europe:

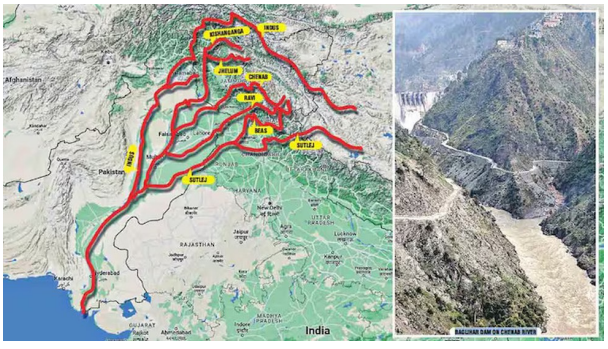
- The Eastern part of Europe experienced warmer and sunnier
- Western Europe witnessed cloudier and wetter
- Southeastern European countries (e.g., Bulgaria, Romania, Serbia, Croatia) saw their longest heatwave on record in 2024.
- The number of 'cold stress days' was the lowest ever, and below-freezing temperature days dropped significantly.

Source: Indian Express

Indus Water Treaty

Why in the news?

Recently, India suspended the Indus Water Treaty (IWT) following a deadly militant attack in Pahalgam, Kashmir, which killed 26 civilians.



About Indus Water Treaty

- The Indus Waters Treaty was signed between India and Pakistan on September 19, 1960, with the World Bank acting as a mediator.
- The treaty was designed to ensure cooperation and information-sharing between the two countries regarding water use from the Indus River system, which includes six rivers: Indus, Jhelum, Chenab, Ravi, Beas, and Sutlej.
- The treaty allocated the three western rivers—Indus, Jhelum, and Chenab—to Pakistan for unrestricted use, while India retained the three eastern rivers—Ravi, Beas, and Sutlej—for its exclusive use.
- India was allowed limited, non-consumptive uses of the western rivers for domestic, agricultural, and hydroelectric purposes, under strict conditions.
- This arrangement meant that around 80% of the total water volume was granted to Pakistan, while India received the remaining 20%.
- To manage the treaty's implementation, both nations agreed to establish a Permanent Indus Commission (PIC), which is required to meet annually to discuss technical matters and facilitate data exchange.

Source: Indian Express

Mahadev Koli Tribe

Why in the news?

A recent study highlights the Mahadev Koli tribe's rich reservoir of medicinal and ecological knowledge, expertise that could be vital in strengthening global climate resilience.

About Mahadev Koli Tribe:

- Mahadev Koli or Mahadeo Koli are a subcaste of the Koli community of Maharashtra and Goa states of India.
- The Mahadev Koli derive their name from their god, Mahadev, and live in the Mahadev hills of Maharashtra.
- They are found mostly in the Pune, Ahmednagar, and Nasik districts of Maharashtra.
- They are classified as a Schedule Tribe.
- They speak Marathi and use the Devanagari script.
- There are twenty-four exogamous clans among the Mahadev Koli, and they use their clan's names as their surnames.
- Their staple food consists of rice, nagli, varai, and wheat.
- Occupation: Other than agriculture, they are also involved in cattle production, dairy and poultry farming, and wage labour as subsidiary occupations.

Beliefs of the Tribe:

  - Most of the Mahadev Koli follow a number of Hindu traditions.
  - Members of each clan have their own deity.
- They possess extensive knowledge of local flora, utilizing over 50 native tree species for medicinal purposes.
- Tanaji Malusare, a revered general in Chhatrapati Shivaji Maharaj's army, hailed from this community. His valor in the Battle of Sinhagad is legendary.

Source: Indian Express

ASI Documents Rock, Temple Inscriptions in T.N.'s Pudukkottai

Why in the news?

The Archaeological Survey of India's (ASI) Epigraphy Division recently documented inscriptions from Malayadipatti and Ponnamaravathi in Tamil Nadu's Pudukkottai district using the estampage method on maplitho paper.

Key facts about the Malayadipatti:

- It is located near Kumbeswarar Temple and is a 16th-century inscription, though partially damaged, it records a land partition agreement between Sundara Chozhapuram and Sevvalur villages for excavating a pond (oorani).
  - Near a spring (sunai), another inscription mentions King Raja Rajan Sundarapandyan and credits Udaiyan Perumal of Sevalur for his contribution to the creation of the waterbody.

Key facts about the Ponnamaravathi

- It is an inscription on the western side of the sanctum dates to the 8th regnal year of Maravarman Kulasekara Pandiyan.
- It refers to the temple as Chozheeswarar Udaiya Nayanar Temple, under Uzhavalai Nadu, and records a donation of 40 panam for lighting five temple lamps.
  - Earlier inscriptions from the same temple, copied by ASI in 1909 and 2000, include one from the 6th regnal year of Raja Raja III, placing the temple under Rajendra Chola Vala Nadu.

Importance :

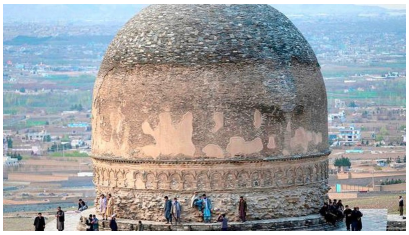
These inscriptions offer valuable insights into regional governance, religious patronage, and community contributions to water management in historical Tamil Nadu.

Source: The Hindu

Bamiyan Buddhas

Why in the news?

Taliban's changing approach towards heritage sites in Afghanistan.



About Bamiyan Buddhas

- The Bamiyan Buddhas, carved in the 6th century CE, were two monumental statues of standing Buddhas measuring 115 feet and 174 feet in height, embedded into the sandstone cliffs of Bamiyan Valley, central Afghanistan.
- These statues are considered exemplary of the Gandhara School of Buddhist Art, which reflected a unique blend of Indian, Persian, and Greco-Roman artistic influences.
- The Bamiyan Buddhas, named Salsal (meaning "light shines through the universe") and Shamama ("Queen Mother"), stood 55 metres and 38 metres tall.
- These statues represented a fusion of Gupta, Sassanian, and Hellenistic styles, representing a unique confluence of civilisations.
- The statues represented the confluence of cultural traditions and were significant markers of the spread of Buddhism across Central and South Asia between the 1st and 13th centuries.

Background of Destruction

- The Taliban, a hardline group that emerged in the 1990s, imposed an extremist interpretation of Islamic law, which included banning art, education for girls, and public expression.
- On 27 February 2001, the Taliban officially announced its plan to demolish the Bamiyan Buddhas, deeming them un-Islamic.
- Over 25 days, the statues were systematically destroyed using explosives, marking one of the most egregious acts of cultural vandalism in modern history.
- In 2003, UNESCO designated the Bamiyan Valley as a World Heritage Site, despite the irreversible damage done.
- In 2021, a 3D holographic projection temporarily recreated the statue of Salsal, offering a new way to engage with the lost heritage.

Source: The Hindu

Article 355 of the Indian Constitution

Why in the news?

The Supreme Court recently appeared surprised over a petition seeking the invocation of Article 355 in West Bengal, citing violence in Murshidabad district during protests against the Waqf Amendment Act.

About Article 355:

- It is a part of emergency provisions contained in Part XVIII of the Constitution of India, from Article 352 to 360.
- It empowers the Centre to take necessary steps to protect a state from any kind of threat, be it internal or external.
- It allows the Centre to take charge of a state's law and order enforcement without dismissing the government, and is considered a step below the President's rule, which gives full control to the President.
- The provision is designed to ensure that the government can act swiftly and decisively in the event of any disturbance or threat to the peace and security of the country.

Exact definition:

- The exact definition of Article 355 in the Constitution of India is, "It shall be the duty of the Union to protect every State against external aggression and internal disturbance and to ensure that the government of every State is carried on in accordance with the provisions of this Constitution."

Source: Hindustan Times

Parens Patriae Doctrine

Why in the news?

The Bombay High Court, invoking 'parens patriae', recently appointed a daughter as the legal guardian of her 78-year-old mother diagnosed with severe dementia.

About Parens Patriae Doctrine:

- The Doctrine of Parens Patriae, meaning "parent of the nation" in Latin, is a legal principle that empowers the state to act as a guardian for individuals who are unable to care for themselves.
- Under parens patriae, a state or court has a paternal and protective role over its citizens or others subject to its jurisdiction.
- Originating from English common law, the doctrine allows the government to protect the welfare of vulnerable groups such as minors, incapacitated individuals, and persons with disabilities.
- It embodies the state's responsibility to ensure the safety, rights, and interests of those unable to safeguard their own.
- In modern legal systems, this principle has been applied in areas such as juvenile justice, mental health, consumer protection, and environmental conservation, making it a cornerstone of judicial intervention to promote societal welfare and equity.

Parens Patriae in Indian Legal Framework:

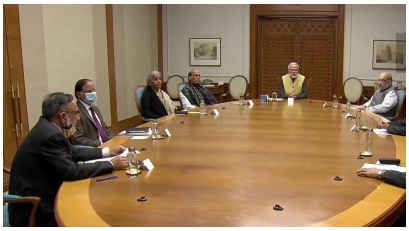
- In India, the Doctrine of Parens Patriae reflects the state's constitutional commitment to protecting the welfare and rights of its citizens, particularly vulnerable groups.
- Indian courts have consistently invoked this doctrine in areas such as juvenile justice, consumer protection, environmental conservation, mental health, and the rights of persons with disabilities.

Source: The Times of India

Cabinet Committee on Security (CCS)

Why in the news?

Noting the cross-border linkages of the terrorist attack in Pahalgam recently, the Cabinet Committee on Security (CCS) announced a series of extraordinary retaliatory measures against Pakistan.



About Cabinet Committee on Security (CCS):

- The CCS, headed by the Prime Minister, is responsible for important discussions and decisions on defence policy, expenditure, and matters related to national security.
- It is also the apex body when it comes to the appointments of the officials in the national security bodies.

History of the Cabinet Committee on Security:

- A committee comparable to the current CCS structure was first formed in independent India in 1947 by then-Prime Minister Jawaharlal Nehru.
- Formed against the background of a newly independent nation facing national security challenges, the committee was constituted with the primary aim of assessing and addressing the political, economic, and military situations in India's border areas.
- The first emergency meeting of this committee was reportedly called during the Indo-Pak War of 1947–48.
- It was reportedly chaired by Prime Minister Jawaharlal Nehru, with Home Minister Sardar Patel and Defence Minister Baldev Singh as its members.
- It was after the 1999 Kargil War that the committee evolved to adopt the present formal structure of the CCS and became a high-powered committee for defence and national security.
- Over time, the CCS has evolved into the apex decision-making body concerning internal and external security matters of the Government of India.

Composition of the CCS:

- With the Prime Minister as its chairperson, the committee typically comprises the Home Minister, Defence Minister, Finance Minister, and External Affairs Minister as members.
- The National Security Advisor (NSA) acts as secretary-level coordinator on matters within its purview.
- While the defence minister is a permanent invitee to the panel, other members may be included as per requirements.
- The Cabinet Secretariat is responsible for maintaining records of all the meetings and proceedings of the CCS.
- The CCS concerns itself with all matters related to defence, foreign affairs, intelligence, nuclear issues, space policy, and major appointments related to national security.

Source: Indian Express

INTERNATIONAL RELATIONS & ORGANIZATIONS

International Federation of Red Cross and Red Crescent Societies (IFRC)

Why in the news?

The International Federation of Red Cross and Red Crescent Societies (IFRC) has launched an urgent appeal for over $100 million to assist the victims of the devastating earthquake that struck Myanmar recently.

About International Federation of Red Cross and Red Crescent Societies (IFRC):

- It is the world's largest humanitarian network.
- Founded in 1919, the Geneva-based Federation brings together 192 Red Cross and Red Crescent societies and some 100 million volunteers.
- The IFRC's mission is to improve the situation of the most vulnerable, coordinating emergency international assistance to people affected by natural and man-made disasters, including the forcibly displaced, and in health crises.
- The Federation also helps vulnerable communities to overcome crisis and become more resilient through disaster preparedness activities.
- Its mandate includes strengthening the capacities of its member Red Cross and Red Crescent Societies to conduct effective emergency relief, disaster preparedness, and health and community care programmes.
- It also represents these societies at an international level.

- The IFRC also has programs addressing the humanitarian consequences of rapid urbanization, climate change, violence and migration.
- Funding: Voluntary contributions from governments, NGOs, corporate donors, and the public.
- Relationship with ICRC: Works alongside the International Committee of the Red Cross (ICRC), which focuses on humanitarian law and aid in conflict zones.

Source: The Print

Carriage of Goods by Sea Bill, 2024

Why in the news?

The Lok Sabha recently passed the Carriage of Goods by Sea Bill, 2024, paving the way for the enactment of modern maritime law in the country.

About Carriage of Goods by Sea Bill, 2024:

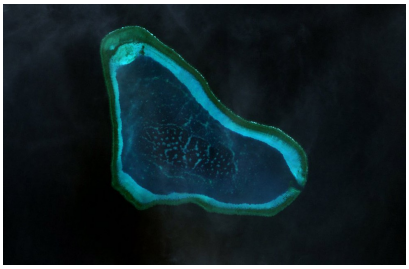
- It will replace the colonial-era Indian Carriage of Goods by Sea Act, 1925.
  - The Act establishes the responsibilities, liabilities, rights, and immunities in case of goods carried from a port in India to another port in India or any other port in the world.
  - The Act is in conformance with the International Convention for the Unification of Certain Rules of Law relating to Bills of Lading of August 1924 (Hague Rules) and subsequent amendments to it.
  - The bill retains all provisions of the act.
- The bill is aimed at consolidating laws related to port management, promoting integrated port development, and enhancing the ease of doing business in the maritime sector.
- It seeks to optimize the utilisation of India's vast coastline by establishing and empowering State Maritime Boards to ensure effective management of ports other than major ports.
- It also proposes the formation of the Maritime State Development Council to foster structured growth and development of the port sector.
- It also addresses critical aspects such as pollution control, disaster management, emergency response, security, safety, navigation and data management at ports.
- It seeks to ensure India's compliance with international obligations and maritime conventions.
- This bill includes provisions for port conservation and introduces adjudicatory mechanisms for resolving port-related disputes efficiently.
- Powers of the Central Government: The Bill empowers the Central Government to:
  - issue directions for carrying out provisions of the Bill;
  - amend the schedule specifying rules applicable to bills of lading;

Source: Live Mint

Scarborough Shoal

Why in the news?

China deployed two long-range H-6 bombers around the Scarborough Shoal recently, in Beijing's latest move to assert sovereignty over the hotly disputed atoll in the South China Sea.



About Scarborough Shoal:

- The Scarborough Shoal (also known in English as the Scarborough Reef) is an oceanic coral atoll that developed on top of a seamount into a triangle shape in the eastern part of the South China Sea.
- It is located some 220 kilometers west of the Philippines' Island of Luzon.
- It is the largest atoll in the South China Sea, submerged at high tide with few rocks above sea level.
- This atoll extends 18 km along its northwest-southeast axis and reaches 10 km along its northeast-southwest axis.

- The deep waters around the shoal make it a productive fishing area, rich in marine life, and the lagoon also contains many commercially valuable shellfish and sea cucumbers.
- The shoal is the source of an ongoing and, so far, unresolved dispute between the People's Republic of China and the Philippines, with both countries claiming that the shoal lies within their territory and saying they have exclusive rights to access its waters.
    - There are no structures built on Scarborough Shoal, but the feature is effectively controlled by China, which has maintained a constant coast guard presence at the feature since 2012.
    - China, which now refers to the shoal as Huangyan Island, makes a historical claim to the area, stating that they can trace their ownership of the area back to the Yuan Dynasty of the 1200s.
    - The Philippines claim the area on the basis of geography, as it is much closer to the Philippines' main island of Luzon, which contains the capital, Manila, but lies over 500 miles from China.
    - It is considered within the Philippines' 200-nautical mile exclusive economic zone, based on the 1982 United Nations Convention on the Law of the Sea (UNCLOS).

Source: NDTV. Com

INSV Tarini

Why in the news?

The Indian Naval Sailing Vessel (INSV) Tarini has reached Cape Town, South Africa, marking the fourth and final international stop in its global circumnavigation expedition, Navika Sagar Parikrama II.

About INSV Tarini:

- INSV Tarini is an indigenously built, 56-foot sailing vessel commissioned into the Indian Navy in February 2017.
- Built by: Aquarius Shipyard Ltd., Goa, under the Make in India initiative.
- Advanced features: It is equipped with a Raymarine navigation suite, satellite communication systems, and emergency steering mechanisms, allowing it to operate under extreme conditions.
- Symbolic naming: The vessel is named after the Tara-Tarini hill shrine in Odisha, which was historically revered by sailors for safe voyages. In Sanskrit, 'Tarini' means both boat and saviour.

About Navika Sagar Parikrama II

- The expedition was flagged off from Goa on October 2, 2024, by Chief of the Naval Staff, Admiral Dinesh K. Tripathi.
- Total Distance: The mission aims to cover 23,400 nautical miles (approximately 43,300 km) in eight months, sailing across three oceans and three major capes.
    - Route Covered:
    - Fremantle, Australia
    - Lyttelton, New Zealand
    - Port Stanley, Falkland Islands (UK)
    - Cape Town, South Africa (final stop before returning to India)
- The mission is scheduled to conclude in May 2025, when INSV Tarini returns to Goa.

Source: The Hindu

Ottawa Convention

Why in the news?

NATO members Poland, Finland and all three Baltic states have queued up over the past few weeks to withdraw from the Ottawa Convention.

About Ottawa Convention:

- The Ottawa Convention, also referred to as the "Mine Ban Treaty," prohibits the use, stockpiling, production, and transfer of anti-personnel landmines (APLs).
- It requires states-parties to destroy their stockpiled APLs within four years and eliminate all APL holdings, including mines currently planted in the soil, within 10 years.

- Countries may request a renewable extension, which can be up to 10 years long, to fulfill their destruction obligations.
- States-parties are also required annually to report their total APL stockpiles, the technical characteristics of their APLs, the location of all mined areas, and the status of APL destruction programs.
- The convention, which is of unlimited duration and open to all nations, entered into force on March 1, 1999.
- 164 countries had ratified or acceded to the treaty.
- Some key current and past producers and users of landmines, including the United States, China, India, Pakistan, and Russia, have not signed the treaty.

Source: Indian Express

SAARC Visa Exemption Scheme (SVES)

Why in the news?

The Indian government recently announced that Pakistani nationals will not be permitted to travel to India under the SAARC Visa Exemption Scheme (SVES).

About SAARC Visa Exemption Scheme (SVES):

- The SVES was launched in 1992.
- Under the scheme, certain categories of dignitaries from SAARC countries are issued a special travel document.
- This special instrument exempts them from the need for visas and other travelling documents to travel among these countries.
- Currently, the list includes 24 categories of entitled persons, which include dignitaries, judges of higher courts, parliamentarians, senior officials, businessmen, journalists, sportspersons, etc.
- Visa stickers are issued by the respective member states to the entitled categories of that particular country.
- The validity of the visa sticker is generally for one year.
- The implementation is reviewed regularly by the immigration authorities of SAAR member states.

What is SAARC?

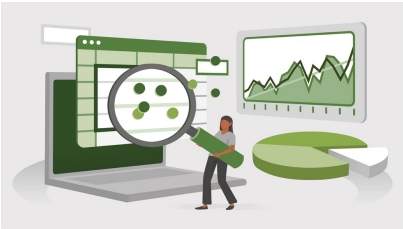
- The South Asian Association for Regional Cooperation (SAARC) was established on December 8, 1985.
- SAARC is an economic and political regional organisation of countries in South Asia.
- The Secretariat of the Association was set up in Kathmandu, Nepal, in January 1987.
- SAARC has eight member countries — Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.
- SAARC aims to accelerate the process of economic and social development in its member states through increased intra-regional cooperation.

Source: The Hindu

NITI NCAER States Economic Forum Portal

Why in the news?

Amid complaints by opposition-ruled states that they faced discrimination in the sharing of resources, the Union Finance Minister will launch the "NITI NCAER States Economic Forum" portal.



About NITI NCAER States Economic Forum Portal:

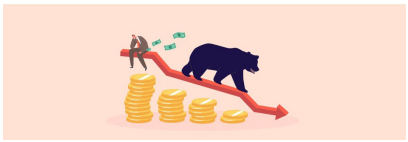
- It was developed by NITI Aayog, in collaboration with the National Council of Applied Economic Research (NCAER).
- It is a comprehensive repository of data on social, economic, and fiscal parameters, research reports, papers, and expert commentary on state finances for a period of about 30 years from 1990-91 to 2022-23.
- The portal has four main components, namely:
  - State Reports - summarising the macro and fiscal landscape of 28 Indian States, structured around indicators on demography, economic structure, and socio-economic and fiscal indicators.
  - Data Repository – offering direct access to the complete database categorised across five verticals, viz. Demography; Economic Structure; Fiscal; Health and Education.
  - State Fiscal and Economic Dashboard – showcasing graphical representations of key economic variables over time and providing quick access to raw data through a data appendix or additional information through summary tables.
  - Research and Commentary - draws on extensive research on State finances and critical aspects of fiscal policy and financial management at the State and national levels.
- The portal will facilitate an understanding of macro, fiscal, demographic, and socio-economic trends; easily accessible data and a user-friendly format; and will also address the ongoing need for consolidated sectoral data in one place.
- It will further help in benchmarking the data of each state against that of other States and the national figures.
- It will also provide a forum for policymakers, researchers, and others interested in alluding to the data for informed debates and discussions.
- The portal will serve as a comprehensive research hub, offering a wealth of data and analytical tools for in-depth research studies.
- By leveraging historical trends and real-time analytics, users will be able to track progress, identify emerging patterns, and formulate evidence-based policies for development.

Source: The Hindu

Bear Market

Why in the news?

S &P 500 — a stock market index that tracks the performance of 500 of the largest publicly traded companies in the US — briefly entered bear market territory for the first time since 2022.



About Bear Market:

- A bear market is a financial market experiencing prolonged price declines, generally of 20% or more.
- A bear market usually occurs along with widespread investor pessimism, large-scale liquidation of securities and other assets, and a weakening economy.
- A bear is an investor who expects prices to decline and, on this assumption, sells a borrowed security or commodity in the hope of buying it back later at a lower price, a speculative transaction called selling short.
- Bear markets are often associated with declines in an overall market or index, but individual securities or commodities can also be considered to be in a bear market if they experience a decline of 20% or more over a

sustained period of time, typically two months or more.

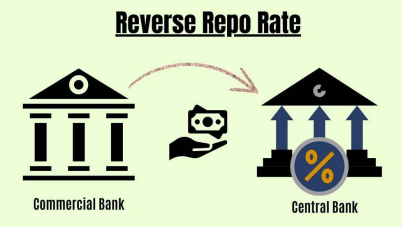
- Bear markets also may accompany general economic downturns such as a recession.
- They are seen as the opposite of upward-trending bull markets.

Source: Indian Express

Repo Rate

Why in the news?

Recently, the Reserve Bank of India (RBI) reduced the repo rate by 25 basis points, bringing it down to 6%.



About Repo Rate:

- The repo rate is the interest rate at which the RBI lends short-term funds to commercial banks against government securities.
- It serves as a primary tool for the RBI to regulate liquidity, control inflation, and influence overall economic activity.
- By adjusting the repo rate, RBI can either encourage banks to borrow more (by lowering the rate) or discourage borrowing (by raising the rate), thus influencing the money supply in the economy.

Impact of RBI Repo Rate Cut

- Lower Borrowing Costs: Commercial banks benefit from reduced borrowing costs, enabling them to offer loans at more competitive interest rates.
- Fixed Deposit (FD) Interest Rates: Banks typically lower FD rates after a repo rate cut, as their own cost of funds decreases. This means new FDs will offer lower returns, while existing FDs remain unaffected until maturity.
- Enhanced Credit Flow: Lower interest rates encourage increased borrowing by businesses and consumers, stimulating investment and consumption.
- Boost to Real Estate and Infrastructure: Due to more affordable financing options, sectors like real estate and infrastructure may see heightened activity.
- Support Amid Global Challenges: The RBI's accommodative stance aims to bolster the Indian economy against global uncertainties, such as increased U.S. tariffs impacting exports.

Source: Business Standard

National Industrial Corridor Development Programme (NICDP)

Why in the news?

Recently, NICDC was honoured with the Udyog Vikas Award at the Udyog Vikas event organised by Janmabhumi Daily in Kerala.

About National Industrial Corridor Development Programme (NICDP):

- NICDP is India's most ambitious infrastructure initiative aimed at developing new industrial cities as "Smart Cities", integrating next-generation technologies across infrastructure sectors.
- National Industrial Corridor Development Corporation (NICDC) is the nodal agency managing the programme.
- NICDP is designed to attract investments from both large anchor industries and Micro, Small, and Medium Enterprises (MSMEs), acting as a catalyst for achieving the Government's goal of $2 trillion in exports by 2030.
- Newly sanctioned industrial areas under NICDP include: Khurpia (Uttarakhand), Rajpura-Patiala (Punjab), Dighi (Maharashtra), Palakkad (Kerala), Agra and Prayagraj (Uttar Pradesh), Gaya (Bihar), Zaheerabad (Telangana), Orvakal and Kopparthy (Andhra Pradesh), and Jodhpur-Pali (Rajasthan).
- These projects are closely aligned with the PM GatiShakti National Master Plan, ensuring integrated, seamless multi-modal connectivity across the country.

Key facts about the Palakkad Industrial Smart City (Kerala):

- The Palakkad Industrial Smart City, spanning 1,710 acres across Pudussery Central, Pudussery West, and Kannambra, is set to reshape Kerala's industrial landscape.

Strategic location advantages:

- 21 km from Palakkad city
- 120 km from Cochin
- 50 km from Coimbatore
- Offering seamless interstate connectivity and strong logistical benefits.
- Designed to be South India's key industrial gateway, it ensures multimodal connectivity via road, rail, and air, making it attractive for high-quality investments, regional employment generation, and innovation.

Source: PIB

SCIENCE & TECHNOLOGY

Perm Submarine

Why in the news?

Russian President Vladimir Putin recently launched the Perm, a Project 885M Yasen-class nuclear-powered submarine, from Murmansk.

About Perm Submarine:

- It is a fourth-generation nuclear-powered attack submarine belonging to the Yasen-M class (Project 885M).
- Named after the city of Perm in the Urals, it is the sixth vessel in the Yasen/Yasen-M series and the first Russian nuclear submarine to be officially equipped with the 3M22 Zircon hypersonic cruise missile as a standard feature.
- It is scheduled to enter service with the Russian Navy in 2026.

Features of the Perm Submarine:

- It is powered by a pressurized water-cooled nuclear reactor generating 200 megawatts (approximately 268,204 hp).
- It can reach speeds of up to 31 knots underwater and 16 knots on the surface.
- It has a 25–30-year core life, eliminating the need for mid-life refueling, and allows natural coolant circulation, contributing to lower acoustic signatures.
- With a maximum diving depth of 600 meters and an operational depth of 520 meters, the Perm can remain submerged for up to 100 days.
- Its overall length is 130 meters, with a beam of 13 meters and a draft of 9.4 meters, and it accommodates a crew of 64 members.

Source: Reuters. Com

INS Tarkash

Why in the news?

The Indian Navy's frigate INS Tarkash, which has been deployed in the Western Indian Ocean for maritime security operations, has intercepted and seized over 2500 kg of narcotics recently.

About INS Tarkash:

- It is a state-of-the-art stealth frigate of the Indian Navy. It is part of the navy's Western Fleet.
- It belongs to the Talwar class of guided missile frigates. These are modified Krivak III-class frigates built by Russia.
- INS Tarkash was built at the Yantar shipyard in Kaliningrad,
- It was commissioned and inducted into the Indian Navy on November 9, 2012, at Kaliningrad, Russia.

Features of the INS Tarkash:

- It uses stealth technologies and a special hull design to ensure a reduced radar cross-section.
- It has a length of 124.8 m, a beam of 15.2 m, and a draught of 4.2 m (13 ft 9 in).
- Top Speed: 32 knots (59 km/h; 37 mph).
- It has been equipped with a weapon sensor that enables it to address threats in all dimensions.

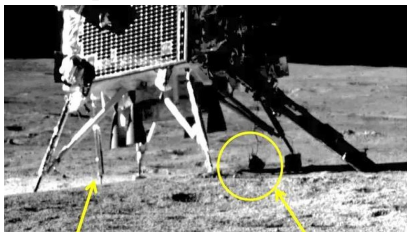
- It can board one Ka-28 Helix-A antisubmarine helicopter or one Ka-31 Helix-B airborne early warning helicopter.
- Weapons: Supersonic BrahMos missile system, advanced surface-to-air-missile system, upgraded 100mm medium range gun, optically controlled 30mm close-in weapon system, torpedoes, rocket launchers, and advanced electronic warfare/communication suite.

Source: The Hindu

Chandrayaan-3 ChaSTE

Why in the news?

Chandrayaan-3's Surface Thermophysical Experiment (ChaSTE) became the first instrument to measure in situ temperatures near the moon's south pole.



About ChaSTE

- It successfully penetrated lunar soil and deployed a thermal probe, achieving what two previous missions—ESA's Philae (2014) and NASA's InSight HP3 (2018)—could not.
- This experiment provided crucial data on lunar surface temperatures, strengthening evidence of water ice deposits.

How ChaSTE Works?

- ChaSTE's thermal probe was integrated into the Vikram lander of Chandrayaan-3, which landed on August 23, 2023.
- The probe is equipped with 10 temperature sensors placed 1 cm apart along its length, near the nose-tip.
- It uses a rotation-based deployment mechanism instead of a hammering device, which played a crucial role in its success.
- The motor rotates, pushing the probe downward until the tip touches the Moon's surface.
- As the probe continues to penetrate deeper, the increasing resistance from the lunar soil helps determine how far it has descended.
- ChaSTE successfully reached a depth of 10 cm in the Moon's regolith, where it continuously monitored temperature variations until September 2, 2023.
- The final temperature readings from the deep lunar soil confirmed thermal properties essential for lunar exploration.

Comparisons with Previous Missions

- ESA's Philae lander (2014) on Comet 67P: It carried the MUPUS instrument to measure surface and subsurface temperatures. Failed due to an awkward landing, preventing the probe from being deployed properly.
- NASA's InSight lander (2018) on Mars: Included the Heat Flow and Physical Properties Package (HP3), featuring a self-hammering nail nicknamed "The Mole" designed to penetrate 5 meters underground.
- Encountered low friction in Martian sand, preventing it from burrowing deep enough to collect meaningful temperature data.
- The temperature sensors were attached to a tether, not on the mole itself, which made data collection impossible.

Source: The Hindu

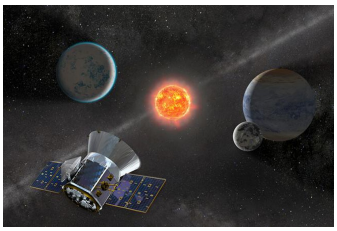
Transiting Exoplanet Survey Satellite (TESS)

Why in the news?

Using the Transiting Exoplanet Survey Satellite (TESS), an international team of astronomers recently detected a new warm Jupiter exoplanet located more than 1,000 light years away.

About Transiting Exoplanet Survey Satellite (TESS):

- TESS is a NASA mission that was launched in March 2018.
- It is a small space telescope designed to discover thousands of exoplanets in orbit around the brightest dwarf stars in the sky.
- It is a follow-up to NASA's highly successful Kepler space telescope, which found thousands of exoplanets during a decade of work after its launch in 2009.
- In its prime mission, a two-year survey of the solar neighborhood, TESS monitored the brightness of stars for periodic drops caused by planet transits.



    - This method reveals the diameter of the planet and the size of its orbit.
    - Orbits within a certain range lie in the "habitable zone", where liquid water can exist on the surface of an Earth-like world.
- The prime mission ended on July 4, 2020, and TESS is now in an extended mission.
- TESS is finding planets ranging from small, rocky worlds to giant planets, showcasing the diversity of planets in the galaxy.
- TESS finished its primary mission by imaging about 75% of the starry sky as part of a two-year-long survey. In capturing this giant mosaic, TESS found 66 new exoplanets.

Source: The Hindu

Technology and Innovation Report 2025

Why in the news?

India has been ranked 10th in the world with significant private investments in Artificial Intelligence (AI) in 2023, according to the 2025 Technology and Innovation Report.

About Technology and Innovation Report:

- It was released by the UN Conference on Trade and Development (UNCTAD).
- It seeks to address issues in science, technology and innovation that are topical and important for developing countries in a comprehensive way with an emphasis on policy-relevant analysis and conclusions.
- The 2025 edition of the report, entitled: Inclusive artificial intelligence for development, aims to guide policymakers through the complex Artificial Intelligence (AI) landscape and support them in designing science, technology and innovation policies that foster inclusive and equitable technological progress.

Highlights of the Report:

- It shows that just 100 companies, mostly in the United States and China, are behind 40 percent of the world's private investment in research and development, highlighting a sharp concentration of power.
- At the same time, 118 countries – mostly from the Global South – are missing from global AI governance discussions
- The report estimates that up to 40 percent of global jobs could be affected by AI.
- To avoid being left behind, developing countries need to strengthen what UNCTAD calls the "three key leverage points": infrastructure, data and skills.
- India and China are the only developing countries in the world with significant private investments in AI in 2023.
- The US leads the world in terms of private investment in AI, at 67 billion US dollars in 2023, or 70 percent of global AI private investment. China was in second position, with 7.8 billion US dollars, and India in tenth position, with 1.4 billion dollars.
- India ranked 36th in 2024 out of 170 nations on the Readiness for Frontier Technologies Index, improving its position from 48th in 2022.

Source: PIB

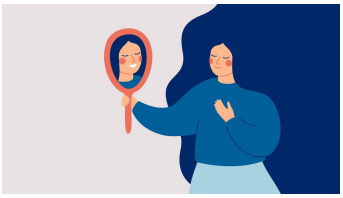
Topological Materials

Why in the news?

The United Nations has declared 2025 as the International Year of Quantum Science and Technology, marking 100 years since quantum theory began to revolutionise science.

What are Topological Materials?

- Topological materials are substances that exhibit different physical properties on their surface and in their interior.
- These materials may behave like a metal on the outside (conducting electricity) but like an insulator on the inside (not conducting electricity).
- The term "topological" refers to the unique geometric and quantum properties of the material, which remain unchanged even if the shape of the material is distorted.
- Discovered in the latter half of the 20th century, these materials represent a new class of quantum matter.
- Nobel Prize in Physics (2016) was



awarded to scientists (David Thouless, Duncan Haldane, and Michael Kosterlitz) for their theoretical discoveries in this field.

How do they work?

- These materials exhibit a metallic surface (conducting electrons freely) while maintaining an insulating core (electrons remain localized).
- This strange duality arises from quantum mechanical effects, especially the topology of electronic band structures.
- The behaviour is deeply rooted in the principles of quantum mechanics, where electron spin and momentum interplay due to a phenomenon called spin-orbit coupling.
- The interaction of light and matter, the collective behavior of electrons, and phase transitions are governed by quantum principles.
- The UN declared 2025 as the International Year of Quantum Science and Technology, marking 100 years since the foundation of quantum mechanics.

Why do Metals and Insulators differ?

- In metals, electrons are free to move — like a soup of charge, allowing conduction of electricity and heat.
- In insulators, electrons are bound tightly to their atoms and do not move freely, hence they do not conduct electricity.
- When light (an electromagnetic wave) hits these materials:
- In metals, electrons move collectively and reflect light.
- In insulators, electrons move individually, allowing light to pass through.

Source: The Hindu

Biomass Satellite Mission

Why in the news?

The European Space Agency (ESA) is preparing to launch its newest space satellite, called Biomass.

About Biomass Satellite Mission:

- It is a European Space Agency (ESA) mission to provide more accurate measurements of forest biomass to enhance our understanding of the carbon cycle.
- It will provide detailed 3D maps of the world's most dense and remote tropical forests.
- The mission will lift off aboard the Vega C rocket from Europe's spaceport in French Guiana.
- It will be placed in a sun-synchronous orbit (SSO) — a type of orbit in which satellites are in sync with the Sun — at an altitude of around 666 km.
- It is the first space satellite to carry a long-wavelength radar, called P-band.
- This special radar means that it can scan deep through the forest canopy and collect information on different parts of the forest, such as tree trunks, branches, and stems, where trees store most of their carbon.
- This will allow the satellite to provide experts on the ground with new information on forest height and above-ground forest biomass from space.
- Scientists will then be able to find out more about the state of our forests and how they are changing, and further our knowledge about the role that forests play in the carbon cycle.

Source: Indian Express

Rafale-M Jets

Why in the news?

Recently, the Cabinet Committee on Security (CCS), chaired by the Prime Minister, approved a ₹63,000-crore deal for procuring 26 Rafale-M fighter jets from France for the Indian Navy.

Background

- Initially, under the MMRCA tender (2007), India planned to acquire 126 jets with technology transfer, which was shelved in 2015.
- A direct deal in 2016 led to 36 Rafale jets for the IAF, delivered between 2019-2022.

Details of the Deal:

- The deal includes 22 single-seater Rafale-M jets for carrier operations and 4 twin-seater

trainer variants, which are non-carrier compatible.
- The jets are meant to operate from INS Vikramaditya and INS Vikrant, India's two operational aircraft carriers.

About the Rafale Fighter Jet:
- Dassault Rafale is a 5 generation, twin-engine, delta-wing, multirole fighter aircraft manufactured by Dassault Aviation.
- Capable of speeds up to Mach 1.8 and a combat radius exceeding 1000 km.
- Designed for air superiority, ground support, reconnaissance and anti-ship missions.

Key Features and Avionics
- Equipped with RBE2 AESA radar, SPECTRA electronic warfare suite, front sector optronics, and omnidirectional warning systems.
- Powered by 2 SNECMA M88 turbofan engines, providing supercruise capability (supersonic flight without afterburners).
- 14 hardpoints can carry external payloads up to 9,500 kg.

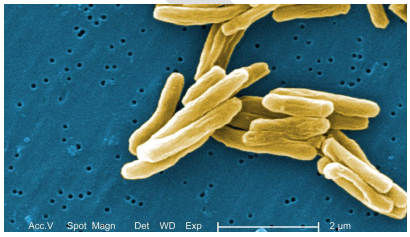
Rafale Variants
- Rafale C: Single-seat Air Force version.
- Rafale B: Twin-seat version for training with full combat capability.
- Rafale M: Naval variant, designed for carrier-based operations, with reinforced landing gear and tailhook for short-deck landings.
- Other variants include Rafale N (nuclear strike) and Rafale R (research and development).

Source: The Hindu

rt-LAMP Assay

Why in the news?

Researchers from Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Thiruvananthapuram, have successfully developed a novel, indigenous, real-time LAMP (rt-LAMP) assay for the early detection of Tuberculosis (TB).



What is the rt-LAMP Assay?
- The rt-LAMP assay is a molecular diagnostic tool similar to GeneXpert and Truenat, providing high sensitivity and specificity. It can detect TB DNA even when only 10 copies per microliter are present, enabling early-stage diagnosis.
- Unlike RT-PCR, which requires three different temperature cycles, rt-LAMP works at a single temperature, simplifying the testing process.
- The test uses six primers for DNA amplification (compared to two in RT-PCR), ensuring faster and more specific detection.
- The researchers used a fluorescent dye (Syto 16)—commonly used in cell biology—which does not inhibit the reaction, solving the long-standing issue of false negatives in earlier LAMP tests.
- Results can be detected in 10–20 minutes, significantly reducing diagnostic time compared to RT-PCR.

Regulatory Status:
- The rt-LAMP assay has been licensed to the industry for production.
- It has received approval from the Central Drugs Standard Control Organisation (CDSCO).
- The Indian Council of Medical Research (ICMR) is currently validating the technology.
- The World Health Organization's Health Technology Access Pool (HTAP) also evaluates the test, pending ICMR validation.

Significance for India's TB Control Strategy
- As of 2023, around 79% of presumptive TB cases in India were still being diagnosed using sputum smear microscopy, while only 21% used molecular tests.
- Despite the rise in molecular testing labs (from 5,090 in 2022 to 6,496 in 2023), India still falls short of the targets set under the National Strategic Plan (2017–2025) to reduce reliance on smear microscopy.
- The indigenous rt-LAMP assay could help bridge the diagnostic gap, by providing a low-cost, rapid, scalable, and accurate alternative to outdated smear techniques.
- It supports the National TB Elimination Programme (NTEP) by enabling faster case detection, reducing disease transmission, and improving public health outcomes.

Source: The Hindu

Long-Range Glide Bomb (LRGB) 'Gaurav'

Why in the news?

Defence Research and Development Organisation (DRDO) successfully conducted the Release Trials of Long-Range Glide Bomb (LRGB) 'Gaurav' recently.

About Long-Range Glide Bomb (LRGB) 'Gaurav':

- "Gaurav" is a 1,000-kg class glide bomb designed and developed indigenously by the DRDO.
  - Unlike conventional bombs that fall vertically after release, glide bombs are equipped with fins or wings that allow them to glide forward through the air toward their target.
- Importantly, a glide bomb does not have an engine. Instead, it relies on the momentum from being dropped from a high-flying aircraft and uses aerodynamic surfaces to cover long distances.
- This enables the launching aircraft to stay away from the enemy's radar and air defence systems, thereby reducing risk to pilots while still achieving accurate strikes.
- Developed by DRDO's Research Centre Imarat (RCI) in Hyderabad, the Gaurav project involved active collaboration with Indian private sector partners such as Adani Defence Systems & Technologies, Bharat Forge, and several Micro, Small and Medium Enterprises (MSMEs).

Features of the aircraft:

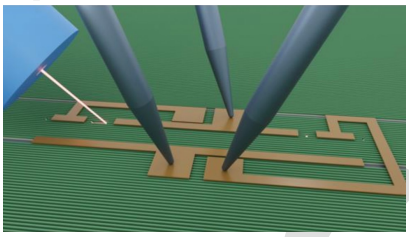
- With a diameter of 0.6 metre, it is four metre long and has a wingspan of 3.4 metre.
- It is an air-launched glide bomb capable of striking targets at long distances.
- When launched from high altitudes—typically over 40,000 feet—the Gaurav can glide to a range of over 100 kilometres.
- It is equipped with a dual guidance system that combines an Inertial Navigation System (INS) with satellite-based GPS.

Source: PIB

Miniature Laser Grown on Silicon Chip

Why in the news?

Scientists from the US and Europe have successfully fabricated miniature lasers directly on silicon wafers, as published in a recent study in Nature.



About Miniature Laser Grown on Silicon Chip

- This is a major advancement in the field of silicon photonics, as integrating a light source (laser) directly on the chip has long been a technological challenge.
- Traditionally, lasers are manufactured separately and then attached to chips, which results in slower operation, higher costs, and manufacturing mismatches.
- The new research resolves this issue by growing the laser directly on a silicon chip using a scalable process and compatible with standard CMOS (Complementary Metal-Oxide-Semiconductor) technology, which is the backbone of current semiconductor manufacturing.
- Initially, electrons carried data within silicon chips. However, modern advancements are replacing electrons with photons, leading to the rise of silicon photonics.
- Photons carry information faster, with higher bandwidth and lower energy loss than electrons, making them ideal for next-generation computing, especially in data centres, sensors, and quantum computing.

Photonic Chip Components and Laser Physics

- A photonic silicon chip consists of four key parts:
  - A light source (laser),
  - Waveguides to channel the photons,
  - Modulators to encode or decode data onto light signals, and
  - Photodetectors convert light into electrical signals
- The laser functions on the principle of stimulated emission, where electrons drop to a lower energy level, releasing coherent photons to form a laser beam.

  However, silicon has an indirect bandgap, making it inefficient at light emission.

Therefore, materials like gallium arsenide (GaAs) with a direct bandgap are preferred for laser construction.

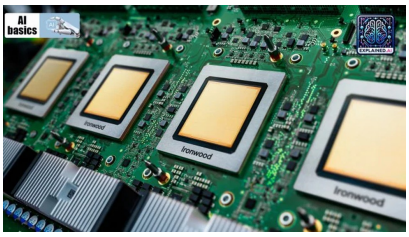
- The setup was completed with a protective layer of indium gallium phosphide and electrical contacts to power the laser.

Source: The Hindu

AI Basics: CPU, GPU and TPU

Why in the news?

How TPU is different from CPU and GPU.



What is a CPU (Central Processing Unit)?

- The CPU is a general-purpose processor that was developed in the 1950s and can handle a wide variety of tasks.
- It functions like a conductor in an orchestra, coordinating the operations of all other computer parts like GPUs, disk drives, and memory units.
- A CPU contains cores — individual units that execute instructions. Early CPUs had only one core, but modern CPUs may contain 2 to 16 cores.
- Each core can handle one task at a time, so a CPU's multitasking capacity depends on the number of cores.
- For everyday users, 2 to 8 cores are usually sufficient, and CPUs are so efficient that users rarely notice that tasks are completed sequentially, not simultaneously.

What is a GPU (Graphics Processing Unit)?

- A GPU is a specialised processor designed to perform many tasks simultaneously, using a technique called parallel processing.
- Unlike CPUs, which process tasks sequentially, GPUs break down complex tasks into thousands or millions of smaller problems, solving them in parallel.
- Modern GPUs contain thousands of cores, making them far more suitable for intensive computational tasks.
- Initially developed for rendering graphics in gaming and animation, GPUs are now widely used in machine learning and artificial intelligence.
- GPUs have evolved into general-purpose parallel processors, making them a key tool in running AI models and handling large data operations.
- However, GPUs have not replaced CPUs, because certain operations are better handled sequentially, which is the strength of CPUs.

What is a TPU (Tensor Processing Unit)?

- A TPU is also a type of ASIC (Application-Specific Integrated Circuit), meaning it is built for a specific function — in this case, AI tasks.
- First introduced by Google in 2015, TPUs are specially designed hardware units built from the ground up to handle machine learning operations.
- TPUs focus on processing tensors — the multidimensional data arrays used in AI model computations.
- They are optimised to run neural networks efficiently, enabling faster training and execution of AI models than GPUs or CPUs.
- For example, training an AI model that may take weeks on a GPU can often be completed in hours using a TPU.
- TPUs are used at the core of Google's major AI services, such as Search, YouTube, and DeepMind's large language models, illustrating their real-world application in high-scale AI infrastructure.

Source: Indian Express

Vehicle-to-Grid (V2G) Technology

Why in the news?

Recently, the Kerala State Electricity Board (KSEB), in partnership with IIT Bombay, has launched a pilot V2G project to test its feasibility in the state.

What is Vehicle-to-Grid (V2G) Technology?

- Vehicle-to-Grid (V2G) is a set of technologies that enable Electric Vehicles (EVs) to send stored electricity back to the power grid when they are not in use.
- When an EV is idle and connected via a bi-directional charger, it can act as a

decentralised battery energy storage system, contributing electricity to the grid.

- V2G supports both charging (Grid to Vehicle – G2V) and discharging (Vehicle to Grid – V2G) of EV batteries, creating a two-way energy flow.
- During charging, EV batteries act as a load on the grid, which can be managed using tools like Time of Use (ToU) tariffs and smart charging to reduce stress during peak hours.
- During discharging, EV batteries serve as distributed energy sources, providing electricity during peak demand periods or when renewable energy (RE) is low.
- V2G is part of a broader framework including Vehicle to Home (V2H) and Vehicle to Vehicle (V2V) applications, but V2G is the most widely explored use case.

How V2G Works?

V2G involves two key processes:

- Grid-to-Vehicle (G2V): Power flows from the grid to charge the EV.
- Vehicle-to-Grid (V2G): The EV discharges stored energy back into the grid when needed.

Broader Applications

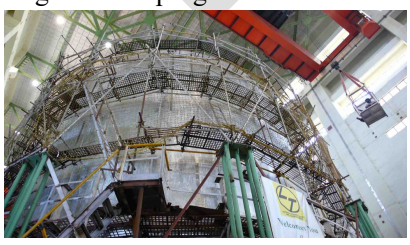
- While V2G is the most prominent, EV batteries can also support:
- Vehicle-to-Home (V2H) for powering household devices
- Vehicle-to-Vehicle (V2V) energy transfers between EVs

Source: The Hindu

India's first Prototype Fast Breeder Reactor (PFBR)

Why in the news?

India's first Prototype Fast Breeder Reactor (PFBR) in Kalpakkam, Tamil Nadu is likely to be commissioned next year, marking the second stage of India's three-stage nuclear programme.



About India's first Prototype Fast Breeder Reactor (PFBR):

- It is a 500 MWe sodium-cooled reactor located in Kalpakkam, Tamil Nadu.
- The PFBR was developed by BHAVINI (Bharatiya Nabhikiya Vidyut Nigam Limited), a government enterprise set up in 2003 under the Department of Atomic Energy (DAE) to focus on fast breeder reactors.
- Construction began in 2004 and the reactor was originally expected to be completed in September 2010, but faced a series of delays.
- Unlike traditional nuclear reactors, the PFBR uses fast neutrons for energy generation and employs liquid sodium as a coolant instead of water.
- The innovative design enables the reactor to breed more fuel than it consumes, offering a sustainable solution to India's growing energy demands.
- The PFBR is powered by plutonium and uranium-based mixed oxide fuel (MOX), which ensures high efficiency in power generation.
- Its advanced sodium cooling system allows operation at higher temperatures, enhancing overall efficiency.
- Additionally, the reactor incorporates robust safety features, including a strong containment structure and passive cooling systems that prevent overheating.

India's Three-Stage Nuclear Programme:

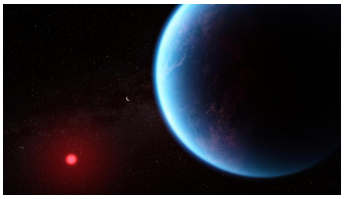
- India has adopted a three-stage nuclear power programme, with the long-term goal of deploying a thorium-based closed nuclear fuel cycle.
- The first stage involves the use of pressurised heavy water reactors (PHWRs), fuelled by natural uranium, and light water reactors.
- The second stage involves reprocessing used fuel from the first stage to recover the plutonium to fuel FBRs.
- In stage 3, Advanced Heavy Water Reactors (AHWRs) will burn thorium-plutonium fuels and breed fissile uranium-233.

Source: The Times of India

K2-18b

Why in the news?

In 2025, scientists detected the presence of either dimethyl sulphide (DMS) or dimethyl disulphide (DMDS) in the atmosphere of K2-18b.



What is K2-18b?

- K2-18b is an exoplanet (a planet located outside our solar system) situated 124 light-years away from Earth in the constellation Leo, orbiting a star called K2-18.
- It was discovered in 2015 by the Kepler Space Telescope.
- K2-18b is 5.2 times wider and around 9 times more massive than Earth, suggesting it may possess a hydrogen-rich atmosphere.
- The planet receives a similar level of stellar radiation from its star as Earth does from the Sun, hinting at the possibility of habitable surface conditions.

Atmospheric Discoveries:

- In 2019, the Hubble Space Telescope detected water vapour in the atmosphere of K2-18b.
- Later, the James Webb Space Telescope (JWST) found the presence of carbon dioxide (CO_2) and methane (CH_4).
- The absence of ammonia along with CO_2 and CH_4 in a hydrogen-rich atmosphere is significant because it may indicate the possible presence of a liquid water ocean.

About Dimethyl Sulphide (DMS):

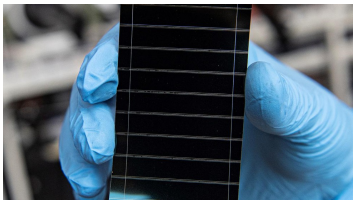
- DMS is considered a potential biomarker because, on Earth, it is mostly produced by phytoplankton in the oceans.
- DMS is formed when phytoplankton die and enzymes break down dimethylsulphoniopropionate (DMSP).
- It is also released when soil bacteria decompose plant matter and in trace amounts during volcanic eruptions.
- A 2015 study found that 76% of soil bacteria on Earth contain a gene that produces DMS, reinforcing its biological origin.

Source: Indian Express

Perovskite Solar Cells

Why in the news?

Recently, scientists have developed a water-based, non-toxic recycling method for PSCs, avoiding the need for hazardous solvents.



What are Perovskite Solar Cells (PSCs)?

- Perovskite solar cells (PSCs) are a type of photovoltaic (PV) technology that uses crystal structures called perovskites for converting sunlight into electricity.
- These crystals share the structure of the mineral calcium titanium oxide ($CaTiO_3$) and can be engineered to possess a wide range of optical, electrical, and semiconducting properties.
- The general chemical formula of a perovskite compound is ABX_3, where 'A' and 'B' are cations, and 'X' is an anion.
- They offer high power conversion efficiencies at a lower cost than traditional silicon-based PVs, but they suffer from shorter lifespan and stability issues.

Carbon-Based Perovskite Solar Cells (CPSCs)

- CPSCs are the first indigenous perovskite-powered niche product developed in India, aimed at improving device stability and reducing fabrication costs.
- However, humidity and thermal stress remain challenges for widespread commercialization.
- Indian scientists have enhanced thermal stability by incorporating Guanidinium iodide (GuI) and improved moisture resistance through surface passivation using 5-amino valeric acid iodide (5-AVAI).

How the New Recycling Process Works?

- Sodium acetate is added to the recycling solution. Its acetate ions bind with lead ions, forming lead acetate, which dissolves easily in water.
- Sodium iodide and hypophosphorous acid are then introduced.
  - Sodium iodide helps in regenerating degraded perovskite crystals.
  - Hypophosphorous acid acts as a long-term stabilizer for the water-based recycling solution.
- Scientists also used ethanol and ethyl acetate to dissolve other cell components, allowing them to recycle and reassemble each layer of the solar cell.

Source: The Hindu

3D Microscope

Why in the news?

For the first time, the Indian Army's Department of Ophthalmology at Army Hospital (Research and Referral), New Delhi, has successfully performed

Minimally Invasive Glaucoma Surgery (MIGS) using a 3D Microscope.

What is a Microscope?

- A microscope is an instrument that magnifies small objects, making them visible to the naked eye by bending (refracting) light rays through curved lenses.
- The most commonly used microscopes are optical microscopes, where visible light is focused through lenses to create an enlarged image.

What is a 3D Microscope?

- A 3D microscope produces images with depth information (X, Y, and Z axes), allowing researchers to visualize and measure the topography, volume, and internal structures of samples.
- Unlike traditional light microscopes, which provide flat, 2D images, 3D microscopes use advanced optical, electron, or computational techniques to capture and reconstruct three-dimensional data.
- This is particularly useful for studying complex biological or environmental samples, such as soil microbes, aquatic organisms.

Features of the 3D Microscope

- The 3D Microscope uses advanced three-dimensional visualisation, assisting in complex eye surgeries such as treatment for squint, cataract, corneal diseases, glaucoma, and retinal conditions.
- It employs special 3D polarisation glasses for surgeons and a 55-inch 4K ultra-HD display.

Key advantages include:

- Reduced surgical time and lower complication rates compared to conventional microscopes.
- Decreased endoilluminator power requirements, thereby reducing photo-toxicity risks.
- Ease of performing surgeries in complex and rare cases.

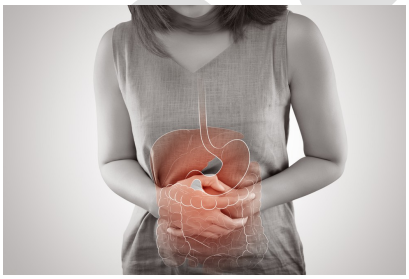
Source: PIB

HEALTH & DISEASE

Inflammatory Bowel Disease (IBD)

Why in the news?

Jipmer recently launched a support group for patients with Inflammatory Bowel Disease (IBD).



About Inflammatory Bowel Disease (IBD):

- It is an umbrella term for a group of conditions that cause swelling and inflammation of the tissues in the digestive tract.
- The most common types of IBD include:
  - Ulcerative colitis. This condition involves inflammation and sores, called ulcers, along the lining of the colon and rectum.
  - Crohn's disease:
    - In this type of IBD, the lining of the digestive tract is inflamed.
    - The condition often involves the deeper layers of the digestive tract.
    - Crohn's disease most commonly affects the small intestine.
    - However, it also can affect the large intestine and, uncommonly, the upper gastrointestinal tract.
- Symptoms: Symptoms of both ulcerative colitis and crohn's disease usually include belly pain, diarrhea, rectal bleeding, extreme tiredness, and weight loss.
- Causes: The exact cause of IBD is unknown, but IBD is the result of a weakened immune system. Its possible causes are:
  - The immune system responds incorrectly to environmental triggers, such as viruses or bacteria, which cause inflammation of the gastrointestinal tract.
  - There also appears to be a genetic component. Someone with a family

history of IBD is more likely to develop this inappropriate immune response.

Treatment:

- IBD is a chronic or long-term condition, but there are treatments available to ease symptoms and prevent flare-ups.
- IBD treatment usually involves either medicines or surgery.

Source: The Hindu

World Health Day 2025

Why in the news?

Every year on April 7, World Health Day is observed to increase global awareness of a varied range of health-related concerns.

About World Health Day 2025:

- World Health Day is observed on April 07 every year.
- This day marks the anniversary of the founding of the World Health Organization (WHO) in 1948 and has been celebrated since 1950. .
- Each year, World Health Day is used as an opportunity to draw attention to a specific health topic that affects people all over the world.
- By emphasizing one particular theme every year, World Health Day encourages governments, healthcare organisations, and individuals to work collectively toward improving health standards and access to healthcare.
- The theme for World Health Day 2025 is 'Healthy beginnings, hopeful futures.'
    - This year's theme will kick off a year-long campaign on maternal and newborn health.
    - This initiative will encourage governments and the healthcare sector to intensify their actions to eliminate preventable maternal and newborn deaths.
    - It will also focus on the long-term health and well-being of women.
    - The campaign will aim to promote information and strategies that can help support healthy pregnancies and births, and better postnatal health.

Source: Business Standard

Acute Promyelocytic Leukemia (APL)

Why in the news?

CRISPR-based test for rapid diagnosis of rare blood cancer Acute Promyelocytic Leukemia (APL)

What is Acute Promyelocytic Leukemia (APL)?

- Acute Promyelocytic Leukemia (APL) is a rare but aggressive form of leukemia, a cancer affecting blood cells.
- APL is a subtype of Acute Myeloid Leukemia (AML) and contributes to approximately 10-15% of newly diagnosed AML cases.
- The condition arises due to a genetic mutation where two genes—PML and RARA—fuse together abnormally, disrupting normal blood cell formation.
- This fusion leads to a significant drop in white blood cells and platelets, impairing the body's ability to fight infections and control bleeding.
- APL is particularly dangerous because it can cause sudden internal bleeding in vital organs like the lungs and brain, which can be fatal within days if left untreated.
- Early diagnosis and treatment, however, can cure most patients, making timely detection crucial.

Symptoms and Diagnosis

- The median age of diagnosis in India is 34 years, with a male-to-female ratio of 1.5:1.

Common symptoms include:

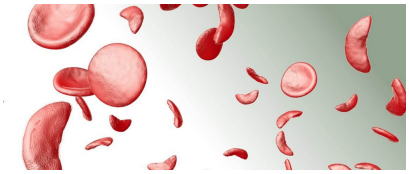
    - Sudden bleeding from gums and nose
    - Fatigue
    - Unexplained fever
    - Bone pain
- Although these symptoms may resemble other illnesses, histopathological parameters such as complete blood count (CBC) and cell morphology are essential for definitive diagnosis.

Source: The Hindu

Sickle Cell Disease (SCD)

Why in the news?

Scientists at Raman Research Institute (RRI) recently developed an affordable electro-fluidic device that aids in the preliminary screening of Sickle Cell Disease (SCD).



About Sickle Cell Disease (SCD):

- It is the most common inherited blood disorder that affects your red blood cells (RBCs).
- It is marked by flawed hemoglobin.
    - Hemoglobin is the molecule in red blood cells (RBCs) that carries oxygen to the tissues of the body.
- Sickle cell disease interferes with the delivery of oxygen to the tissues.

How does it affect blood flow?

- Normally, RBCs are disc-shaped and flexible enough to move easily through the blood vessels.
- People with this disease have atypical hemoglobin molecules called hemoglobin S, which can distort RBCs into a sickle, or crescent, shape.
- These sickled RBCs do not bend or move easily and can block blood flow to the rest of the body.
- Additionally, sickle-shaped cells don't last as long as normal-shaped RBCs, causing a constant shortage of RBCs and leading to anemia.

What causes it?

- SCD is caused by a variant (change) in a gene that has instructions for your body to make one part of the hemoglobin.
- This changed gene is sometimes called a sickle cell gene.
- People with SCD are born with two sickle cell genes, one from each parent.
- If you are born with one sickle cell gene, it's called sickle cell trait.
- People with sickle cell trait are generally healthy, but they can pass the defective gene on to their children.

Symptoms of the disease:

- Early stage: Extreme tiredness or fussiness from anemia, painfully swollen hands and feet, and jaundice.
- Later stage: Severe pain, anemia, organ damage, and infections.

Treatments of the disease

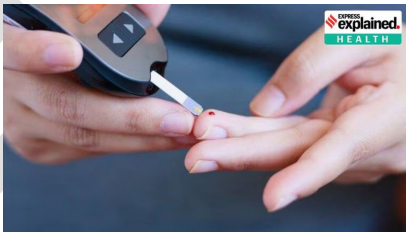
- A bone marrow transplant (stem cell transplant) can cure sickle cell disease.
- However, there are treatments that can help relieve symptoms, lessen complications, and prolong life.
- Gene therapy is also being explored as another potential cure.
- The UK recently became the first country to approve gene therapy treatment for sickle cell disease.

Source: The Hindu

Type 5 Diabetes

Why in the news?

Type 5 diabetes has been officially recognised as a distinct form of diabetes by the International Diabetes Federation (IDF).



What is Type 5 Diabetes?

- Type 5 diabetes primarily affects lean, undernourished teenagers and young adults in low- and middle-income countries (LMICs).
- It is caused by malnutrition-induced reduction in insulin production, unlike Type 2 diabetes, which involves insulin resistance with continuing insulin secretion.
- In Type 5, the pancreatic beta cells function abnormally, resulting in severely reduced insulin secretion.
- This form of diabetes has long been neglected in medical research and often misdiagnosed.

Historical Background:

- The condition was first reported in Jamaica in 1955 under the term J-type diabetes.
- In 1985, the World Health Organization (WHO) named it "malnutrition-related diabetes mellitus", but this was removed in 1999 due to lack of causal evidence linking malnutrition to diabetes.

- Despite this, similar cases were later reported in India, Sri Lanka, Bangladesh, Uganda, Ethiopia, Rwanda, and Korea, mostly in the Global South.
- The condition is estimated to affect about 25 million people globally.

Clinical Markers of Type 5 Diabetes

- No autoimmune or genetic cause is associated with this condition.
- Patients have very low BMI (<18.5 kg/m²), much lower than typical Type 2 diabetic patients.
- Insulin levels are extremely low, significantly below Type 2 diabetes and slightly above Type 1 diabetes.
- Body fat percentage is substantially lower than in Type 2 patients.
- Dietary intake of protein, fibre, and micronutrients is notably inadequate.

Source: Indian Express

Ban on 35 Fixed-Dose Combination (FDC) Drugs – CDSCO

Why in the news?

India's top drug regulator, CDSCO, has banned 35 medicines that combine two or more drugs in one tablet. These included painkillers, nutritional supplements, anti-diabetic, and fertility drugs. The ban was due to safety concerns and lack of proper medical reasoning behind these combinations.

Health Concerns:

- Wrong Combinations: Some drugs work best at different times (e.g., Glimepiride before meals and Metformin after meals), but when taken together, they can be less effective or cause harm.
- Risky Mixes: Some combinations may cancel each other's effect or cause unwanted reactions.
- No Scientific Proof: Many of these fixed-dose medicines don't have enough research to prove they are safe or helpful.

What are FDCs (Fixed-Dose Combination Drugs)

- Definition: Medicines that have two or more active ingredients in fixed amounts in one tablet or dose.
- Why They Are Used: To make treatment easier, reduce the number of pills, and save money.
- Common Uses: Diabetes, infections, pain relief, and long-term illnesses.

Role of CDSCO:

- Full Form: Central Drugs Standard Control Organization.
- Works Under: Ministry of Health and Family Welfare.
- Main Job: Approves new drugs, watches over clinical trials, and checks safety of critical medicines like vaccines and IV fluids.
- Law Behind It: Drugs and Cosmetics Act, 1940.

Why This Matters

- Safer Medicines: Helps doctors and patients use medicines that are proven and safe.
- Less Self-Medication: Stops people from using risky drug combos without advice.
- Better Regulation: Shows the government is serious about drug safety and quality.

What Should Be Done Next

- Improve systems to track side effects of medicines (pharmacovigilance).
- Educate doctors, pharmacists, and the public.
- Promote safer, well-tested medicine options.

Source: The Hindu

Measles and Rubella

Why in the news?

The Measles-Rubella (M-R) Elimination Campaign 2025–26 aims to achieve 100% immunisation coverage by administering two doses of the M-R vaccine to all eligible children.

About Measles

- Measles is a highly contagious viral disease that primarily affects young children and can lead to serious complications or death, especially in malnourished children or those with weakened immunity.
- It is caused by an enveloped, single-stranded RNA virus, classified under the genus Morbillivirus in the Paramyxoviridae family, with only one serotype.
- Common complications include blindness, encephalitis, severe diarrhoea, ear infections, and pneumonia.
- It spreads through respiratory droplets and remains one of the leading causes of vaccine-preventable deaths globally.

About Rubella

- Also known as German Measles, Rubella is a mild viral infection that predominantly affects children and young adults.
- It is caused by the Rubella virus, an enveloped, single-stranded RNA virus.
- Rubella is less infectious and milder than measles, but it poses a major risk during pregnancy.
- Infection in pregnant women may lead to Congenital Rubella Syndrome (CRS), which causes irreversible birth defects like deafness, heart defects, and intellectual disabilities.
- Rubella and measles may have similar rash symptoms, but they are caused by different viruses.

India's plan for eliminating measles and rubella includes a comprehensive framework:

- Immunization: Achieve and maintain high population immunity with > 95% vaccination coverage with 2 doses of measles and rubella containing vaccines in each district of the country.
- Surveillance: Sustain a sensitive and timely case-based surveillance system for measles & rubella.
- Outbreaks: Ensure adequate preparedness and timely response to measles and rubella outbreaks.
- Linkages: Strengthen support and linkages to achieve the above strategic objectives.
- Demand Generation for Vaccination: Focused mass awareness campaigns to mitigate the risks of non-vaccination and dispel myths related to MR vaccine for addressing vaccine hesitancy and increasing coverage.

Source: PIB

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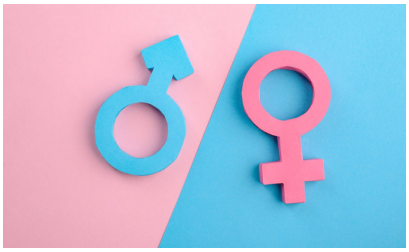
POPULATION & ASSOCIATED ISSUES

Women and Men in India 2024: Selected Indicators and Data

Why in the news?

Ministry of Statistics and Programme Implementation (MoSPI), Government of India, recently released the 26th edition of its publication titled "Women and Men in India 2024: Selected Indicators and Data".



About Women and Men in India 2024: Selected Indicators and Data:

- It is published by the Ministry of Statistics and Programme Implementation (MoSPI), Government of India.
- It offers a comprehensive overview of the gender landscape in India, presenting selected indicators and data across key areas like population, education, health, economic participation, and decision-making, all sourced from various Ministries/ Departments/Organizations.
- Utilizing official statistics, it presents gender-disaggregated data across urban-rural divides and geographic regions, facilitating a nuanced understanding of the challenges and opportunities faced by women and men.

Highlights of the 2024 Report:

- Gender Parity Index (GPI) for enrolments at the primary and higher secondary was higher

in FY24 than in FY23 and FY22, meaning more girls are being enrolled now.

- At upper primary and elementary levels, the enrolment numbers were more or less the same for boys and girls.
- The Labour Force Participation Rate (LFPR) for women aged 15 and above improved significantly, rising from 49.8% in 2017-18 to 60.1% in 2023-24.
- In the financial sector, women own 39.2% of all bank accounts and contribute to 7% of total deposits, with their presence most prominent in rural areas, where they account for 42.2% of account holders.
- Female participation in the capital market is also growing, but overall numbers are small.
- Between March 2021 and November 2024, the number of DEMAT accounts surged from 33.26 million to 143.02 million. Of these, the number of women account holders rose from 6.67 million in 2021 to 27.71 million in 2024.
- A rising percentage of female-headed proprietary establishments across manufacturing, trade, and other services sectors over the years 2021-22, 2022-23, and 2023-24 has been observed.
- The number of male and female voters grew from 173.2 million in 1952 to 978 million in 2024, with an increasing share of females.
- In the 2024 general elections, female voter turnout (65.8%) surpassed male turnout, even as it dipped slightly from 67.2% in 2019.
- Female entrepreneurship is also on the rise. The number of startups recognized by DPIIT with at least one woman director rose sharply from 1,943 in 2017 to 17,405 in 2024.

Source: PIB

Trends in Maternal Mortality 2000-2023 Report

Why in the news?

In 2023, India accounted for the second highest maternal deaths globally, tied with the Democratic Republic of Congo (DRC) with 19,000 and second only to Nigeria, according to the Trends in Maternal Mortality 2000-2023 report released recently.

About Trends in Maternal Mortality 2000-2023 Report:

- It is a new report from the United Nations Maternal Mortality Estimation Inter-Agency Group (MMEIG), comprising WHO, UNICEF, UNFPA, the World Bank Group, and the UN Department of Economic and Social Affairs (UNDESA/population division).
- It presents the most up-to-date, internationally comparable estimates of maternal deaths at global, regional, and country levels.

Highlights of the Report:

- In 2023, an estimated 260,000 maternal deaths occurred worldwide, equivalent to 712 deaths each day.
- This marks a 40% reduction in maternal mortality since 2000, reflecting sustained global efforts to improve access to essential health services.
- For the first time, no country was estimated to have an extremely high maternal mortality ratio (MMR), and no region was classified as having a very high MMR.
- Despite these gains, disparities remain stark. Sub-Saharan Africa accounted for 70% of global maternal deaths, with Central and Southern Asia contributing nearly 17%.
- In 2023, 37 countries were classified as being in conflict or experiencing institutional or social fragility, yet they accounted for 64% of global maternal deaths.
- Nigeria had the highest number of maternal deaths and accounted for more than a quarter (28.7 percent) of all estimated global maternal deaths in 2023, with approximately 75,000 deaths.
- Only three other countries had more than 10,000 maternal deaths in 2023—India, the Democratic Republic of the Congo, and Pakistan (11,000).
- India and DRC accounted for 7.2 percent each, while Pakistan accounted for 4.1 percent of global maternal deaths.
- Together, these four countries accounted for almost half (47 percent) of all maternal deaths globally in 2023.
- China, the only other country on the planet comparable to India by population, registered just 1,400 maternal deaths in 2023.

- The statistics reveal that India's MMR—or the rate at which women per lakh die due to childbirth or pregnancy-related issues—was 362 in 2000 and came down to 80 in 2023, marking a decline of 78 percent over the period.
- The report also provides the first global account of the COVID-19 pandemic's impact on maternal survival.
- In 2021, when the second wave of COVID was at its peak in most parts of the world, an estimated 40,000 more women died due to pregnancy or childbirth, taking the total number of deaths that year to 3,22,000 from 282,000 the previous year.
- Haemorrhage is a direct obstetric cause of death and remains the leading cause of maternal mortality globally.

Source: The Print

Signet Ring Cell Carcinoma

Why in the news?

Recently, a team of Indian scientists has developed novel analytical methods to study and potentially treat Rare Colorectal Cancer (SRCC) more effectively.

What is Signet Ring Cell Carcinoma (SRCC)?

- Signet Ring Cell Carcinoma (SRCC) is a rare and aggressive subtype of colorectal cancer (CRC) that originates in the colon or rectum.
- It is named for the signet ring-like appearance of its cells under a microscope, caused by mucus pushing the nucleus to one side.
- SRCC is known for its rapid spread, resistance to conventional therapies, and late-stage diagnosis, making it one of the deadliest colon cancer variants.

What Are the Innovative Methods Introduced?

- The researchers developed Patient-Derived Organoids (PDOs) and Patient-Derived Xenografts (PDXs):
  - PDOs are miniature 3D tumour models grown from human cancer tissues in lab dishes.
  - PDXs involve implanting human tumour cells into mice, enabling the tumour to grow in a living system.
- These lab-grown models closely mimic the molecular behaviour of actual human SRCC tumours.
- This method forms one of the first living biobanks of SRCC models, enabling researchers to study the disease more precisely and test treatments in a controlled environment.
- A major difficulty in treating SRCC is its tendency to spread to the peritoneum, the lining of the abdominal cavity, which worsens the prognosis and reduces treatment effectiveness.
- While SRCC makes up only 1% of all CRC cases globally, in India, it affects a disproportionately larger number of patients — nearly 10 times more, often in younger individuals.

Source: Indian Express

Kyasanur Forest Disease

Why in the news?

Kyasanur Forest Disease (KFD), or "monkey fever," is currently surging in Karnataka's Shivamogga and Chikkamagaluru districts recently.

About Kyasanur Forest Disease (KFD):

- KFD, also referred to as Monkey Fever, is a tick-borne viral haemorrhagic disease, which can be fatal to humans and other primates.
- It is mostly found in southern India. The disease was first reported from the Kyasanur Forest of Karnataka in 1957, hence, it is known as KFD.
- The causal agent, Kyasanur Forest Disease Virus (family Flaviviridae, genus Flavivirus), is a member of the tick-borne encephalitis (TBE) complex.
- The epidemic period usually begins in October or November and peaks from January to April, then declines by May and June.

Transmission of the disease:

- Hard ticks (Hemaphysalis spinigera) spread the KFD virus to people and to animals, like monkeys and rodents.

- No person-to-person transmission has been established yet.

Symptoms of the disease:

- Most people with KFD have a sudden onset of chills, fever, and headache.
- Severe muscle pain, vomiting, gastrointestinal symptoms, and bleeding can follow 3 or 4 days after symptoms begin.
- Most patients recover one to two weeks after symptoms begin.
- About 10 to 20% of patients experience a second wave of symptoms, including severe headache, mental disturbances, tremors, and vision problems.
- Between 5 and 10% of people who are known to be affected by KFD die.

Treatment of the disease:

- There is no cure for KFD.
- Supportive care is crucial, including fluid balance, providing oxygen, managing blood pressure, and treating additional infections.
- Vaccine: A vaccine for KFD is available and recommended in the parts of India where KFD is found.
    - The existing vaccine is a formalin-inactivated whole virus vaccine, but it requires booster doses and has shown limited efficacy in some cases.

Source: The Times of India

BILATERAL, REGIONAL & GLOBAL GROUPINGS

INIOCHOS-25

Why in the news?

Aiming to hone skills against a dozen other counterparts, including the US, Israel, and France, the Indian Air Force (IAF) will be participating in biennial multinational air exercise INIOCHOS-25.

About INIOCHOS:

- It is a biennial multinational air exercise hosted by Greece's Hellenic Air Force.
- It serves as a platform for air forces to hone their skills, exchange tactical knowledge, and strengthen military ties.

INIOCHOS-25:

- It will take place at Andravida Air Base in the region of Elis, Greece.
- It will integrate multiple air and surface assets from fifteen countries under realistic combat scenarios, designed to simulate modern-day air warfare challenges.
- The IAF contingent will include Su-30 MKI fighters, along with combat-enabling IL-78 and C-17
- Apart from the Hellenic Air Force and the IAF, the participants include France with the M-2000, Israel with G-550, Italy with Tornado, Montenegro with B-412, Poland with F-16, Qatar with F-15, Slovenia with 2 PC-9, Spain with F-18, the UAE with M-2000/9, and the US with F-16, KC-46, and KC-135.
- It will provide an opportunity to train in planning and executing combined air operations, refine tactics in complex air warfare scenarios, and gain insights into operational best practices.

Source: NDTV

Operation Brahma

Why in the news?

After a devastating earthquake ravaged Myanmar recently, India initiated its relief and rescue efforts in the country under the banner 'Operation Brahma'.

About Operation Brahma:

- It is India's humanitarian mission launched in response to the devastating 7.7-magnitude earthquake that struck Myanmar on March 28, 2025.
- The massive earthquake that devastated Myanmar and neighbouring Thailand killed over 1,600 people and caused widespread destruction.

- The large-scale humanitarian mission includes rescue teams, medical aid, and relief supplies.
- The National Disaster Response Force (NDRF) deployed an 80-member team equipped with concrete cutters, drill machines, plasma cutters, and other rescue tools.
- The Indian Army has mobilised a specialised medical task force to provide urgent humanitarian assistance.
- The Indian Army dispatched a specialized 118-member medical team from the elite Shatrujeet Brigade Medical Responders.
- As part of the mission, the Indian Army will set up a 60-bed Medical Treatment Centre to provide immediate care to those injured in the disaster.
- The facility will be equipped to handle trauma cases, emergency surgeries, and essential medical services to support Myanmar's strained healthcare system.
- Two Indian naval ships, INS Satpura and INS Savitri, were dispatched carrying 40 tonnes of humanitarian aid to the port of Yangon.

Source: The Economic Times

Exercise Tiger Triumph

Why in the news?

India and the US will kick off the fourth edition of their major tri-service exercise called 'Tiger Triumph' in the Bay of Bengal.

About Exercise Tiger Triumph:

- It is an India-U.S. tri-service Humanitarian Assistance and Disaster Relief (HADR) Exercise.
- The exercise aims to enhance interoperability for conducting HADR operations and to formulate Standard Operating Procedures (SOPs) for establishing a Combined Coordination Centre (CCC).
- The Indian side would be represented by Indian Naval Ships Jalashwa, Gharial, Mumbai, and Shakti, along with integral helicopters and landing crafts embarked, Long Range Maritime Patrol Aircraft P8I, army troops from 91 Infantry Brigade and 12 Mechanical Infantry Battalion, Air Force C-130 Aircraft, and MI-17 Helicopters, along with the Rapid Action Medical Team (RAMT).
- The US side would be represented by US navy ships Comstock and Ralph Johnson, with troops of the US Marine Division embarked.
- Participants from both sides would also engage in training visits, subject matter expert exchanges, sports events, and social interactions.

Source: The Times of India

Exercise INDRA

Why in the news?

India and Russia have commenced a six-day naval exercise, 'Indra', off the coast of Chennai, involving sophisticated maritime drills and live weapon firings.

About Exercise INDRA:

- It is an India - Russia bilateral naval exercise.
- Since its inception in 2003, Exercise Indra has epitomised the long-term strategic relationship between the Indian and Russian navies.

- The exercise has evolved into a symbol of maritime cooperation, showcasing the two nations' commitment to enhancing naval interoperability and operational synergy.
- INDRA 2025:
- It is the 14th edition of the exercise.
- The exercise is being conducted in two phases: Harbour phase at Chennai and Sea phase in the Bay of Bengal.
- The Harbour Phase included an opening ceremony, Subject Matter Expert Exchanges (SMEEs), reciprocal visits, sports fixtures, and pre-sail briefings between personnel from both navies.
- The sea phase of the exercise will witness advanced naval drills, including tactical manoeuvres, live weapon firings, anti-air operations, underway replenishment, helicopter cross-deck landings, and exchange of sea riders.

- It is witnessing participation of Russian naval ships -- Pechanga, Rezkiy, and Aldar Tsydenzhapov.
- The Indian Navy has deployed its warships Rana, Kuthar, and maritime patrol aircraft P8l.

Source: The Economic Times

Africa India Key Maritime Engagement (AIKEYME)

Why in the news?

Recently, the inaugural edition of the Africa India Key Maritime Engagement (AIKEYME), a large-scale multilateral maritime exercise, began in Dar-es-Salaam, Tanzania.

About Africa India Key Maritime Engagement (AIKEYME):

- AIKEYME is a large-scale multilateral maritime exercise between India and African nations, inaugurated in April 2025 at Dar-es-Salaam, Tanzania.
- Co-hosting Nations: India and Tanzania jointly host the exercise, reflecting their shared strategic interests in the Indian Ocean Region (IOR).
- 11 nations are participating: India, Tanzania, Comoros, Djibouti, Eritrea, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, and South Africa.
- The primary aim is to develop cooperative solutions to regional maritime challenges and to enhance naval interoperability and coordination between partner navies.
- Strategic vision: The exercise aligns with India's SAGAR (Security and Growth for All in the Region) vision and MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions) initiative, which the PM unveiled in March 2025.
- Indian naval participation: INS Chennai (Destroyer), INS Kesari (Landing Ship Tank), and INS Sunayna are deployed as part of the engagement.
- IOS Sagar initiative: INS Sunayna is sailing under the Indian Ocean Ship (IOS) SAGAR mission, involving joint surveillance and goodwill port calls in Tanzania, Mozambique, Mauritius, Seychelles, and the Maldives.
- Exercise duration: Conducted over six days (April 13–18, 2025), divided into harbour and sea phases.

Source: The Hindu

EXERCISE DUSTLIK-VI

Why in the news?

The 6th edition of the India-Uzbekistan Joint Military Exercise DUSTLIK-VI officially commenced on 16 April 2025 at the Foreign Training Node, Aundh (Pune).

About Exercise Dustlik-VI

- Exercise DUSTLIK is an annual bilateral military exercise conducted alternatively in India and Uzbekistan, with the previous edition (DUSTLIK-V) held in Termez District, Uzbekistan in April 2024.
- The first edition was held in November 2019 in Uzbekistan, marking the beginning of a structured defence partnership.

Participants and Representation

- The Indian contingent consists of 60 personnel, including troops from a battalion of the JAT Regiment and the Indian Air Force (IAF).
- The Uzbekistan contingent is represented by troops from the Uzbekistan Army, reflecting their ongoing military cooperation with India.

Theme and Focus of DUSTLIK-VI:

- The central theme of DUSTLIK-VI is "Joint Multi-Domain Sub-Conventional Operations in a Semi-Urban Scenario".
- The exercise simulates response mechanisms to terrorist activities, specifically territorial capture by hostile forces, with coordinated joint battalion-level operations.

Source: PIB

Exercise Balikatan 2025

Why in the news?

As many as 17,000 personnel are participating in the annual "Balikatan" exercises, which this year will simulate a "full-scale battle scenario" as the treaty allies seek to deter China's ambitions in the waterway.

About Balikatan Exercise:

- It is the largest bilateral exercise conducted between the Armed Forces of the Philippines and the United States.
- "Balikatan," a Tagalog phrase that means "shoulder-to-shoulder," characterizes the spirit of the exercise and represents the alliance between the Philippines and the United States.
- Held annually, Exercise Balikatan is designed to enhance military interoperability and readiness in support of the Mutual Defense Treaty between the United States and the Philippines.
- The 2025 edition is the 40th iteration of the exercise.
    - Distinguishing itself from past iterations, Balikatan 25 will feature a Full Battle Test that incorporates real-world forces and events into a virtual and constructive exercise scenario.
    - The exercise will span all domains—air, land, sea, space, and cyber—testing the interoperability between U.S. and Philippine forces to simulate the defense of Philippine sovereignty.
    - The exercise will consist of four primary components: a Combined Joint Logistics Over-the-Shore (CJLOTS) operation, humanitarian civic assistance (HCA) activities, a command-and-control exercise (C2X), and a Multilateral Maritime Exercise (MME).
    - Each component will encompass several training events and engagement throughout the Philippines.

Source: The Hindu

Digital Threat Report 2024

Why in the news?

The Ministry of Electronics and Information Technology recently launched the Digital Threat Report 2024 for the Banking, Financial Services, and insurance (BFSI) sector.

About Digital Threat Report 2024:

- It is a collaborative effort by SISA (Strategic Information Services Agreement), a global cybersecurity company, in collaboration with the Computer Emergency Response Team (CERT-In, Ministry of Electronics and Information Technology) and CSIRT-Fin.
- It offers an in-depth analysis of the growing cybersecurity risks in India's Banking, Financial Services, and Insurance (BFSI) sector.
- Built on frontline threat intelligence and real-world incident data, the report outlines a unified view of the cyber threat landscape and the shifting dynamics of digital security in an era of rapid technological transformation.

Key Highlights from the Report:

- Social Engineering on the Rise: Business Email Compromise (BEC) and phishing attacks have become more precise and damaging, targeting BFSI institutions with tailored tactics that bypass traditional security barriers.
- Supply Chain Vulnerabilities: Breaches through third-party vendors and open-source software have introduced threats at scale, underlining the need for stricter vendor risk management.
- Compliance Evolution: Regulatory frameworks are moving toward harmonization, transforming compliance from a rigid obligation into a strategic tool that can drive growth, improve operations, and build cyber resilience.
- Persistent Control Gaps: Misconfigurations, over-privileged access, and weak access controls continue to plague even the most security-conscious organizations.
- AI-Powered Threats: With artificial intelligence being leveraged by both defenders and attackers, the report warns of a future dominated by highly personalized, large-scale cyber attacks driven by AI technologies.

Source: The Hindu

POEM-4

Why in the news?

Recently, POEM-4 re-entered the Earth's atmosphere and made an impact in the Indian Ocean, as monitored by ISRO's IS4OM (System for Safe and Sustainable Space Operations Management).

What is POEM-4?

- POEM-4, or PSLV Orbital Experiment Module-4, is a space research platform developed by ISRO that utilizes the spent fourth stage (PS4) of the PSLV rocket as an orbiting experimental module in space.
- It is part of the SpaDeX (Space Docking Experiment) mission and represents the fourth deployment of the POEM series, following POEM-3.
- POEM-4 has a three times larger payload capacity than its predecessor, POEM-3, marking a major advancement in reusing upper rocket stages for scientific research.
- Total of 24 payloads were hosted on POEM-4: 14 payloads from ISRO and 10 payloads from non-government entities (NGEs) including start-ups and academic institutions

Notable payloads include:

- Walking Robotic Arm (RRM-TD): A robotic manipulator capable of inchworm-like motion, aimed at enabling inspection and servicing tasks in space.
- Debris Capture Robotic Manipulator: Developed by Vikram Sarabhai Space Centre (VSSC), this innovation assists in space debris collection and manipulation, aligning with global efforts in space clean-up.

- Gradient Control Reaction Wheel Assembly (RWA): Designed by ISRO Inertial Systems Unit (IISU), this system enhances attitude control and stabilization of the POEM platform using reaction wheels.

Launch and Mission Details:

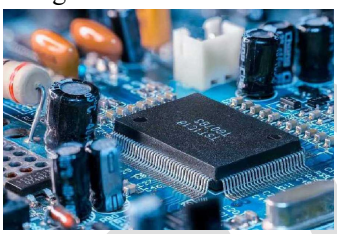
- POEM-4 was launched on December 30, 2024, aboard PSLV-C60, which also carried twin SPADEX satellites to a 475 km altitude.
- After satellite deployment, the PS4 upper stage was reconfigured as POEM-4 and continued in a nearby orbit, serving as an experimental platform.
- POEM-4 was then de-orbited by restarting its engine and brought to a circular orbit at 350 km altitude with a 2° inclination.
- The stage was passivated (leftover fuel vented) to prevent accidental break-up and ensure safe operations in orbit.

Source: The Hindu

Electronics Components Manufacturing Scheme

Why in the news?

The Ministry of Electronics and Information Technology (MeitY) recently notified the Electronics Components Manufacturing Scheme, marking a significant step towards strengthening India's position as a global hub for electronics manufacturing.



About Electronics Components Manufacturing Scheme:

- It is the first dedicated production-linked incentive (PLI) scheme to promote the manufacturing of select passive electronic components, including resistors, capacitors, speakers, microphones, special ceramics, relays, switches and connectors.
- The scheme will offer three incentive structures:
  - Turnover-linked incentive (based on revenue)
  - Capex-linked incentive (for investments in plants & machinery)
  - Hybrid incentive model (a combination of both)
- Incentives for incremental investments and turnover range from 1–10% depending on the year and the component.
- Employment generation will be a mandatory requirement for all applicants, including both component manufacturers and capital equipment producers. Thus, the scheme not only boosts manufacturing but also creates skilled jobs.
- This scheme has a tenure of six years, with a one-year gestation period.
- The scheme focuses particularly on passive electronic components. In contrast, active components fall under the purview of the India Semiconductor Mission (ISM).
- This scheme is set to benefit a number of industries, such as automobiles, consumer electronics, and electronics.

Source: PIB

WAVES 2025 - Anti-Piracy Challenge

Why in the news?

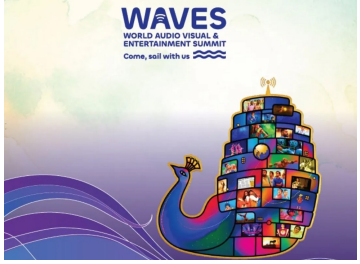
A key initiative under "Create in India" to promote indigenous innovation in Digital Content Security.

Key Points

- The Anti-Piracy Challenge is a flagship initiative under the Create in India Challenge, part of WAVES (World Audio Visual and Entertainment Summit) 2025.
- Organized by the Ministry of Information and Broadcasting, Government of India, WAVES 2025 will be held from May 1–4, 2025, in Mumbai, Maharashtra.
- The challenge aims to advance technologies like fingerprinting and watermarking to combat the rising threat of digital piracy in India.

About WAVES 2025:

- WAVES (World Audio Visual & Entertainment Summit) is a global event organized by the Government of India.
- It aims to position India as a hub for media innovation, IP creation, and content development.
- **Sectors covered include:**
  - Broadcasting, Films, TV,



Radio, Animation, Gaming, Comics, Advertising, and
    - Emerging tech like Generative AI, Augmented/Virtual/Extended Reality (AR/VR/XR) and Digital Media Platforms.
- Supports the Creative Economy, which is valued at $30 billion and employs nearly 8% of India's workforce.
- Contributes to the growth of India's Media and Entertainment (M&E) sector, projected to reach $44.2 billion by 2028, currently the 5th largest globally.

Source: PIB

Indian Cyber Crime Coordination Centre (I4C)

Why in the news?

The government recently authorised Indian Cyber Crime Coordination Centre (I4C) to share and receive information from the Enforcement Directorate under the anti-money laundering law, a move aimed at detecting money trails and combating cyber frauds.

About Indian Cyber Crime Coordination Centre (I4C):

- I4C has been established under the Ministry of Home Affairs (MHA) to act as a nodal point at the National level in the fight against cybercrime.
- It is designed to provide a framework and ecosystem for law enforcement agencies (LEAs) to deal with cybercrime in a coordinated and comprehensive manner.
- I4C brings together academia, industry, public, and government in the prevention, detection, investigation, and prosecution of cybercrimes.
- Headquarters: New Delhi

Objectives of the Indian Cyber Crime Coordination Centre:

- To act as a nodal point to curb Cybercrime in the country.
- To strengthen the fight against Cybercrime committed against women and children.
- Facilitate easy filing of cybercrime related complaints and identifying cybercrime trends and patterns.
- To act as an early warning system for LEAs for proactive cybercrime prevention and detection.
- Awareness creation among the public about preventing cybercrime.
- Assist States/UTs in capacity building of Police Officers, Public Prosecutors and Judicial Officers in the area of cyber forensic, investigation, cyber hygiene, cyber-criminology, etc.
- Identify the research problems and needs of LEAs and take up R&D activities in developing new technologies and forensic tools in collaboration with academia/research institutes within India and abroad.
- Suggest amendments, if required, in cyber laws to keep pace with fast-changing technologies and international cooperation.
- To coordinate all activities related to the implementation of Mutual Legal Assistance Treaties (MLAT) with other countries related to cybercrimes in consultation with the concerned nodal authority in MHA.

Components of I4C:

- National Cybercrime Threat Analytics Unit (TAU): For reporting threats pertaining to cybercrimes at regular intervals.
- National Cybercrime Reporting Portal (NCRP): To report various cybercrime complaints by citizens at all India levels on a common platform on a 24x7 basis from "anywhere, anytime".
- National Cybercrime Training Centre (NCTC): To impart training to government

officials, especially state law enforcement agencies.

- National Cybercrime Research and Innovation Centre: To carry out research for the development of indigenous tools for the prevention of cybercrimes.
- Platform for Joint Cyber Crime Coordination Team: For coordination, sharing of modus operandi of cybercrimes, data/information among states/UTs LEAs.
- Cybercrime Ecosystem Management Unit: For creating mass awareness in cyber hygiene for prevention of cybercrimes.
- National Cybercrime Forensic Laboratory (Investigation) Ecosystem: For helping LEAs in cyber forensics investigation.

Other Initiatives:

- Citizen Financial Cyber Fraud Reporting and Management System: For immediate reporting of financial cyber frauds and preventing the siphoning of funds by cyber criminals on a near-real-time basis.
- National Toll-Free Helpline number '1930' has been operationalized to provide citizen assistance in lodging online cyber complaints.
- The social media handle "CyberDost", which provides cyber safety tips at regular intervals.
- I4C has envisaged the Cyber Crime Volunteers Program to bring together citizens with a passion to serve the nation on a single platform and contribute to the fight against cybercrime in the country.

Source: The Hindu

Operation ATALANTA

Why in the news?

Recently, the European Union Naval Force (EUNAVFOR) under Operation ATALANTA has proposed a joint naval exercise with the Indian Navy.

Key Points

- EUNAVFOR Operation ATALANTA, which operates in the Western Indian Ocean and the Red Sea, has proposed a joint maritime exercise with the Indian Navy to be conducted around the end of May 2025.
- The primary goal of the proposal is to enhance coordination and maritime cooperation between European naval forces and the Indian Navy, particularly in the face of resurgent piracy threats and geopolitical instability in the Red Sea region.
- The proposed drill will go beyond the usual Passage Exercises (PASSEX) and will include advanced tactical manoeuvres, counter-piracy operations, and inter-naval communications training, if approved.
- The Horn of Africa region, once again experiencing piracy amidst Houthi rebel activity in the Red Sea, has prompted a need for enhanced maritime coordination, even though incidents have decreased recently.

About Operation ATALANTA

- Launched in 2008, Operation ATALANTA is the EU's counter-piracy mission in the Western Indian Ocean and the Red Sea, initially targeting piracy off the Somali coast.
- Its expanded mandate includes:
    - Protection of World Food Programme (WFP) vessels
    - Surveillance of arms embargo on Somalia
    - Monitoring drug and arms trafficking
    - Combating Illegal, Unreported and Unregulated (IUU) fishing
    - Disruption of illegal charcoal trade.

Source: The Hindu

Exercise Desert Flag 10

Why in the news?

Recently, the Indian Air Force (IAF) has joined the prestigious Exercise Desert Flag-10, a multinational air combat exercise being hosted by the United Arab Emirates (UAE) at Al Dhafra Air Base.

About Exercise Desert Flag:

- Exercise Desert Flag is a premier multinational air exercise designed to simulate complex aerial combat scenarios, allowing diverse air forces to train together under realistic operational conditions.
- IAF Aircraft Participation: The Indian Air Force is deploying two frontline aircraft types in the exercise:
    - MiG-29 – a versatile air superiority fighter, and
    - Jaguar – a ground attack aircraft known for deep strike capabilities.
- Participating Nations: Along with the Indian Air Force, the exercise involves air forces from Australia, Bahrain, France, Germany, Qatar, Saudi Arabia, South Korea, Turkey, the United Kingdom, the United States, and the host nation UAE.
- Objective: The primary aim of Exercise Desert Flag is to conduct complex and diverse fighter engagements. It focuses on:
    - Operational exchange of knowledge,
    - Sharing best practices, and
    - Enhancing air combat tactics among some of the most advanced air forces in the world.

Source: PIB

CROP (Comprehensive Remote Sensing Observation on Crop Progress)

Why in the news?

The Indian Space Research Organisation (ISRO) has estimated that India's wheat production from eight major wheat-producing states will reach 122.724 million tonnes as of March 31, 2025, by using advanced satellite-based remote sensing technologies.

What is CROP?

- CROP stands for Comprehensive Remote Sensing Observation on Crop Progress.
- It is a semi-automated and scalable framework developed by the National Remote Sensing Centre (NRSC), a part of the Indian Space Research Organisation (ISRO).
- The primary objective of CROP is to enable near real-time monitoring of crop sowing, growth, and harvesting across different seasons, especially during the rabi season in India.

Technological Components:

- CROP integrates data from multi-source remote sensing satellites, including:
  - EOS-04 (RISAT-1A) – provides Synthetic Aperture Radar (SAR) data,
  - EOS-06 (Oceansat-3) – provides optical remote sensing data, and
  - Resourcesat-2A – used for high-resolution optical imaging of agricultural areas.
- It uses both Optical and SAR datasets to accurately monitor crop progress under varying weather and light conditions.

Major Wheat-Producing States Identified:

- The eight primary wheat-growing states covered by the ISRO study are Uttar Pradesh, Madhya Pradesh, Rajasthan, Punjab, Haryana, Bihar, Gujarat, and Maharashtra.
- These states are crucial for ensuring national food security and contribute the bulk of India's rabi wheat harvest.

Source: The Hindu

Vibrant Villages Programme-II

Why in the news?

The Union Cabinet recently approved the Vibrant Villages Programme (VVP)-II for the period 2024-2029, as a 100% centrally funded scheme.

About Vibrant Villages Programme (VVP)

- Launched in 2023, the VVP is a centrally sponsored initiative aimed at the comprehensive development of villages along India's northern border.
- The goal is to improve the quality of life for residents and enhance border security.
- The programme covers the states of Arunachal Pradesh, Himachal Pradesh, Sikkim, Uttarakhand, and the Union Territory of Ladakh.

Objectives of the VVP:

- Improve living conditions and create livelihood opportunities in border villages.
- Strengthen border security by involving local populations as support for border forces.
- Control trans-border crime and promote the integration of border communities with the rest of the nation.

Key facts about VP-II:

- The VVP-II will be a 100% Centre-funded programme with a total outlay of ₹6,839 crore.
- It will be implemented in select strategic villages in the following states and UTs: Arunachal Pradesh, Assam, Bihar, Gujarat, Jammu & Kashmir (UT), Ladakh (UT), Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Rajasthan, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal, through FY 2028-29.
- Both VVP-I and VVP-II are transformative initiatives designed to make border villages self-reliant and vibrant.

Source: PIB

PM-POSHAN Scheme

Why in the news?

The Government of India has approved a 9.5% hike in material cost under the PM-POSHAN Scheme, resulting in an additional central expenditure of ₹954 crore for the financial year 2025–26, effective from May 1, 2025.

About PM-POSHAN Scheme

- The PM-POSHAN Scheme, formerly known as the Mid-Day Meal Scheme, is a centrally sponsored scheme implemented by the Ministry of Education.
- It aims to provide one hot cooked meal per school day to 20 crore children studying in Balvatikas (pre-primary), and Classes 1 to 8 across 10.36 lakh government and government-aided schools.
- The scheme addresses twin objectives:
  - Enhancing nutritional status of school-going children.
  - Improving enrollment, retention, and attendance in schools, especially among disadvantaged children.
- The revised material cost per student per day is:
  - ₹6.78 for Balvatika and Primary students (up from ₹6.19).
  - ₹10.17 for Upper Primary students (up from ₹9.29).
- These rates represent the minimum mandatory contribution. However, States and Union Territories can contribute more from their budgets to provide meals with higher nutritional value.
- Nutritional norms under PM-POSHAN include:
  - For Balvatika and Primary classes: 20g pulses, 50g vegetables, and 5g oil.
  - For Upper Primary classes: 30g pulses, 75g vegetables, and 7.5g oil.
- The Labour Bureau under the Ministry of Labour supplies data on inflation for the items in the PM-POSHAN meal basket. This data is based on the Consumer Price Index – Rural Labourers (CPI-RL), calculated from 600 sample villages across 20 States.
- POSHAN Abhiyan is managed by the Ministry of Women and Child Development and aims to improve nutrition among adolescent girls, pregnant women, lactating mothers, and children (0–6 years).
- Mission POSHAN 2.0, launched in 2021, merged POSHAN Abhiyan and the Supplementary Nutrition Programme to streamline efforts under one unified framework.
- Funding Pattern under POSHAN Abhiyan:
  - 60:40 between Centre and States/UTs with legislature.
  - 90:10 for the Northeastern and Himalayan States.
  - 100% central funding for UTs without legislature

Source: The Hindu

Adarsh Sanskrit Village Programme

Why in the news?

The Uttarakhand cabinet approved the Adarsh Sanskrit village programme to teach Sanskrit to everyone in 13 selected villages, turning them into "model Sanskrit villages."

About Adarsh Sanskrit Village Programme:

- Uttarakhand is inspired by Mattur, a village in Karnataka where everyone speaks Sanskrit. The state wants to create similar "Sanskrit Grams" to make the language alive again, not just a subject in books.
- The programme encourages villagers to use Sanskrit for everyday tasks—like greeting neighbors or singing songs during festivals.
- The government picks one village per district for this pilot project. If it works well, they'll expand it to more villages at the block level.
- A committee in each district, led by the District Magistrate, District Education Officer, and Sanskrit officer, chose the villages.
- The programme starts in May 2025, funded by the Central Sanskrit University in Delhi.

How will it be implemented?

- The government hired 13 instructors, each will be paid ₹20,000 per month, after a written test and interview. These instructors train at the

Sanskrit Academy in Haridwar to learn how to teach villagers.

This programme is part of Uttarakhand's push to revive Sanskrit. Other efforts include:

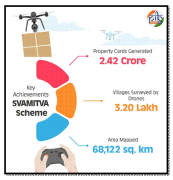
- Financial incentives: Girls get ₹250 monthly from 2023-24, and SC/ST students from 2024-25, for studying Sanskrit in schools.
- Sanskrit in madrasas: The Uttarakhand Waqf Board plans to teach Sanskrit in 416 madrasas, alongside Arabic and NCERT subjects, to promote inclusivity.
- Tech boost: The state collaborates with IIT Roorkee to use AI for Sanskrit, feeding 1 billion characters of Sanskrit texts into a language model.
- Vedic mathematics: The Uttarakhand State Council for Science and Technology promotes Vedic math in projects.

Source: Indian Express

5 Years of SVAMITVA Scheme

Why in the news?

Recently, SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) Scheme completed 5 Years.



About SVAMITVA Scheme

- SVAMITVA Scheme was launched on April 24, 2020 on National Panchayati Raj Day.
- It is a Central Sector scheme of the Ministry of Panchayati Raj.
- It aims to provide legal ownership papers for houses and land in villages using drones and mapping technology.
- This helps villagers access loans, resolve disputes, and support better planning.
- It is being implemented by the Survey of India with National Informatics Centre Services Inc. (NICSI) as the tech partner.
- It has a budget of ₹566.23 crores from FY 2020-21 to 2024-25, with an extension to FY 2025-26.

Progress of the scheme:

- Over 2.42 crore property cards have been created for 1.61 lakh villages under the scheme.
- Drone surveys completed in 3.20 lakh villages, covering 68,122 sq. km of the area.

Source: PIB

MISCELLANEOUS

Tonga

Why in the news?

The strong 7.1 magnitude earthquake recently hit near Tonga, prompting a tsunami warning for the Pacific island country.

About Tonga:

- Tonga, officially the Kingdom of Tonga, also called Friendly Islands, is an archipelago composed of 169 islands, of which only 36 islands are inhabited, and is located in the South Pacific Ocean.
- It lies south of Samoa, east of Fiji, and just north of the Tropic of Capricorn.
- Tonga's western islands are volcanic (four with active volcanoes) and sit well above sea level. Those to the east are coral and are more low-lying.
- The three largest islands are Tongatapu, Ha'apai, and Vava'u, with Tongatapu being the most populated.
- The capital, Nuku'alofa, is on the island of Tongatapu.
- Due to its location within the Pacific Ring of Fire, Tonga experiences relatively frequent volcanic activity.
- A former British protectorate, Tonga became fully independent in 1970, although it was never formally colonised.
- Political System: It is a constitutional monarchy.
- Tonga is a member of the Commonwealth and of the United Nations.
- Language: Tongan, English
- Currency: Tongan Pa'anga (TOP)

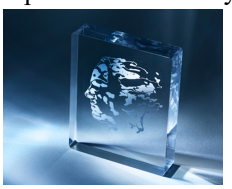
- Economy: Tonga has no strategic or mineral resources, and relies on agriculture, fishing and the money sent home by Tongans living abroad.

Source: India Today

Abel Prize 2025

Why in the news?

The prestigious Abel Prize for mathematics was recently awarded to Japanese mathematician Masaki Kashiwara, a specialist in algebraic analysis, representation theory, and sheaf theory.



About Abel Prize:

- The Abel Prize recognises pioneering scientific achievements in mathematics.
- It is named after Norwegian mathematician Niels Henrik Abel (1802-29), who in his short life made pioneering contributions to multiple fields.
- The prize was established by the Norwegian Parliament in 2002, on Abel's 200th anniversary.
- The Abel Prize is awarded and administered by the Norwegian Academy of Science and Letters on behalf of the Norwegian government.
- The recipients are chosen by an expert committee appointed by the Academy under the advice of the International Mathematical Union (IMU) and the European Mathematical Society (EMS).
- First awarded in 2003, the Abel Prize is often considered to be an equivalent of the Nobel Prize, which does not have a category for mathematics. It has been modelled as such.
- The prize includes a monetary award of 7.5 million kroner (roughly USD 720,000) and a glass plaque designed by Norwegian artist Henrik Haugan.

Abel Prize 2025:

- It was awarded to Japanese mathematician Masaki Kashiwara for his fundamental contributions to algebraic analysis and representation theory, in particular the development of the theory of D-modules and the discovery of crystal bases.
- His work has not only helped solve some hard problems that have been around for a long time but also opened new avenues for research by connecting areas that were not known to be connected before.
- For instance, Kashiwara discovered crystal bases, which allowed mathematicians to replace complex calculations with much simpler graphs of vertices connected by lines.

Source: NDTV. Com

Tribhuvandas Patel

Why in the news?

The Lok Sabha recently passed a bill to set up the Tribhuvan Sahkari University in Anand, Gujarat, that is named after Tribhuvandas Patel, who was one of the pioneers of the cooperative movement in India and instrumental in laying the foundation of Amul.

About Tribhuvandas Patel:

- Tribhuvandas Kishibhai Patel is an Indian independence activist, lawyer, and politician.
- A follower of Mahatma Gandhi, he is regarded as the father of the cooperative movement in India, most notably in the Kaira District Co-operative Milk Producers' Union in 1946, and the Anand Co-operative movement.

- He was born in 1903 to a farming family in Gujarat.
- He was very much influenced by the philosophy and principles of Mahatma Gandhi.
- He was totally involved in the various movements of Mahatma Gandhi, like civil disobedience, rural development, and the drive against untouchability, alcoholism,
- He was the President of Harijan Sevak Samiti from 1948 to 1983.
- In Nasik in 1930, he was jailed for the first time for the salt satyagraha.
- He was further imprisoned in Visapur in 1930 where he took an oath to dedicate his life for the benefit of the masses at large.
- In 1946, guided by the wisdom of Morarji Desai and inspired by Sardar Vallabhbhai Patel, Tribhuvandas formed the Kaira District Cooperative Milk Producers' Union Ltd.

(KDCMPUL) as a protest against the exploitation of local farmers by Polson Dairy.

- The basic approach adopted by Tribhuvandas Patel was first to establish milk cooperatives in the villages. These co-operatives were literally the "base" of the entire venture.
- He insisted that each village co-operative should be open to all milk producers in the village regardless of caste, creed, or community.
- He invited Dr. Verghese Kurien to KDCMPUL, who later spearheaded the White Revolution in India.
- He was instrumental in establishing the Gujarat Cooperative Milk Marketing Federation (GCMMF), National Dairy Development Board (NDDB), and Institute of Rural Management Anand (IRMA).
- During his lifetime he held various positions and received innumerable recognitions and awards for his outstanding leadership and social service. Some of these awards are:
    - Ramon Magsaysay Award from the Philippines in 1963 as a recognition towards his community leadership,
    - Padma Bhushan from the Government of India, 1964, towards Social Service.

Source: Indian Express

Protection of Interests in Aircraft Objects Bill, 2025

Why in the news?

The Rajya Sabha recently passed the Protection of Interests in Aircraft Objects Bill, 2025, which seeks to implement international conventions on the leasing of aviation equipment.

About Protection of Interests in Aircraft Objects Bill, 2025:

- The bill aims to implement international agreements, particularly the Convention on International Interests in Mobile Equipment (commonly known as the Cape Town Convention of 2001) and its Protocol on Aircraft Equipment.
- India became a signatory to these agreements in 2008.
- These international standards are designed to secure the rights over high-value mobile assets such as aircraft, helicopters, and engines, thereby ensuring greater legal clarity and uniformity across the aviation industry.
- The bill is designed to bring these international agreements into India's legal framework, ensuring that creditors and stakeholders in the aviation leasing space are protected under clear guidelines.
- The bill empowers the central government to make rules to implement the provisions of the Convention and the Protocol.
- The legislation designates the Directorate General of Civil Aviation (DGCA) as the registry authority for the purposes of the convention.
- The registry authority is responsible for the registration and de-registration of aircraft.
- Key provisions of the bill include the requirement for creditors to notify the DGCA before initiating any remedies in the event of a default.
- In cases where defaults occur, creditors will be entitled to recover assets such as aircraft, helicopters, and engines within two months, or a mutually agreed upon timeframe.
- The bill is expected to provide much-needed clarity and security, particularly in the leasing industry.

Source: Indian Express

Kannadi Papaya

Why in the news?

Kannadippaya, a traditional tribal handicraft from Kerala, has been awarded the Geographical Indication (GI) tag.

What is Kannadippaya?

- "Kannadippaya" (meaning 'mirror mat') originates from its distinct reflective design.
- It is woven using reed bamboo's soft inner layers, which give it remarkable thermal properties—it provides warmth in winter and a cooling effect in summer.
- It is primarily crafted by tribal communities such as the Oorali, Mannan, Muthuva, Malayan, and Kadar tribes, along with Ulladan, Malayarayan, and Hill Pulaya artisans in the Idukki, Thrissur, Ernakulam, and Palakkad

- The finest Kannadippaya is made from Teinostachyum wightii, locally known by various names such as Njoonjileetta, Njoojoora, Ponneetta, Meieeta, and Neytheetta.
- Other bamboo species, like Ochlandra sp. (locally called Kareetta, Pereetta, Velleeta, Chitoora, and Kanjoora), are also used.
- Kannadippaya is the first tribal handicraft from Kerala to receive a GI tag.

Source: The Hindu

Khelo India Games

Why in the news?

The 7th edition of the Khelo India Youth Games will be staged in five cities of Bihar from May 4 to 15.

Key Points:

- Bihar is set to host the Khelo India Youth Games and the Khelo India Para Games in May 2025.
- The Khelo India initiative, launched in 2018, aims to revive India's sports culture by encouraging youth participation and identifying potential olympians.

Key Components of Khelo India :

- Sports Competitions and Talent Development: Organizes annual events like the Khelo India Youth Games, University Games, and Winter Games to identify and nurture young talent.
- Creation and Upgradation of Sports Infrastructure: Develops and enhances sports facilities nationwide to provide world-class training environments.
- Khelo India Centres and Sports Academies: Establishes centers and academies offering specialized coaching across various sports disciplines.
- Fit India Movement: Promotes physical fitness and a healthy lifestyle among citizens through various initiatives.
- Promotion of Inclusiveness through Sports: Focuses on gender equality, disability inclusion, and the promotion of indigenous sports to ensure widespread participation.

Source: The Hindu

BatEchoMon

Why in the news?

Recently, India's First Automated Bat Monitoring and Detection System was created by the Indian Institute for Human Settlements (IIHS), Bengaluru.

What is BatEchoMon?

- BatEchoMon stands for "Bat Echolocation Monitoring". It is India's first automated, real-time bat monitoring and detection system.
- The system was developed by bat biologist Kadambari Deshpande and engineer Vedant Barje under the guidance of Jagdish Krishnaswamy.
- It was designed as part of the Long-Term Urban Ecological Observatory at the School of Environment and Sustainability, Indian Institute for Human Settlements (IIHS), Bengaluru.

What Does BatEchoMon Do?

- BatEchoMon autonomously detects, records, analyses, and classifies bat echolocation calls in real-time — something that previously took researchers months to do manually.
- It includes:
  - An ultrasonic microphone using a modified AudioMoth

  - A Raspberry Pi microprocessor to process and classify calls.
  - A solar-powered battery for power and a Wi-Fi unit for data transmission.
- The device activates automatically at sunset and continuously records audio through the night.
- It uses a Convolutional Neural Network (CNN) algorithm to distinguish bat calls from other sounds and to classify them based on peak frequency and call structure.
- The output includes:
  - Spectrograms (visual frequency-time plots of bat calls),
  - Audio files of bat calls,
  - Species-specific statistical data showing call frequency and timing

Source: The Hindu

Meghayan-25

Why in the news?

Recently, the Indian Navy hosted the 3rd edition of its Meteorological and Oceanological Symposium, titled Meghayan-25.

Meghayan-25 Theme and Objective

- The event commemorated the formation of the World Meteorological Organization (WMO) and celebrated World Meteorological Day 2025 (23rd March every year).
- Meghayan-25 was held under the WMO Day 2025 theme, 'Closing the Early Warning Gap Together', which highlights the importance of improving early warning systems for climate and disaster preparedness.

Major Launches during Meghayan-25

- MOSDAC-IN Web Services were launched, a joint initiative of the Directorate of Naval Oceanology and Meteorology (DNOM) and SAC-ISRO.
- It provides customised satellite-derived weather products with secure, individual log-ins for Naval Meteorological Offices.
- The Navy also relaunched its professional journal, "Sagar Manthan", with the 10th edition being published after a decade-long gap.

World Meteorological Organization (WMO)

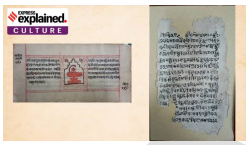
- The WMO is a specialised agency of the United Nations (UN), focused on meteorology, operational hydrology, climate, and related sciences.
- WMO coordinates global efforts to monitor weather and climate, promotes scientific research, and enables the exchange of data and weather forecasts.
- The WMO evolved from the International Meteorological Organization (IMO), which was established in 1873.
- WMO was officially established in 1950 as a specialized UN agency, building upon the IMO's foundational work.
- The headquarters of WMO is located in Geneva, Switzerland.
- It has 193 member countries and territories, reflecting global participation in meteorological cooperation and research

Source: PIB

UNESCO Memory of the World (MoW) Programme

Why in the news?

Recently, UNESCO has added manuscripts of the Bhagavad Gita and Bharata's Natyashastra to the Memory of the World (MoW) Register in 2025.



What is the Memory of the World (MoW) Programme?

- The MoW Programme was launched by UNESCO in 1992 with the goal of preserving global documentary heritage and preventing what it called "collective amnesia."
- It aims to safeguard rare documents, including manuscripts, oral traditions, audio-visual content, and archive materials, of global and universal value.
- According to UNESCO, this documentary heritage should be preserved, protected, and permanently accessible to all, while respecting cultural practices.
- The MoW Register serves as a global compendium of such heritage, and is updated biennially (every two years).
- As of 2025, the Register contains 570 entries, including:
  - The Mahavamsa (Sri Lanka's ancient chronicle),
  - Shaiva Siddhanta manuscripts (India),
  - Auschwitz trial recordings (Germany),
  - And the March 7, 1971 speech of Bangabandhu Sheikh Mujibur Rahman (Bangladesh).

India's Contributions to the MoW Register:

- India has made 13 contributions, including two joint submissions:
  - Rig Veda (added in 2005),
  - Works of Abhinavagupta, the Shaivite philosopher (added in 2023),
  - Archives of the Non-Aligned Movement's first summit in Belgrade, 1961 (joint submission),

- Dutch East India Company archives (joint submission).
- In 2025, two new Indian manuscripts were added, both preserved at the Bhandarkar Oriental Research Institute, Pune:
  - Natyashastra by Bharata Muni
  - Bhagavad Gita, attributed to Vyasa.

Source: Indian Express

Cash Recovery at Justice Yashwant Varma's Residence – Judicial Controversy

Context :

Burnt cash was allegedly discovered during a fire incident at the residence of Delhi High Court judge **Justice Yashwant Varma** on **Holi night (March 2025)**. The incident triggered concerns over judicial accountability and lack of criminal investigation.

V.P. Dhankhar's Remarks

No FIR Filed :

Vice President **Jagdeep Dhankhar** questioned why no FIR was lodged, calling it a violation of the law as **cognizable offences must be reported**.

- **Judicial Independence Misused:** Stressed that **judicial independence** should not be used as a shield against legal probes.
- **Committee's Limitations :** The **SC-formed in-house committee** lacks legal power, can only **recommend**, not act.

Final Authority : Any real action, such as **removal of a judge**, can only be done by **Parliament**.

What is NJAC (National Judicial Appointments Commission)?

Purpose : To **replace the collegium system** and bring transparency to the appointment and transfer of judges in the higher judiciary.

Established By:

- **99th Constitutional Amendment Act, 2014, (NJAC Act, 2014)**

Composition:

- Chief Justice of India (Chairperson)
- Two senior-most SC judges
- Union Law Minister
- Two eminent persons
- One nominee must be from SC / ST / OBC / Minorities/Women

Functions:

- Recommend appointments and transfers of SC and HC judges
- Ensure integrity and competence in recommendations

Role of Parliament:

- Parliament can regulate procedures and empower NJAC to frame its rules

Supreme Court Verdict (2015)

Case: *SC Advocates-on-Record Association v. Union of India*

- **Declared NJAC unconstitutional**
- Violated **Basic Structure Doctrine**
- **Judicial independence** must remain with judges; outside interference (via non-judicial members) not allowed

Result:

The Collegium system was **restored** as the method for judicial appointments.

Pope Francis

Why in the news?

Pope Francis, leader of the Roman Catholic Church has passed away and India has announced a three-day state mourning, as a mark of respect.

About the Pope Francis:

- Pope Francis was the 266th pope, in a lineage dating back to Saint Peter in 30 CE.
  - He assumed the papacy in 2013, taking over from Pope Benedict XVI.
- Pope Francis was the first non-European pope in more than a millennium and the first Latin American pope.

Office of Pope

- In Christianity, there are three major branches — Catholic, Protestant, and (Eastern) Orthodox.
  - And among them, the Pope is the supreme spiritual leader of Roman Catholics.
- The papacy oversees the Holy See, the central governing body of the Church and Vatican City.
- The Ring of the Fisherman, the Pope's signet ring bearing the seal of his papacy, is broken off to symbolise the end of his rule.

Election of Pope:

- The College of Cardinals, the Church's most senior officials worldwide, chooses the pope.
- Within 15-20 days, cardinals under age 80 arrive from all over the world to participate in the papal conclave, the secret election process to determine a successor.

- A candidate must receive a two-thirds majority of votes to be elected.
- In India, four cardinals are eligible to vote in a papal conclave.

Source: Indian Express

Chlorpyrifos

Why in the news?

The 2025 COPs (Conferences of the Parties) of the Basel, Rotterdam, and Stockholm Conventions are being held in Geneva (April 28–May 9) to address hazardous chemicals like chlorpyrifos.

About Chlorpyrifos

- Chlorpyrifos, a pesticide classified as 'moderately hazardous' by the World Health Organisation, is still approved for use in India on 18 crops, despite bans in over 40 countries.
- It is linked to neurotoxicity, reproductive toxicity, irreversible brain damage in unborn children, and the ability to contaminate distant ecosystems due to its mobility.

Global and National Advocacy

Pesticide Action Network (PAN) India:

- It advocates placing chlorpyrifos under Annex III of the Rotterdam Convention, requiring prior informed consent before trade.
- It calls for its inclusion under Annex A of the Stockholm Convention, which demands a complete global ban, though exemptions are usually allowed.
- It stresses that safer alternatives are already available, making a total ban both feasible and necessary.

- Unauthorised Use in India: A 2022 report found the illegal use of chlorpyrifos and other agrochemicals like paraquat, raising serious regulatory and enforcement concerns.

What is CIBRC?

- The Central Insecticides Board & Registration Committee (CIBRC) operates under the Directorate of Plant Protection, Quarantine & Storage, part of the Department of Agriculture & Farmers Welfare, Ministry of Agriculture & Farmers Welfare.
- It was established in 1970 to ensure the safe regulation of insecticides across India, particularly focusing on minimising risks to human health, animal safety, and the environment.

Legal backing:

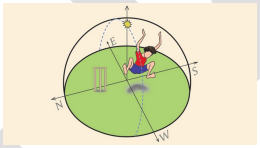
- The Insecticides Act, 1968 forms the statutory basis for CIBRC. It came into effect from 1st August 1971 along with the notification of the Insecticides Rules, 1971.
- The Act mandates the regulation of import, manufacture, sale, transport, and use of insecticides through a centralized registration process.

Source: Down to earth

Zero Shadow Day (ZSD)

Why in the news?

The Cosmology Education and Research Training Center (COSMOS), Mysuru, of the Indian Institute of Astrophysics recently observed 'Zero Shadow Day'.



About Zero Shadow Day (ZSD):

- It is an interesting celestial phenomenon that occurs twice in a year when the Sun is directly overhead and thus no shadow of any vertical object can be seen.
- This event happens for locations situated between the Tropic of Cancer and the Tropic of Capricorn.
- The ZSD phenomenon transpires when the Sun's declination becomes equal to the latitude of the location.
- On this day, as the sun crosses the local meridian, its rays fall exactly vertically relative to an object on the ground, making it impossible to observe any shadow of that object.
- This is due to the tilt of the Earth's axis and its rotation around the sun, causing the angle of the sun's rays to change throughout the year, which in turn affects the lengths and directions of shadows.
- The southern part of India, roughly below the latitude of Bhopal, will experience the ZSD.
- The states that can see this event are Andaman and Nicobar Islands, Kerala, Tamil Nadu, Puducherry, Karnataka, Andhra Pradesh, Telangana, Goa, Maharashtra, Odisha, Daman & Diu, Dadra & Nagar Haveli, most of

Gujarat and Chhattisgarh, and the southern parts of Madhya Pradesh, Jharkhand, West Bengal, Tripura, and Mizoram.

When does it occur?

- There are two zero shadow days every year, observed in places that lie between the Tropic of Cancer and the Tropic of Capricorn.
- One falls during the Uttarayan (when the Sun moves northwards), and the other is during Dakshinayan (when the Sun moves southwards).
- It will clearly be different for different places on earth.
- It lasts for a small part of a second, but the effect can be seen for a minute to a minute-and-a-half.

Source: The Hindu

PRACTICE QUESTIONS FOR MAINS EXAM

1. What are plateaus? Discuss the significance of the Bundelkhand Plateau for agriculture. (8 marks 125 words)

2. Why do different regions of India experience extreme temperature variations during summer and winter? (8 marks 125 words)

3. Define watershed. Why are watersheds important for sustainable water management ? (8 marks 125 words)

4. Discuss the significance of post-disaster recovery planning in the context of sustainable development and community resilience. (8 marks 125 words)

5. "Sector-specific guidelines play a vital role in disaster management". How do these guidelines aid in reducing vulnerabilities and enhancing sectoral resilience during disasters? (8 marks 125 words)

6. "Discuss the growth of megacities across the globe and analyze the challenges they pose in terms of infrastructure and quality of life." (8 marks 125 words)

7. Explain the Coriolis effect and its influence on global wind patterns. How does it contribute to the deflection of winds in both hemispheres and affect the formation of cyclonic systems? (8 marks 125 words)

8. How do invasive species impact native biodiversity in Indian ecosystems? Suggest strategies to mitigate their effects. (8 marks 125 words)

9. How does urbanization affect the microclimate of cities? (8 marks 125 words)

10. "Discuss how niche differentiation helps in reducing competition among species in an ecosystem." (8 marks 125 words)

11. Explain the process of soil degradation in India and suggest sustainable land management practices to combat it, citing regional examples. (12 marks 200 words)

12. "The retreat of Himalayan glaciers poses severe threats to India's water security."

Examine the causes of glacial retreat and its consequences. (12 marks 200 words)

13. Natural disasters are becoming increasingly frequent and severe due to climate change. Discuss the role of the government in managing disaster risks and mitigating their impact, particularly focusing on the National Disaster Management Plan (NDMP) and the Sendai Framework. (12 marks 200 words)

14. Analyze the impact of El Niño and La Niña phenomena on global weather patterns. How do these events affect agriculture, water resources, and coastal regions? (12 marks 200 words)

15. "Discuss the global phenomenon of desertification and its impact on India, particularly in regions like Rajasthan and Gujarat. What strategies can India adopt to combat desertification and ensure sustainable land use?" (12 marks 200 words)

16. Examine the global effects of climate change on India's coastal regions, especially in the context of the Sundarbans and Mumbai. How is India preparing for rising sea levels and extreme weather events? (12 marks 200 words)

17. Analyze India's biodiversity hotspots role in global ecological stability. Discuss threats like deforestation, habitat loss, and climate change and the conservation efforts in place. (12 marks 200 words)

18. "How the port-led development initiatives reshaped the economic geography of coastal regions in India? Illustrate with examples of recent projects. (12 marks 200 words)

19. "Discuss the challenges of managing biological disasters in India, such as pandemics. How can India improve its preparedness for such disasters?" (12 marks 200 words)

20. "Examine the role of traditional ecological knowledge (TEK) in sustainable resource management in India. Provide examples where TEK has been successfully integrated into modern conservation practices." (12 marks 200 words)

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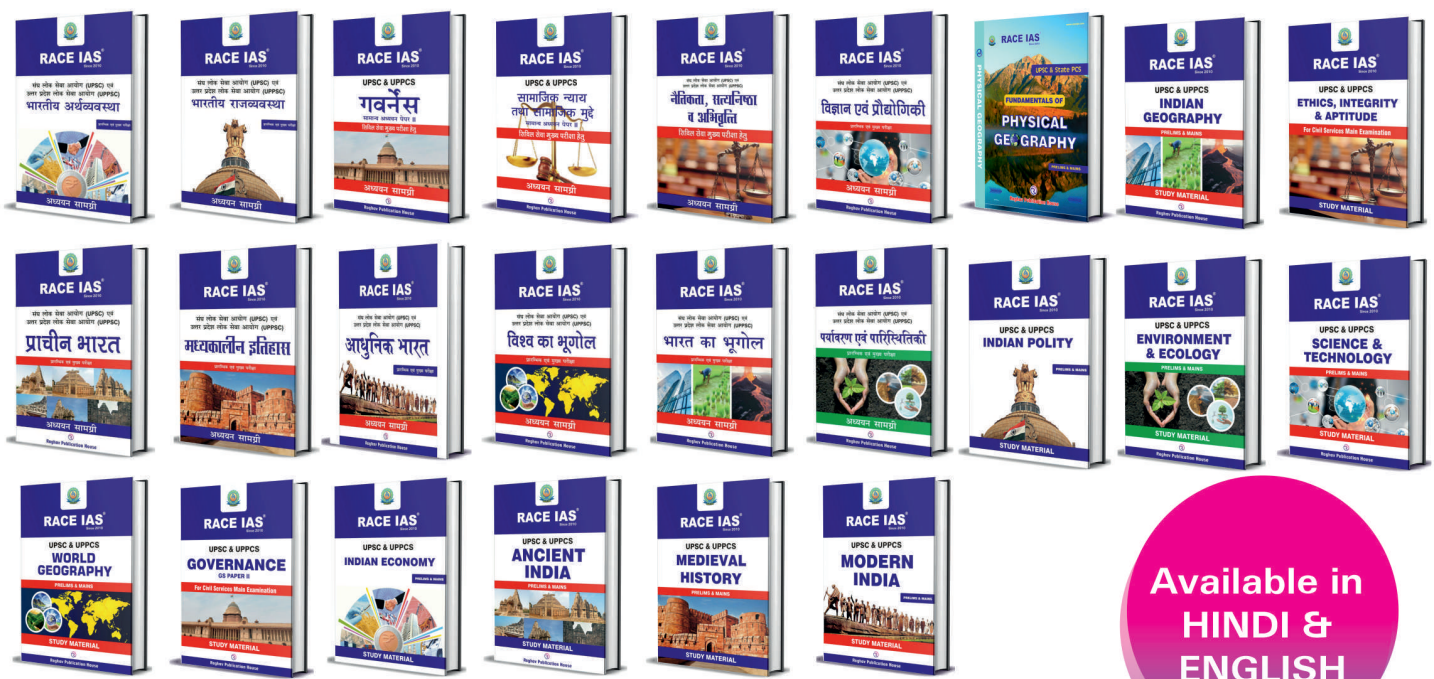

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