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AIR 593
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UPSC PRELIMS SPECIFIC

1.India's Rising Supercomputing Ecosystem

Source: The Hindu

National Supercomputing Mission

- The National Supercomputing Mission (NSM) was launched in 2015 with an outlay of ₹4,500 crore to build indigenous high-performance computing (HPC) capabilities.
- It is jointly steered by the Department of Science and Technology (DST) and Ministry of Electronics and Information Technology (MeitY), with C-DAC and IISc as implementing institutions.
- As of September 2026, India has deployed 40 supercomputers with a combined capacity of 68 PetaFLOPS (PF).
- The mission aims to establish 50 supercomputers with cumulative computing capacity exceeding 123 PF across research and academic institutions.

Indigenous HPC Capabilities

- NSM seeks to reduce dependence on imported supercomputing technologies and develop an indigenous HPC ecosystem.
- Major developments include the Rudra series servers, PARAM Rudra supercomputers and an indigenous HPC software stack.
- Indigenous capabilities also include high-speed interconnects, cooling technologies and PARAM Shavak, a compact "supercomputing-in-a-box" system designed for educational and research applications.
- The mission supports the broader objectives of Aatmanirbhar Bharat and Viksit Bharat 2047.

Applications of Supercomputing

- HPC enables computationally intensive research in weather forecasting, climate modelling, computational biology, drug discovery and disaster management.
- National applications include genomics and drug discovery, the Urban Environment Decision Support System and early-warning systems for flood prediction.
- Supercomputing can improve the accuracy and speed of scientific simulations and support evidence-based planning in areas with major societal and economic impacts.

Human Resource and Digital Infrastructure

- NSM supports skill development through workshops, hackathons, faculty training and the HPC Shiksha Portal.

- The National Knowledge Network (NKN) facilitates high-speed connectivity among research and educational institutions, enabling access to advanced computing resources.
- Development of indigenous hardware, software and skilled manpower is important for creating a sustainable domestic HPC ecosystem rather than merely acquiring supercomputers.

Significance for India

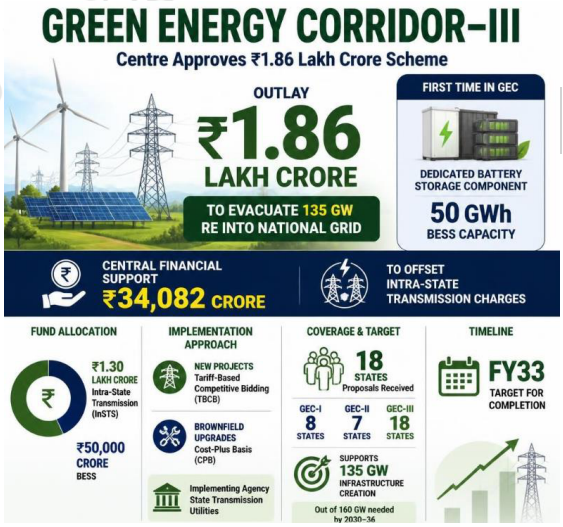
- Supercomputing strengthens India's scientific research, technological self-reliance and strategic computing capabilities.
- It can support advances in artificial intelligence, climate science, healthcare, disaster management and advanced engineering.
- By combining indigenous hardware, software, research infrastructure and skilled manpower, NSM seeks to create a complete domestic high-performance computing ecosystem.
- Its applications across development sectors also contribute to multiple UN Sustainable Development Goals (SDGs).

2.Green Energy Corridor III: Tackling India's Renewable Power Bottleneck

Source: IE

Green Energy Corridor III

- The Centre approved the third phase of the Green Energy Corridor (GEC-III) on September 30 with an outlay of ₹1.86 lakh crore.
- GEC-III aims to facilitate the evacuation of up to 135 GW of renewable energy into the national grid by FY33.
- For the first time, the scheme includes 50 GWh of Battery Energy Storage Systems (BESS).
- GEC is a flagship programme for developing dedicated transmission infrastructure to integrate large-scale renewable energy into the national grid.



Transmission Bottlenecks and Renewable Energy Curtailment

- Rapid expansion of solar and wind capacity has increased pressure on

transmission networks, creating grid congestion and evacuation constraints.

- When transmission capacity is insufficient, renewable electricity may have to be curtailed, meaning generation is reduced despite available renewable resources.
- Around 6,900 GWh of clean electricity reportedly faced restrictions due to a mismatch between renewable-energy deployment and transmission infrastructure.
- GEC-III is expected to support 135 GW of state-level transmission infrastructure out of an estimated 160 GW requirement during 2030–36.

Financing and Implementation

- More than ₹1.30 lakh crore is earmarked for Intra-State Transmission Systems (InSTS), while ₹50,000 crore is allocated for BESS.
- Central Financial Support of ₹34,082 crore will help offset intra-state transmission charges.
- Greenfield transmission projects will be developed through Tariff-Based Competitive Bidding (TBCB), encouraging private-sector participation.
- Brownfield upgrades and network-strengthening projects will be undertaken on a Cost-Plus Basis (CPB).
- State transmission utilities will serve as implementing agencies, with a Cabinet Secretary-level steering committee monitoring GEC-II and GEC-III twice a year.

Battery Energy Storage Systems

- BESS can store surplus renewable electricity during periods of high generation and release it when demand rises or renewable generation falls.
- Its inclusion in GEC-III addresses the growing need for grid flexibility as the share of intermittent solar and wind power increases.
- Storage can reduce renewable-energy curtailment and improve the reliability of renewable power integration.

Expansion and Significance

- GEC-III will expand the geographical coverage of the programme, with proposals received from at least 18 states, compared with 8 states under GEC-I and 7 under GEC-II.
- The programme can support greater decentralisation of renewable-energy capacity by strengthening transmission networks across more states.
- GEC-III highlights that India's renewable-energy transition depends not only on generating clean power but also on efficiently transmitting and storing it.

- Timely implementation of transmission and storage infrastructure will be crucial for converting India's growing renewable-energy capacity into reliable grid electricity.

3..Ramappa Temple: Kakatiya Heritage and Conservation Concerns

Source: The Hindu

Historical Background

- Ramappa Temple, also known as the Rudreswara Temple, is located in Telangana.
- It was constructed in 1213 AD during the reign of Kakatiya ruler Ganapati Deva by his general Recharla Rudra.
- The presiding deity is Ramalingeswara Swamy.
- The temple is named after its chief sculptor, Ramappa, making it notable as a temple named after its architect.
- In 2021, it was inscribed on the UNESCO World Heritage List as "Kakatiya Rudreshwara (Ramappa) Temple, Telangana".

Architectural Features

- The temple is built on a 6-foot-high star-shaped platform.
- Its walls, pillars, beams and ceilings contain intricate carvings made mainly from granite and dolerite.
- It has a distinctive pyramidal Vimana consisting of horizontally stepped tiers.
- The sculptures reflect the artistic and architectural achievements of the Kakatiya period.

Sandbox Technique and Earthquake Resistance

- The temple used the traditional sandbox technique in its foundation.
- The foundation pit was filled with a mixture containing sand, lime, jaggery and black myrobalan fruit, creating a cushioning effect.
- Lightweight porous bricks were used in the gopuram; these were made using clay mixed with materials such as acacia wood, chaff and myrobalan fruit.
- The lightweight construction and flexible foundation are considered important features contributing to the temple's resilience against seismic disturbances.

Mining Threat and Conservation

- The Kakatiya Heritage Trust has raised concerns over a proposed open-cast mining project by Singareni near the heritage site.
- The concern relates to potential impacts on the Ramappa Temple and the associated Ramappa Lake.
- Mining-related activities can potentially affect heritage structures through vibrations,

changes in groundwater conditions, dust and alteration of the surrounding landscape.

- Conservation of the site therefore requires balancing mineral-resource development with protection of its cultural, architectural and environmental heritage.

4.Visa and Right of Entry into India

Source: IE

Delhi High Court Ruling

- The Delhi High Court held that possession of a valid visa does not give a foreign national an inherent or legally enforceable right to enter India.
- The ruling came in a case involving a Turkmenistan citizen who was stopped at Indira Gandhi International Airport despite holding a valid business visa.
- Her husband, travelling with her and holding a visa of the same category, was permitted entry.
- The Court held that visa issuance and permission to enter India are distinct processes.

State's Power Over Entry of Foreigners

- Grant of a visa is subject to eligibility requirements, whereas admission into India remains subject to immigration clearance and applicable laws.
- Authorities can refuse entry based on considerations such as national security, public order, foreign relations and other statutory grounds.
- In the present case, the government cited "adverse inputs" concerning the petitioner and stated that the decision was taken in the interests of national security and public order.
- Immigration officers can examine travel documents and seek necessary information at the point of entry.

Immigration and Foreigners Act, 2025

- Section 3 requires a foreigner seeking entry into India to possess a valid passport or travel document and a valid visa.
- However, a foreigner may still be denied entry or stay on grounds including threats to national security, sovereignty and integrity, relations with foreign states and public health.
- Section 7 empowers the Central Government to regulate, restrict or prohibit the entry, departure or continued presence of foreigners.
- Thus, possession of a visa is a necessary condition for entry in applicable cases but does not

create an absolute right of admission.

Article 14 and 21: Foreign Nationals

- The petitioner argued that denial of entry despite her husband being admitted violated Articles 14 and 21.
- The Court rejected the Article 14 claim, observing that the two individuals were not necessarily similarly situated because the adverse inputs specifically concerned the petitioner.
- Article 21 protects life and personal liberty, including in relation to foreign nationals, but it does not confer a general right to enter India.
- The right to reside and settle in India under Article 19(1)(e) is available only to Indian citizens.

Supreme Court Precedents

- In Hans Muller of Nurenburg v. Superintendent, Presidency Jail (1955), the Supreme Court recognised broad governmental powers regarding the entry and expulsion of foreigners.
- In Louis De Raedt v. Union of India (1991), the Supreme Court held that foreigners are entitled to protection under Article 21 but cannot claim the Article 19(1)(e) right to reside and settle in India.
- The ruling therefore reinforces the distinction between a visa as authorisation to seek entry and immigration clearance as the final decision regarding admission into India.