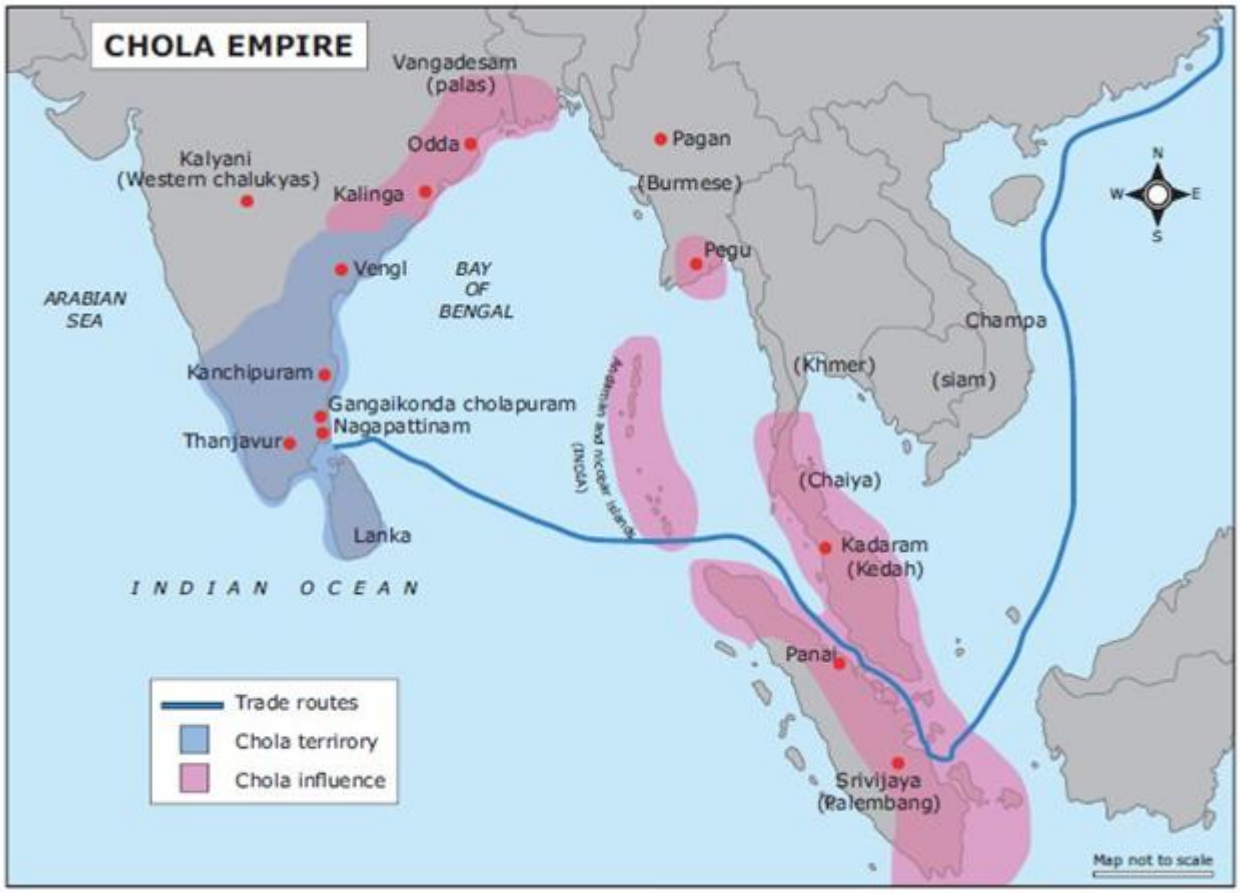
Today's Prelims Topics

Chola Gangam Lake

Context

Tamil Nadu CM M.K. Stalin announced the **development of the historic Chola Gangam lake, dug by Rajendra Chola I**, at a cost of ₹12 crore, along with tourism and irrigation projects to honour the king's birth anniversary.

Chola Gangam (Ponneri Tank)

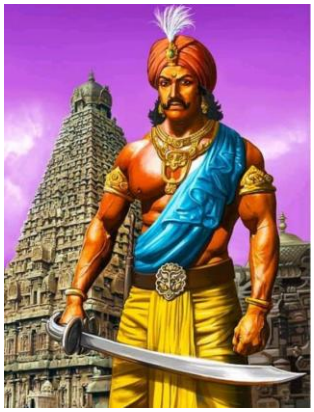


- **Chola Gangam, also called Ponneri**, was constructed by **Rajendra Chola I** to commemorate his victorious northern campaign.
- As per historian K.A. Nilakanta Sastri (citing the Tiruvalangadu Copper Plates), Rajendra built a "liquid pillar of victory" (Ganga-jalamayam Jayastambham) in the form of this tank at his capital.
- British official F.R. Hemingway noted that the tank once irrigated 1,564 acres and supplied drinking water to Gangaikonda Cholapuram.
- Historically, Kollidam River water filled a chain of tanks before reaching Veeranam Lake, with surplus flowing to rivers — showcasing a sophisticated hydrological network.
- **Advanced Engineering**:
    - Elliptical bunds made of laterite were used to resist water pressure.
    - A square structure at the lower end had a sediment trap linked to a silt ejector.
    - The "thoompu" outlet system created a vortex flow to suck silt and enrich paddy fields.
- Once a stopover for migratory birds en route to Kodiakkarai Bird Sanctuary, its degradation has disrupted bird migration and caused groundwater depletion in the region.

The Chola Dynasty (9th – 13th Century)

- Rose to power in the 9th century after defeating the Pallavas and ruled until the 13th century.
- Known for a centralized administration, military prowess, and cultural development.
- Renowned for grand temple architecture, including the **Brihadeeswarar Temple** built by Rajaraja I in 1010 CE.

Rajendra Chola I (1014 – 1044 CE)



- Son of Rajaraja I, known as **Rajendra Chola the Great**.
- Expanded Chola power to **Song China** and **Srivijaya (Indonesia)** through naval expeditions.
- Maintained trade and diplomatic ties with the **Khmer Empire**, **Arab world**, and **Africa**.
- Instrumental in projecting Chola political and cultural influence across South and Southeast Asia.

Source: TheHindu

Ambrosia beetle

Context

Rubber plantations in Kerala are facing a serious threat due to an alliance between the **ambrosia beetle** and a fungus.

About Ambrosia Beetle

- **Origin of Name**: Named after *ambrosia fungi* which live symbiotically with the beetle; the term 'ambrosia' is ecological, not taxonomic.
- **Native Region**: Indigenous to Central and South America.
- **First Sighting in India**: Detected in cashew trees in Ponda, Goa, in 2012.
- **Fungal Partnership**: Maintains a **mutualistic relationship** with two fungi — *Fusarium ambrosia* and *Fusarium solani*.

Impact on Rubber Trees

- **Target Trees**: Primarily attacks **dead or already infected trees**, but can also infest **stressed trees**.
- **Ethanol Attraction**: Stressed trees emit **ethanol**, attracting beetles.
- **Feeding Mechanism**:
    - Beetles **don't feed** on wood directly; they cultivate fungi inside the bark.
    - Bore **tunnels (galleries)** into the bark and introduce fungi.
    - Fungi break down the wood and provide **nutrient-rich mycelia**, which the beetles and larvae consume.
- **Wood Damage**: Fungal enzymes **weaken the wood**, aiding deeper penetration.
- **Structural Weakening**: The beetle-fungus complex causes:
    - Severe **leaf fall**
    - **Trunk drying**
    - In extreme cases, **tree death**
- **Latex Loss**: Infection reduces **latex yield**, leading to **economic and agricultural losses**.

Prevention Techniques

- Use of **antifungal agents**.
- **Pruning or removing** infected parts of the tree.
- **Burning or chipping** wood with visible boreholes.
- Setting up **traps** specifically to catch ambrosia beetles.

Source: TheHindu

Artemis Accord

Context

Senegal will sign the Artemis Accords at NASA Headquarters in Washington.

About Artemis Accords

- **Meaning & Origin**:
  - Named after **Artemis**, the Greek goddess of the Moon.
  - Launched on **October 13, 2020**, by **NASA** and the **U.S. Department of State**.
  - Aims to unite countries with a shared vision for **peaceful civil space exploration**.
- **Legal Foundation**:
  - Builds upon the principles of the **Outer Space Treaty of 1967**.
  - Acts as a **non-binding framework** for cooperation in space activities.
- **Signatory Countries**:
  - Initially signed by 8 countries including **Canada, Italy, Japan, Luxembourg, UAE, UK**.
  - As of **June 23**, a total of **26 countries** have signed.
  - Includes major powers (e.g., **USA, UK, Japan, France**) and emerging space nations (**Colombia, Nigeria, Rwanda, Mexico**).

Core Principles of the Artemis Accords

- **Peaceful use** of outer space.
- **Transparency** in activities and public sharing of scientific data.
- **Interoperability** of systems to improve safety and efficiency.
- **Emergency assistance** to astronauts in distress.
- **Preservation of outer space heritage sites** (e.g., landing sites).
- **Responsible use of space resources** within Outer Space Treaty limits.
- **Safe disposal** of orbital debris to ensure sustainability.

About the Artemis Programme

- Plans include:
  - A **permanent lunar base**.
  - **Spacecraft** to carry humans and cargo.
  - An **orbiting lunar space station** (Gateway).
  - A network of **navigation and communication satellites**.
- The **first crewed Artemis mission to the Moon** is expected by **2026**.
- NASA aims to land the **first woman** and the **first person of colour** on the lunar surface.

India's Participation & Benefits

- **ISRO's gains**:
  - Access to **cutting-edge technology** and **scientific collaborations**.
  - Enhanced **knowledge-sharing** and **technology transfer** through NASA partnerships.
- Upcoming cooperation includes:
  - A **joint mission to the ISS in 2024**.
  - Support for **India's Gaganyaan human spaceflight** programme.

- Positions India to play a **greater role in global space exploration**.

About Senegal

- **Location**: Located in **West Africa**, bordered by the Atlantic Ocean, Mauritania, Mali, Guinea, Guinea-Bissau, and surrounds The Gambia.
- **Capital**: **Dakar**, a key cultural, economic, and political hub in West Africa.
- **Government**: **Democratic republic** with a history of political stability and peaceful transitions of power.
- **Space Ambitions**:
    - Senegal is a **developing country in space science** but is showing **growing interest in space technology** for development.
    - Focuses on **using space applications** for **agriculture, disaster management, environmental monitoring**, and **education**.
- **Significance of Artemis Accord Signing**:
    - Marks Senegal's **first major international step** into space collaboration.
    - Aligns Senegal with global norms for **peaceful and cooperative space exploration**.
    - Strengthens Africa's representation in **global space governance**.
- **Symbolic Importance**:
    - Reflects NASA's goal to build a **diverse and inclusive space coalition**.
    - Encourages **space diplomacy and science capacity-building** in Africa.

Source: IndiaEducationDiary

Bio Stimulants

Context

The **Agriculture Ministry** has ordered states to **stop the forced sale of biostimulants** with subsidized fertilizers and tightened scrutiny over their safety, efficacy, and regulation under the FCO following farmer complaints.

About Biostimulants

- **Definition**: Substances or microorganisms applied to plants or soil to **stimulate natural biological processes** and boost plant performance.
- **Primary Function**:
  - Enhance the plant's own **physiological functions**.
  - **Reduce reliance on chemical fertilizers** while improving plant growth and resilience.
- **Key Benefits**:
  - Improve **root development**, **nutrient use efficiency**, and **stress tolerance** (e.g., drought, salinity, heat).
  - Boost **soil microbial activity** and overall plant **health and productivity**.
  - Increase **resistance to abiotic stresses** like extreme temperatures and water scarcity.
  - Enhance **plant quality traits** irrespective of their direct nutrient content.
- **Common Types**:
  - **Humic and fulvic acids**
  - **Seaweed extracts**
  - **Beneficial fungi and bacteria** (e.g., mycorrhizae, rhizobacteria)
- **Regulatory Framework in India**: Biostimulants are regulated under the **Fertiliser (Control) Order, 1985 (FCO)**.

Advantages of Biostimulants

- Improve plant **tolerance to abiotic stress** (drought, heat, frost, salinity).
- Enhance **nutrient uptake and utilization** from soil and applied sources.
- Promote **soil health** by boosting beneficial soil microorganisms.
- Increase **crop quality** through improved plant vigor and health.
- Help in achieving **higher harvestable yields** with reduced chemical input.

Source: IndianExpress

Article 174 (1)

Context

The Manipur Congress has sought clarification from the Governor on the constitutional status of the State Assembly, which hasn't convened since August 2024, raising concerns about a possible **violation of Article 174(1) of the Constitution.**

About the Issue

- **Background**: President's Rule was imposed in **Manipur on February 13, 2025**, after CM **N. Biren Singh resigned on February 9** amid ethnic violence.
- **Congress Concern**: The **Manipur Congress** asked Governor **Ajay Kumar Bhalla** whether the **60-member Legislative Assembly** is still "alive" or "constitutionally dead," as it hasn't met since **August 2024**.
- **Constitutional Point Raised**: Article **174(1)** of the Constitution states that **no more than six months** should pass between two sittings of a Legislative Assembly.
    - Since the last sitting was on **August 12, 2024**, the next should have been held **by February 11, 2025**.
- **Governor's Action**: The Governor had **summoned the Assembly for February 11**, but later declared it **null and void** due to the CM's resignation.
- **Congress Stand**: Argued that the Assembly **was not dissolved or suspended** at the time of the resignation, so **Article 174(1) remains applicable**.

Article 174(1) – Sessions of the State Legislature

"The Governor shall from time to time summon the House or each House of the Legislature of the State to meet at such time and place as he thinks fit, but six months shall not intervene between its last sitting in one session and the date appointed for its first sitting in the next session."

Key Points

- **Power to Summon State Legislature:**
    - The **Governor** has the constitutional authority to **summon** (call), **prorogue** (suspend without dissolving), or **dissolve** the **State Legislative Assembly**.
- **Governor Acts on Aid & Advice:**
    - Though the article says "as he thinks fit," in practice, the Governor **must act on the advice of the Council of Ministers** headed by the Chief Minister (as per Article 163 and SC judgments like *Shamsher Singh vs State of Punjab*).
- **Mandatory Time Gap:**
    - There must not be a gap of more than **6 months** between two sessions of the State Legislature (as per **Article 174(2)(a)**).
- **Applicable to Unicameral and Bicameral States:**
    - Applies to **both Houses** in bicameral states (Legislative Assembly + Legislative Council) and to the **only House** in unicameral states.

Judicial Interpretation

- In **State of Rajasthan v. Union of India (1977)**, the SC clarified that **Governor is bound by ministerial advice** in routine matters like summoning the House.
- **Governor cannot act independently** unless under special constitutional provisions like **Article 356 (President's Rule).**

Source: TheHindu

Legal Status of Polyandry & Polygamy in India

Context

A woman from Himachal Pradesh who belongs to Hatti tribe married two brothers. This form of polyandry is locally known as **'Jodidaran'.**

Jodidaran in Hatti Tribe

- It is a traditional practice among the **Hatti tribe**.
- The primary motivation behind this custom is to **prevent the division of ancestral agricultural land** and maintain joint family holdings.
- Supporters argue that the practice helps in **strengthening brotherly bonds** and offers **greater economic and emotional security** to women in the household.

Related Fact

- The **Hatti tribe** was officially recognised as a **Scheduled Tribe (ST)** by the central government in **2022**.

Legal Status of Polyandry and Polygamy in India

- **Polyandry** (a woman marrying multiple men) is **not legally recognized** and **not protected** under any Indian law.
- **Polygamy** (a man marrying multiple women) is:
    - **Prohibited** for Hindus, Sikhs, Buddhists, and Jains under the **Hindu Marriage Act, 1955**.
    - **Outlawed** under the **Special Marriage Act, 1954**, which governs civil marriages across all communities.
    - **Criminalised** under the **Bharatiya Nyaya Sanhita (BNS), 2023**, which replaced the IPC.
- **Customary Laws and Scheduled Tribes (STs):** Article **342** of the Constitution empowers the President to declare certain communities as Scheduled Tribes (STs), which entitles them to special legal protections.
    - **Section 2(2) of the Hindu Marriage Act** explicitly states that it **does not apply to members of STs** unless the Central Government directs otherwise through a notification.
    - Thus, **uncodified customary practices**, like *polyandry among the Hatti tribe*, may continue **in the absence of a conflicting government notification**.
- **Conditions for Validity of Customary Practices:** As per **Section 3(a)** of the Hindu Marriage Act, a "custom" must:
    - Be **long-standing** and **unbroken in usage**;
    - Be **certain**, **reasonable**, and **not opposed to public policy**;
    - Be **proven in court** with credible evidence if challenged.
- **Uniform Civil Code (UCC) and Customary Exemptions**
    - **Uttarakhand's UCC (2024–2025)** prohibits polygamy and mandates equal rights in marriage, divorce, and adoption.
    - However, **STs are exempt** under **Section 2 of the UCC Rules**, continuing the constitutional tradition of respecting tribal customs.

Judicial Stance on Customary Practices vs Fundamental Rights

- Courts have increasingly prioritized **Fundamental Rights** over **regressive customs**, especially when customs are arbitrary, discriminatory, inconsistent with **Articles 14, 15, and 21** of the Constitution

Relevant Supreme Court Judgments:

- **Shayara Bano v. Union of India (2017)**
    - **Triple talaq** was struck down as unconstitutional despite being a custom under Muslim Personal Law.

    - The court ruled it violated **Articles 14 & 21** (Right to equality and dignity).
- **Indian Young Lawyers Association v. State of Kerala (Sabarimala Case, 2018)**
    - **Exclusion of menstruating women** from Sabarimala Temple was held unconstitutional.
    - The court held that **customs cannot override equality and dignity**.
- **Ram Charan & Ors. vs Sukhram & Ors. (2024)**
    - Related to **inheritance rights of tribal women**.
    - The SC ruled that even if customs are silent or male-preferential, **women cannot be denied their rights**.
    - Reaffirmed: **"Customs cannot remain stuck in time"**.

Source: Indian Express

Editorial Summary

Tracking India's climate goals

Context

Recently the Minister for New and Renewable Energy has said that India has achieved 50% of its installed electricity capacity from non-fossil fuel sources — 5 years ahead of the target set under its Nationally Determined Contributions [NDCs] to the Paris Agreement.

India's Target under the Paris Agreement (NDCs)

As part of its **Nationally Determined Contributions (NDCs)** under the **2015 Paris Agreement**, India committed to three major climate and clean energy goals for **2030**:

- **Non-fossil fuel-based installed electricity capacity**:
  - **Target**: Achieve **50% of total installed electricity capacity** from non-fossil fuel sources by 2030.
- **Emissions Intensity**:
  - **Target**: Reduce **emissions intensity of GDP** (emissions per unit of GDP) by **45%** from 2005 levels by 2030.
- **Carbon Sink**:
  - **Target**: Create an **additional carbon sink of 2.5–3 billion tonnes** of CO_2 equivalent through **forest and tree cover**.

Achievements

- **Installed Capacity from Non-Fossil Sources**
  - **Achieved in 2025 (5 years ahead)**: 50.1% of India's **installed capacity (484.82 GW)** is now from **non-fossil sources** (242.78 GW), including **solar, wind, nuclear, and large hydropower**.
- **Carbon Sink Target**
  - **Likely already achieved**:
    - As of **2021**, India had added **2.29 billion tonnes** of carbon sink.
    - Based on annual trends (~150 million tonnes/year), India likely crossed **2.5 billion tonnes** by **2023**.
- **Emissions Intensity Reduction**
  - **Status (as of 2020)**: Already achieved a **36% reduction** from 2005 levels.
  - Though updated data is pending, the current trajectory suggests India will **comfortably achieve the 45% target by 2030**.
- **Additional Progress** (non-binding but significant):
  - India aims to install **500 GW of non-fossil capacity by 2030**.
  - In **2024 alone**, India added **30 GW** of renewables, with **24 GW** from solar — the highest annual addition so far.

Persisting Challenges and Gaps

- **Low Share in Actual Electricity Generation:** While **50% of installed capacity** is from non-fossil sources, they contributed **only 28%** of actual electricity generation in May 2025.

    - This gap is due to the **intermittent nature of renewables** (e.g., solar and wind depending on time, season, weather).
- **Small Contribution to Total Energy Use:** Electricity accounts for **only ~22%** of India's **total energy consumption**.
    - Non-fossil sources make up just **~6%** of overall energy consumption.
- **Heavy Dependence on Fossil Fuels in Industry and Transport:** Sectors like steel, cement, and transport are still highly **coal, diesel, and petrol dependent**.
    - Electrification and clean fuel transition in these sectors remain slow.
- **Nuclear and Hydro Bottlenecks: Nuclear energy**, though essential, contributes very little (less than 2% currently).
    - **10 nuclear reactors** are under construction but may not meet the required scale by 2030.
    - **Hydropower** faces land, ecological, and social resistance.
- **Storage and Grid Integration Issues:** Lack of adequate **battery storage and smart grids** limits the scalability of renewable power.
    - Renewable energy often wasted due to **grid balancing issues** and lack of infrastructure.

What India Can Do to Resolve These Issues

- **Invest in Grid Modernisation and Battery Storage:** Build **smart, flexible power grids** and **scale up battery storage** for renewable integration.
    - Introduce **time-of-day tariffs** and **demand response mechanisms** to manage load.
- **Scale Up Green Hydrogen and Industrial Decarbonisation:** Promote **green hydrogen** to decarbonise hard-to-abate sectors like **fertilizer, steel, and cement**.
    - Provide incentives for **industrial electrification** and **clean fuel switching**.
- **Accelerate Transport Electrification:** Expand the **EV ecosystem**, including **charging infrastructure** and **battery manufacturing**.
    - Promote **public transport electrification** and **biofuels** for aviation and long-haul transport.
- **Expand and Incentivize Carbon Sinks:** Involve **local communities and tribals** through **Joint Forest Management** (JFM) programs.
- **Strengthen Data and Monitoring:** Set up an **independent climate data platform** linked to policy planning.
- **Leverage International Climate Finance and Technology:** Push for **fair share of climate finance and green tech transfer** from developed countries.
    - Actively engage in platforms like **International Solar Alliance**, **G20**, and **COP** to advocate for support.

Source: Indian Express

Redeeming India's nuclear power promise

Context

- The Union Budget 2025–26 set an ambitious target of **100 GW nuclear power capacity by 2047**, up from the current **8.18 GW**.
    - This aligns with India's twin goals of becoming a **developed nation (Viksit Bharat) by 2047** and achieving **net zero emissions by 2070**.

More in News

- **5 Indigenously Designed Small Modular Reactors (SMRs) by 2033**
    - ₹20,000 crore allocated under the **Nuclear Energy Mission**.
    - Aimed at replacing captive coal-based thermal power plants.

Key Achievements in Nuclear Energy

- **Historical Development:** Asia's first research reactor **Apsara** (1956), and power reactors at **Tarapur** (1963).
    - Indigenous design of **220 MW Pressurised Heavy Water Reactor (PHWR)** scaled to **540 MW** and then **700 MW** (e.g., Kakrapar units operational in 2024).
- **International Breakthrough:** Post-1998 nuclear tests, India gained a **waiver from Nuclear Suppliers Group (NSG)** and resumed international cooperation.
- **Current Operational Reactors: Kudankulam** project in partnership with Russia (6 VVER-1000 reactors) is the **only active international collaboration**.
- **Revival of Joint Ventures (JVs)**
    - **NPCIL–NTPC JV** for 4x700 MW reactors at **Mahi Banswara,** Rajasthan revived in 2024.
    - New JV being planned with **Rural Electrification Corporation (REC)**.

Major Challenges Facing India's Nuclear Sector

- **Legislative and Regulatory Hurdles: Atomic Energy Act, 1962** restricts private/foreign participation.
    - **CLNDA, 2010** imposes supplier liability, discouraging international reactor suppliers.
    - **Tariff disputes** and lack of clear regulatory jurisdiction (CERC vs NPCIL).
    - **Safety regulation** is currently under a **non-statutory AERB**, lacking legal autonomy.
- **Financial and Market Challenges:** High **capital cost** ($2 million/MW for nuclear vs <$1 million/MW for coal).
    - Lack of **green financing eligibility** and **renewable energy classification**.
    - Inadequate provision of **Viability Gap Funding (VGF)** and long-term **PPAs**.
- **Technological & Infrastructural Delays: Slow progress in reactor construction**, especially with international partners (U.S. and France).
    - Limited **indigenous supply chain** capacity.

  - Long **construction timelines** (7–10 years for a new unit).
- **Limited Private and Foreign Participation:** Private sector (e.g., Tata, Adani, Reliance) cannot enter due to legislative restrictions.
  - FDI in nuclear energy remains closed.

Solutions and Recommendations

- **Legislative Reforms:**
  - Amend the **Atomic Energy Act, 1962** to:
    - Allow **private sector participation**.
    - Enable **foreign partnerships** under regulated frameworks.
  - Revise the **CLNDA, 2010** to limit supplier liability and improve confidence among foreign vendors.
- **Institutional Reforms:** Create an **independent statutory nuclear regulator** by reviving the 2011 draft Bill.
  - Clarify the **tariff jurisdiction** between NPCIL, CERC, and the Supreme Court.
- **Financial Incentives:** Reclassify **nuclear as a "renewable/green energy"** for tax breaks and green bonds.
  - Offer **Viability Gap Funding (VGF)** for large nuclear projects.
  - Facilitate **long-term power purchase agreements** (PPAs).
  - Permit **up to 49% FDI** with Indian ownership/control.
- **Strategic Focus Areas:** Standardise **PHWR designs** and build **Bharat SMRs** to replace old coal plants.
  - Expand **NPCIL's 700 MW PHWR program** with fast-track land and license approvals.
  - Accelerate stalled negotiations with **France (Jaitapur)** and **U.S. (Westinghouse)**.

Source: The Hindu