

Factly Weekly

Compilation

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Exam

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Hydroxymethanesulphonate (HMS)

News: A study shows that hydroxymethanesulphonate (HMS), a secondary aerosol, forms in cold urban environments such as Fairbanks, Alaska. This discovery provides new insights into aerosol chemistry under extreme conditions and its impact on air quality.

About Hydroxymethanesulphonate Explanation



Figure 1 Source- The Hindu

- It is a *secondary aerosol* which forms through chemical reactions involving *formaldehyde and sulfur dioxide* in the presence of liquid water.

- **Role of Liquid Water-** The reaction requires liquid water within aerosol particles. Even under extremely cold conditions, liquid water can persist in a *supercooled state* within aerosols, enabling the reaction to occur.

- **Environmental conditions favoring HMS formation:**

- **Low temperatures:** Inhibit ammonium volatilization,

which reduces aerosol acidity and stabilizes sulfite ions.

- **High ammonium ion concentrations:** Help neutralize acidity, ensuring favorable conditions for HMS formation.
- **Supercooled liquid water:** Allows the chemical reaction to proceed at sub-zero temperatures.
- **Impact on health and environment**
 - **Air Quality:** HMS contributes to the formation of secondary aerosols that increase *PM2.5 pollution*, negatively impacting air quality, especially in cold urban areas like Fairbanks, Alaska.
 - **Climate Impact:** By influencing cloud formation and aerosol radiative properties, HMS can affect climate processes.
 - **Health Concerns:** Increased PM2.5 levels associated with HMS can worsen respiratory and cardiovascular illnesses, particularly in polluted regions.

Additional Facts

Aerosols: Tiny solid or liquid particles suspended in the air. **Examples-** Dust, smoke, fog.

PM2.5: Fine particulate matter with a diameter less than 2.5 micrometres (μm).

GLP-1 Receptor Agonists

News: WHO has endorsed a new class of drug, GLP-1 Receptor Agonists, for managing obesity.



Figure 2.Source- The Indian Express

About GLP-1 Receptor Agonists

- **Role:** They mimic a hormone that regulates appetite and blood sugar level, lipid metabolism, and other biological functions.
- Drugs in this class include *semaglutide* and *tirzepatide*, which have potential to be transformative.
- **Utility:**
 - Helps in treatment of *Type 2 diabetes and obesity*.
 - These drugs can *complement current policies* promoting healthy eating and physical exercise to curb the obesity pandemic.
 - These drugs are significant as obesity affects nearly 1 in 8 people worldwide.
- **Side Effects:** There are severe side effects like stomach paralysis, inflamed pancreas and thyroid cancer.

Varman Therapy

News: Recently, the National Institute of Siddha (NIS) has set a Guinness World Record for administering Varman therapy to 567 individuals simultaneously.

About Varman Therapy



Figure 3.Source- PIB

It is a unique and traditional healing modality within the **Siddha system of medicine**, effective in treating various health conditions.

• **Benefits:**

- It is a *non-invasive, cost effective, non-pharmacological* form of treatment.
- It has potential to provide *immediate pain* relief by manipulating the *Varman points*, which are vital energy centers located throughout the body.

• **Treatment:** Provides rapid relief for musculoskeletal pain, injuries and neurological disorders.

• It is often associated with the **Varmakalai**, a martial arts form in which the body's pressure points are manipulated to heal or cause harm.

IRIS2 Space Programme

News: The European Union has launched an ambitious Infrastructure for Resilience, Interconnectivity and Security by Satellite (IRIS2) space programme, its third major space infrastructure project, to rival Elon Musk's Starlink.



Figure 4. Source- European Commission

About IRIS2

- It is the European Union's **third flagship satellite programme**, after Galileo Navigation System and Copernicus.
 - Galileo is a civilian satellite navigation system while Copernicus is the world's largest Earth Observation Programme.
- The **European Space Agency** has played a key role in the development of the programme.
- It has a **constellation of 290 satellites**, operating in medium and low earth orbit.
- It **aims** to provide secure, resilient and high-speed connectivity in areas where network connectivity is

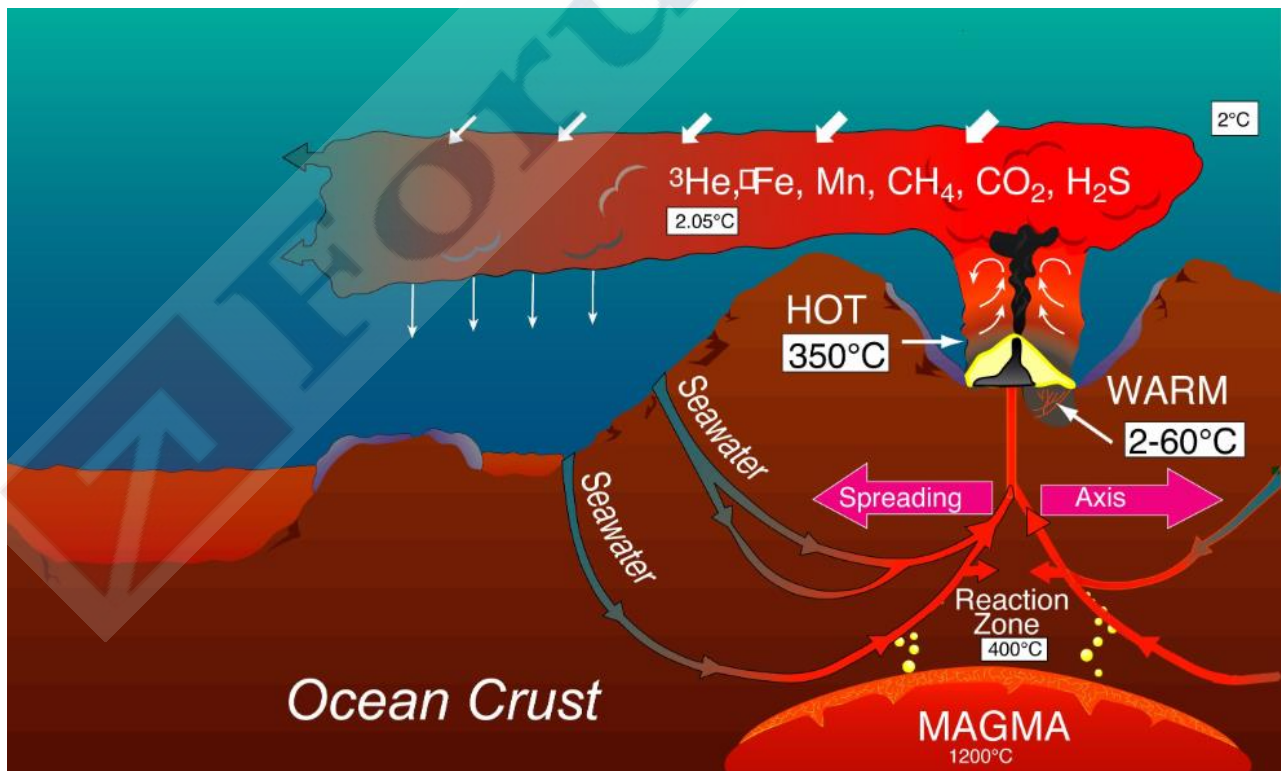
low or unavailable.

- It supports a large variety of governmental applications in the domains of surveillance, crisis management, security and defence etc.

Hydrothermal Vent

News: Indian oceanographers have reached a significant milestone by capturing an image of an active hydrothermal vent situated 4,500 meters beneath the surface of the Indian Ocean.

About Hydrothermal Vent



Source- schmidtcocean

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- Hydrothermal vents are underwater springs that *form in tectonically active areas* where seawater interacts with magma below the ocean floor.
- **Location**– Ridges, For ex. *Central and Southern Ridge of the Indian Ocean*, Convergent plate boundaries, Volcanic hotspots, Ocean trenches
- **Formation:**
 - **Cold Water Entry:** Seawater at about 2°C seeps into cracks in the ocean crust caused by tectonic activity.
 - **Heating by Magma:** The water is heated to extreme temperatures (up to 370°C) upon contact with magma.
 - **Chimney Formation:** As the hot water meets cold seawater, minerals solidify, forming chimney-like structures around the vents.
- **Significance:**
 - **Mineral deposits:** The deposits from hydrothermal venting are generally rich in *copper, zinc, gold, silver, platinum, iron, cobalt, nickel* and other economically-beneficial minerals and metals.
 - **Ecological insights:** Hydrothermal vents host unique ecosystems relying on chemosynthesis rather than photosynthesis. These ecosystems support a variety of organisms, such as *giant tube worms, vent crabs, clams, and shrimp*, many of which are found nowhere else.
 - **Scientific Research:** Provides insights into deep-sea geological processes and the potential for resources, supporting strategic initiatives like [*India's Deep Ocean Mission*](#).

Exercise SLINEX

News: Exercise SLINEX 2024 (Sri Lanka–India Exercise) will take place from December 17 to 20, 2024, at Visakhapatnam, under the supervision of the Eastern Naval Command.

About Exercise SLINEX



Figure 5.Source- PIB

- It is a *bilateral naval exercise* between India and Sri Lanka.
- The first SLINEX exercise took place in 2005. The 11th edition took place in 2024.
- The 2024 edition of SLINEX aims to further enhance the strong maritime ties between India and Sri Lanka while promoting a safe, secure, and rules-based maritime environment.
- **Participating Units:**
 - **From India:** Indian Naval Ship (INS) Sumitra, a Naval Offshore Patrol Vessel of the Eastern Fleet, along with a Special Forces team.
 - **From Sri Lanka:** SLNS Sayura, an Offshore Patrol Vessel, with an embarked Special Forces team.
- The exercise will take place in two phases: the Harbour Phase and the Sea Phase.
 - **Harbour Phase**– Participants will engage in professional and social exchanges to foster mutual understanding.
 - **Sea Phase**- It will include joint exercises such as Special Forces operations, gun firings, communication drills, seamanship practices, navigation evolutions, and helicopter operations.

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Human Rated Launch Vehicle Mark-3 (HLVM-3)



News: ISRO has begun assembling the **Human Rated Launch Vehicle Mark-3 (HLVM-3)** for the first uncrewed flight of Gaganyaan.

About Human Rated Launch Vehicle Mark-3 (HLVM-3)



Source- ISRO

- It is a *human-rated version of ISRO's LVM3*, developed for India's *Gaganyaan mission* to transport humans into space.
- **Aim:** To ensure safe human spaceflight by integrating advanced reliability and safety features.
- **Features:**
 - **Payload capacity**– It is a *three stage vehicle* with a payload capacity of about 10 tonnes to Low Earth Orbit (LEO).
 - **Height and weight**– It is 53 meters tall and *weighs 640 tonnes*.
 - **Crew Escape System (CES)**– It is a safety mechanism designed to protect astronauts in the event of an emergency during a space mission. It is activated in the early stages of flight, typically before the spacecraft reaches the point of atmospheric flight separation

About LVM-3 vehicle

- Launch Vehicle Mark-3 (LVM 3) is a *three-stage launch vehicle* consisting of two solid propellants S200 strap-ons on its sides and a core stage comprising the L110 liquid stage and C25 cryogenic stage.
- LVM3 rocket has a lift-off mass of *640 tonnes*.
- It can carry up to 8 tonnes of payloads to lower earth orbits(LEO).
- To the geostationary transfer orbits (GTO), it can carry a *payload of about 4 tonnes*.

Milkweed Fiber

News: The Ministry of Textiles is promoting research and development into innovative natural fibers, such as milkweed fiber.

About Milkweed Fiber

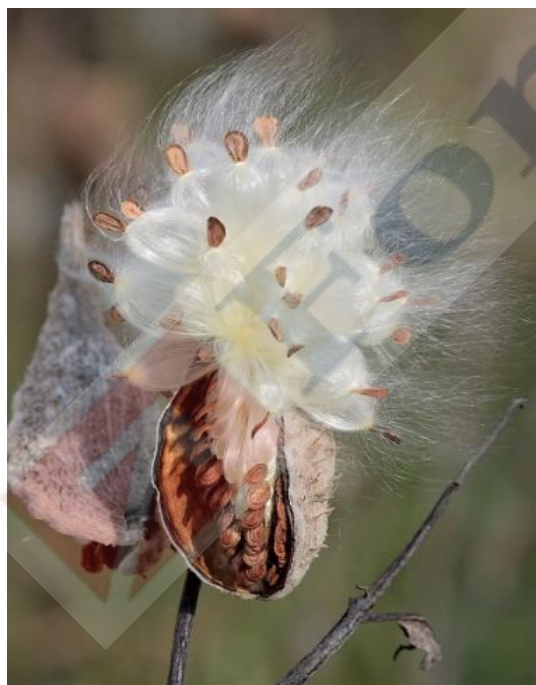


Figure 6.Source- Britannica

- It is a unique *natural fiber* extracted from the seed pods of milkweed plants (*Asclepias syriaca* L).
- The plant is native to North America. In India, it is *found as a wild plant in Rajasthan, Karnataka & Tamil Nadu*.
- **Properties:**
 - It contains *oily material and lignin*, a woody plant substance, which makes them too brittle for spinning.
 - It is *extremely lightweight and soft*.
 - It is biodegradable and a renewable resource.
 - It is an amphiphilic material, capable of displaying both *hydrophilic (water-absorbing) and hydrophobic (water-repelling or resisting) properties*.
- **Applications:**
 - It is used in such water-safety equipment as *life jackets and belts* etc.
 - Its fine fiber structure can trap particles, making it suitable for filtration applications.

Himalayan Birch Tree

News: A new study has found that climate change is altering the tree line landscape of the central Himalayas, leading to the replacement of Birch trees by Fir Trees.

About Himalayan Birch Tree



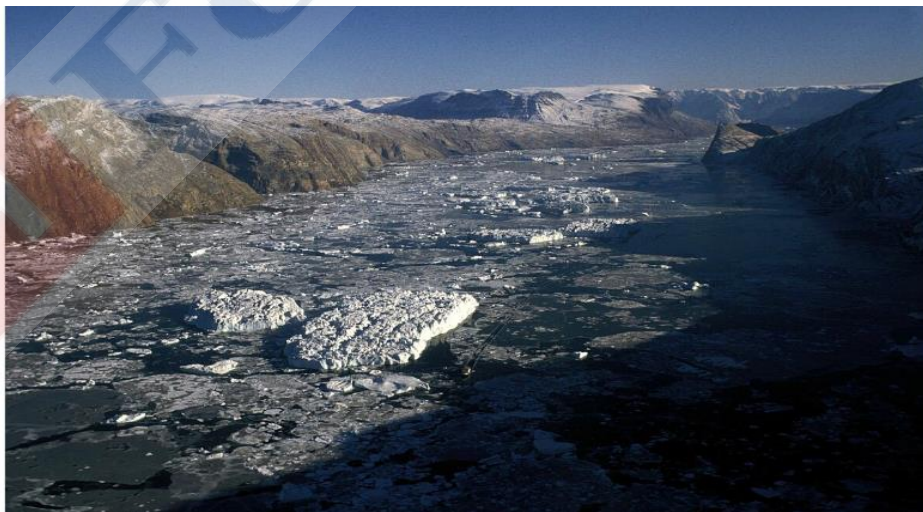
Figure 7. Source- Wikipedia

- It is a ***fast growing, medium sized, deciduous tree*** that dominates the Himalayan region.
- ***Distribution:*** It is widely distributed in the upper altitudes of North-West Himalayas.
- It grows well in moist or wet but well drained rocky or sandy soil conditions.
- **Key Features:**
 - Leaves are *oval shaped*.
 - Can be grown as a *standard or multi-trunked tree*.
 - Known for its *white, paper-like bark*, which was used as writing paper for manuscripts of Sanskrit literature.

Arctic Tundra: Transitioning to a Carbon Source

News: The Arctic Tundra has shifted from being a carbon sink to a carbon emitter, as confirmed by a recent analysis in the National Oceanic and Atmospheric Administration's (NOAA) Arctic Report Card.

About Arctic Tundra



Source- Realty+

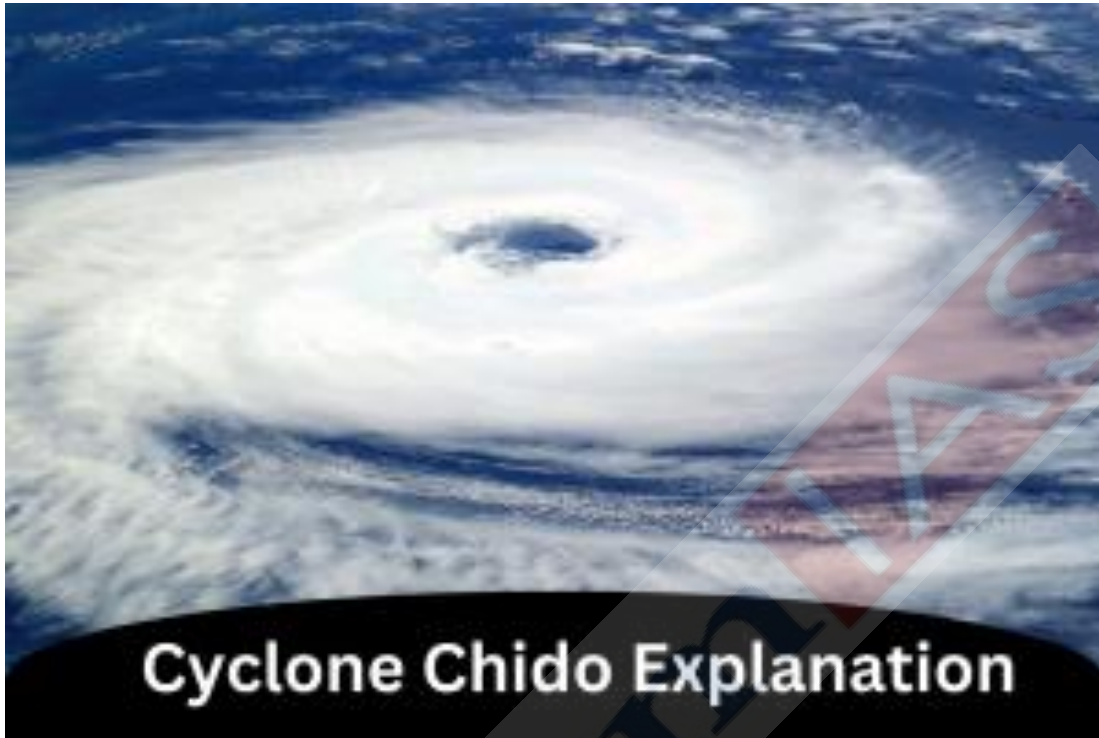
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- The Arctic Tundra is a unique biome located in the northernmost parts of Earth, primarily north of the Arctic Circle.
- It is characterized by *extreme cold, treeless landscapes, and a harsh climate.*
- **Characteristics of the Arctic Tundra:**
 - **Permafrost:** It refers to *permanently frozen soil beneath the surface*, starting within 1 meter of the ground. In summer, only the uppermost layer of permafrost thaws, while deeper layers remain frozen.
 - **Effect:** Limits plant root growth and prevents the growth of trees, resulting in a treeless landscape.
 - **Soil composition:** The tundra soil is *nutrient-poor and rocky*, due to slow decomposition caused by cold temperatures. Organic matter (like sphagnum moss) accumulates as peat and humus, forming a significant carbon sink.
 - **Climate:**
 - Temperatures *range from 15.5°C in summer to -60°C in winter*, with mean temperatures below 0°C for 6–10 months.
 - Low annual precipitation (150–250 mm) but minimal evaporation.
 - Features 24-hour sunlight in summer and 24-hour darkness in winter.
 - **Natural Vegetation:** Herbaceous plants like *grasses, mosses (e.g., reindeer moss), lichens, and liverworts* dominate.
 - **Animal Life:**
 - **Large mammals:** Polar bears, caribou, musk oxen, and Arctic foxes.
 - **Smaller animals:** Lemmings and Arctic hares, which change fur color with the seasons.
 - **Migratory birds,** like snow geese and loons, use the tundra for breeding during summer.

Reasons for Arctic Emitting Greenhouse Gases

- **Thawing Permafrost:**
 - Rising global temperatures are causing permafrost to thaw.
 - When the frozen soil thaws, microbes become active, breaking down the trapped organic matter, releasing carbon dioxide (CO₂) and methane (CH₄).
 - Methane is especially concerning because it is a more potent greenhouse gas than CO₂.
- **Wildfires:**
 - As temperatures rise, wildfires in Arctic regions are becoming more frequent.
 - Fires release large amounts of carbon stored in the vegetation and soil, further accelerating global warming.
- **Arctic Warming Trends:**
 - The Arctic is heating up four times faster than the global average, causing rapid changes in the biome.
 - Melting ice and warming soils are significant contributors to greenhouse gas emissions.

Cyclone Chido



News: Indian Prime Minister Narendra Modi expressed deep sorrow over the devastation caused by Cyclone Chido in Mayotte, France. **Cyclone Chido Explanation**

About Cyclone Chido

- Cyclone Chido was a powerful *tropical cyclone* that struck Mayotte, a French overseas territory in the Indian Ocean, in December 2024.
- With sustained wind speeds exceeding 200 km/h (124 mph) and gusts surpassing 225 km/h (140 mph), it was the strongest storm to hit Mayotte in at least 90 years.

About Mayotte:

- Mayotte is an *archipelago* located in the northern Mozambique Channel in the Indian Ocean, between Madagascar and the coast of Mozambique.
- As a French overseas department, it comprises two main islands: *Grande-Terre* (the main island) and *Petite-Terre* (a smaller island), along with several islets.
- Mayotte is known for its rich biodiversity, including one of the world's largest enclosed lagoons.

Cyclones

- Cyclones are a ***fast inward air movement around a low-pressure area***. In the ***Northern Hemisphere***, the ***air circulates anticlockwise***, while in the ***Southern Hemisphere***, it moves ***clockwise***.
- Cyclones are typically associated with intense storms and severe weather.
- There are two **types of cyclones**:
 - a. Tropical cyclones**—These form over warm ocean waters in tropical and subtropical regions. They are characterized by low pressure, high winds, and heavy rain.
 - b. Extra Tropical cyclones**— They are also known as wave cyclones, mid-latitude cyclones, or temperate cyclones. They develop in the mid and high latitudes, outside the tropics. They are less intense than tropical cyclones.

Source- Forum IAS

Cyclone Classification:

The Indian Meteorological Department (IMD) categorizes cyclones based on wind speeds

- **Depression**: Wind speeds of 31–49 km/h
- **Deep Depression**: 50–61 km/h
- **Cyclonic Storm**: 62–88 km/h
- **Severe Cyclonic Storm**: 89–117 km/h
- **Very Severe Cyclonic Storm**: 118–166 km/h
- **Extremely Severe Cyclonic Storm**: 167–221 km/h
- **Super Cyclonic Storm**: Above 222 km/h

Joint Parliamentary Committee

News: The bills on “One Nation, One Election” have been referred to a Joint Parliamentary Committee (JPC) for wider consultation.

About Joint Parliamentary Committee

- JPC is an ***ad-hoc committee*** formed by both Houses of Parliament for examining a specific subject or Bill in detail.
- JPC is formed after one House of Parliament has passed a motion and other house has agreed to it.
- The ***composition*** of JPC is not fixed and determined by the Parliament.

- It has members from both the Houses of Parliament, including both members of the ruling party and opposition.
- The recommendations of the committee are **advisory in nature** and not binding on the government.
- **Functions of JPC:**
 - Examines bills, policies, specific subject in detail.
 - Gathers evidence from experts, public bodies, associations, individuals or interested parties.
 - Scrutinises documents and summons people for questioning.

National Commission for Minority Educational Institutions



News: The Union Minister of Education addressed the 20th Foundation Day of the National Commission for Minority Educational Institutions (NCMEI). He emphasized the rights of minorities under the Constitution.

National Commission for Minority Educational Institutions.

About National Commission for Minority Educational Institutions



Figure 8. Source- Nagaland Tribune

- It was established by the National Commission for Minority Educational Institutions Act (NCMEI Act), 2004.
- **Mandate**– To safeguard and promote educational rights of religious and linguistic minorities as per *Article 30(1)* of the Constitution.
- **Nodal Ministry**– Ministry of Education
- **Powers and Functions:**
 - It is a *quasi-judicial body* endowed with the powers of a *Civil Court*.
 - It decides on questions regarding the status of an institution as a Minority Educational Institution (MEI).
 - It acts as an *appellate authority* for disputes related to *Minority Status* or No Objection Certificate (NOC).

- The Commission *can cancel the minority status of an institution* granted by an authority or commission based on the Act's provisions.
- It has powers to call for information while enquiring into the complaints of violation or deprivation of the educational rights of the minorities.
- As per Supreme court ruling the Commission has *both original as well as appellate jurisdiction*.
- No court (*except the Supreme Court and a High Court* exercising jurisdiction under articles 226 and 227 of the Constitution) shall entertain any suit, application or other proceedings in respect of any order made by the Commission.

Yuga Yugeen Bharat National Museum

News: The Ministry of Culture has partnered with France Museums Développement (FMD) to develop the Yuga Yugeen Bharat National Museum as part of the Central Vista Redevelopment Project.

About Yuga Yugeen Bharat National Museum



Figure 9.Source- PIB

- The museum was **first announced** by the Prime Minister at the International Museum Expo in May 2023.
- It will **redefine the cultural experience** by celebrating diversity, fostering inclusivity and bridging the past, present and future.
- It will **deepen India-France cultural cooperation** and involves collaboration on feasibility study, museum case studies, interpretive planning and building programming.
- The collaboration leverages France's expertise in museum management and design to breathe new life

into the historic North and South Blocks.

- It will be developed through **Adaptive Reuse**, highlighting India's commitment to sustainability.

M. S. Subbulakshmi

News: The Supreme Court, in a recent interim order, directed that Carnatic vocalist T.M. Krishna "should not be recognised" as a recipient of the Sangita Kalanidhi M.S. Subbulakshmi Award.

About M. S. Subbulakshmi



Source- The Print

- She was an *Indian Carnatic singer*.
- She was born on September 16, 1916, in Madurai, Tamil Nadu
- She was the *first musician to be awarded the Bharat Ratna*.
- In 1974, she became the *first Indian musician to receive the Ramon Magsaysay Award*.
- She was also the *first Indian to perform at the United Nations in 1966* on the occasion of UN Day.
- In 2005, the United Nations issued postage stamps to commemorate her birth centenary.
- She popularized numerous classical and devotional compositions, including *Venkatesa Suprabhatam* and *Bhajagovindam*.