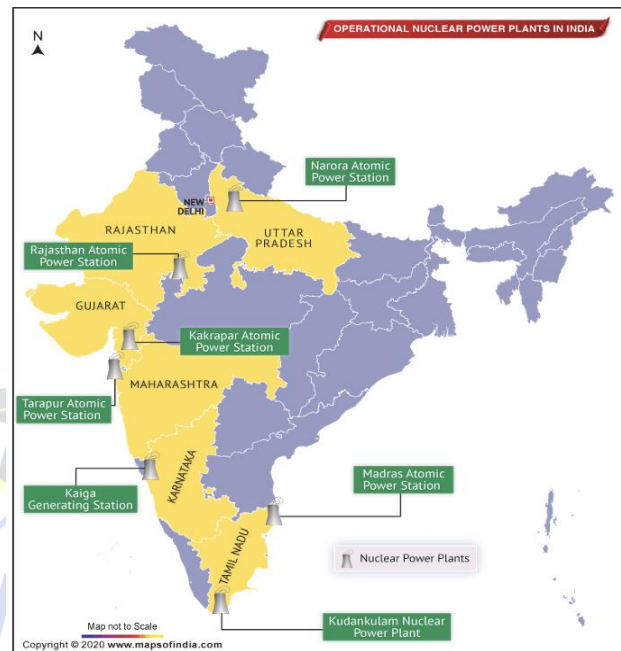# Today's Prelims Topics

Russia ships reactor vessel to Kudankulam

Context

The VVER 1,000-MWe reactor vessel for the sixth unit of the Kudankulam Nuclear Power Project was shipped by Russia recently.

About Kudankulam Nuclear Power Plant (KKNPP)

- KKNPP is the **largest nuclear power station in India,** situated in Kudankulam in the **Tirunelveli district of Tamil Nadu.**
- **Type:** Pressurized Water Reactor (PWR) **using Russian VVER technology.**
    - VVER (water-water energy reactor) technology is used in nuclear power plants designed by the **Russian state nuclear corporation, ROSATOM.**
    - VVER reactors are a type of pressurized water reactor (PWR) that use **light water as both a coolant and moderator.**
- **Technology:** Developed in collaboration between India's NPCIL (Nuclear Power Corporation of India Ltd.) and Russia's Atomstroyexport.
- **Operational Units: Unit 1& 2** (Capacity - 2000 MW)
- **Under Construction:** Unit 3, 4, 5 & 6 (1000 MW each)

Facts

- India's current **installed nuclear power capacity - 8,180 MW** (24 nuclear power reactors).
- 21 New Nuclear Reactors with **15,300 MW Capacity Under construction.**
- **Target:** 1 Lakh MW Nuclear Capacity by **2047 for Net Zero Transition.**
- **India's oldest nuclear power plant -** Tarapur Atomic Power Station (TAPS), Maharashtra.
- The **Department of Atomic Energy (DAE)** responsible for nuclear technology and research in India is under the **Prime Minister's Office.**

Source:

- **The Hindu - Russia ships reactor vessel to Kudankulam sixth unit**

What led to the Azerbaijan Airlines jet crash?

Context

Recently an Airline crash in Azerbaijan claimed the lives of 38 people. There are conflicting reports on the cause about technical failures, bad weather, and alleged missile strike.

Contributing factors of the Crash

- **GPS Jamming:**
  - GPS jamming occurs when a signal is intentionally or unintentionally disrupted, preventing navigation systems from receiving satellite data.
  - **Impact**: Pilots lose access to accurate positioning, timing and navigation information critical for safe flight operations.
  - **Sources**:
    - **Military**: Deliberate jamming as a defense measure in conflict zones.
    - **Civilian**: Accidental interference from devices like signal blockers or electronic equipment.
- **GPS Spoofing:**
  - GPS spoofing involves broadcasting false satellite signals to deceive navigation systems into reporting incorrect positions.
  - **Impact**: Pilots may inadvertently stray into restricted airspace, leading to potential accidents or misunderstandings. **E.g.**
    - **Military Use**: Confuse enemy navigation systems.
    - **Cyber Threats**: Used by hackers or rogue actors to manipulate data.
- **Examples of Affected Regions from GPS Jamming & Spoofing:**
  - **Black Sea**: Persistent GPS jamming due to military activities.
  - **Eastern Mediterranean and Middle East**: Spoofing incidents in regions like Syria and Iraq.
  - **Ukraine and Russia:** High-risk areas due to ongoing conflict and electronic warfare

Rules Regarding Aviation Safety in Conflict Zones

- **International Civil Aviation Organization (ICAO) Guidelines:**
  - States must provide up-to-date advisories on airspace safety.
  - Airlines should evaluate potential threats, such as missile launches or electronic interference.
- **Chicago Convention (1944)**:
  - **Article 3 bis**: Prohibits states from using weapons against civilian aircraft in flight.
  - States are responsible for ensuring airspace safety in their territories.
- **Risk Mitigation Initiatives**:
  - **Safer Skies Initiative (Canada)**: Focused on enhancing aviation safety over conflict zones.
  - **IATA Tactical Operations Portal:** Provides real-time alerts on airspace safety.

Source:
- **The Hindu - Azerbaijan Airlines jet crash**

Anti-tank guided missile Nag Mk-2 tested successfully

Context

The Defence Research and Development Organisation (DRDO) has successfully completed field evaluation trials of the Nag Mark 2.

About Nag Mark 2 Missile

- Nag Mark 2 is an **indigenously developed 3rd generation fire and forget** anti-tank guided missile.
- **3rd Generation Fire-and-Forget Technology**:
  - Allows operators to lock onto targets before launch.
  - Ensures precision strikes with minimal post-launch intervention.
- It has capability to neutralise **Modern Armoured Threats**. It effectively counteracts vehicles equipped with **Explosive Reactive Armour (ERA)**.

Source:
- **The Hindu - Nag Mk-2 tested successfully**

Konkan Region's Sada Ecosystem

Context

Sada ecosystems of the Konkan region which are invaluable due to their rich biodiversity, cultural significance, and ecosystem are facing threats from urbanization, mining and mismanagement,

About Sada Ecosystem

- The **Konkan region** lies between the **Arabian Sea** and the **Western Ghats** and is renowned for its **beaches and temples**.
- Moving towards the **Ratnagiri district**, the terrain transitions from steep mountain ranges to rolling hills with flat tops known as **sada** (large flat areas), shaped by centuries of **erosion.**
- **Biodiversity:**
  - Sada ecosystems, like the **pathar**, are rocky and support unique endemic flora, particularly during the monsoons.
  - A study (2022–2024) conducted in southern Ratnagiri documented:
    - **459 plant species**, of which **105 are endemic** to the Konkan region.
    - **31 species of reptiles**, **13 species of amphibians**, **169 species of birds**, and **41 species of mammals**.
  - **Fauna:** Indian flapshell turtles, Leopards, barking deer and migratory birds.
- **Archaeological Significance:** The area hosts 10,000-year-old geoglyphs, ancient works of art carved into the land.
- **Threats to the Ecosystem:**
  - **Changing Land-Use Patterns**: Open land and croplands are being converted to **orchards** and **residential areas**. **Developmental projects** are on the rise.
  - **Mining Activities**: **Laterite stone mining** poses a significant threat to the sada's integrity.
  - **Misclassification as Wasteland**: The **Wasteland Atlas** classifies sada as a "wasteland," further undermining its ecological and cultural importance.

Source:

- **The Hindu - A Konkan secret**

Genome India Project

Context
The Genome India Project has successfully completed its Phase-1.

About Genome India Project
- It was launched by the Department of Biotechnology (DBT) **in 2020** that aims to **sequence the genomes of over 10,000 Indians** from **diverse** socio-economic, geographical and linguistic backgrounds to create a comprehensive **genomic database of the Indian population.**
- The project involves about **20 institutions across India** and with analysis and coordination done by the **Centre for Brain Research at IISc, Bangalore.**
- **Phase 1**: Sequenced **10,000 genomes** from **99 ethnic populations**.
- **Future Goal**: Expand to sequence up to **1 million genomes**.
- **Genome India Database:**
  - Housed at the **Indian Biological Data Centre (IBDC)** in Faridabad, Haryana.
  - Open to global researchers adhering to data-sharing and privacy policies.
- **Privacy Measures:** Data is anonymized with numeric codes, and access requires proposals vetted by an independent panel.

What is Genome Sequencing?
- It is a laboratory technique that determines the order of the chemical building blocks of an organism's DNA or RNA.
- Major genome sequencing methods are the **clone-by-clone method** and the **whole genome shotgun sequencing.**
- It involves reading the order of nucleotide bases **(adenine, guanine, cytosine, and thymine)** that make up the DNA molecules in an organism's genome.
- **Genome v/s Gene**: Genome is the entire set of genetic material or DNA, while gene is a **specific segment of DNA** that codes for a **particular protein or RNA molecule**

Why is a Genetic Database Important?
- **Understanding Genetic Diseases:** It helps identify genetic risk factors and develop targeted therapies and diagnostic tests. **E.g.** Gene-modifying therapies to treat diseases.
- **Discovery of New Variants**: Project Identified **135 million genetic variations** in 10,000 genomes. **7 million of these variations** are absent in global databases.
- **Population-Specific Insights**: Provides insights into the frequency and impact of certain mutations.
- **Rare Disease Identification**: Facilitates the development of gene therapies for rare diseases.
- **Drug Resistance Research**: Identifies genetic variants affecting medication efficacy.
  - **E.g.** A South Indian Vaishya community lacks the gene to process common anaesthetics, leading to prolonged effects or death.

Global Genome Sequencing Projects
- **Human Genome Project (2003):** First complete human genome by an international consortium funded by the US National Institutes of Health.
- **1,000 Genome Project (2012):** It is an international collaboration between research groups in US, UK, China and Germany
- **European 1+ Million Genome Project**: Ongoing effort across **24 countries** to sequence over 1 million genomes.

Source:
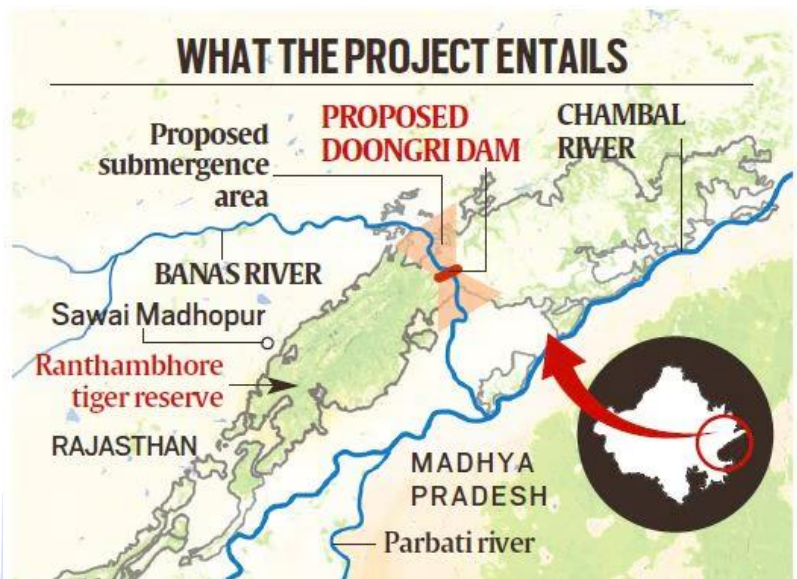- **Indian Express - What is Genome India Project**

Rajasthan river-link lifeline could submerge 37 sq km in tiger reserve

Context
The Parbati-Kalisindh-Chambal-Eastern Rajasthan Canal Project (PKC-ERCP) which aims to provide a lifeline to 23 districts in Rajasthan, proposes the submergence of area within the Ranthambhore tiger reserve, effectively dividing it into **two sections.**

Impact on Ranthambhore Tiger Reserve
● **Submerged Area: 37.03 sq km** of Ranthambhore National Park (392 sq km) and Keladevi Wildlife Sanctuary (674 sq km).
   ○ Total reserve area: **1,113 sq km**, home to **57 tigers**.
● **Habitat Fragmentation**: Submergence will divide the tiger reserve into two sections, constricting the **north-south dispersal route** for animals.
● **Conservation Concerns**:
   ○ Ranthambhore is one of India's prime tiger habitats and a global tourist destination.
   ○ Conservationists warn about the loss of **habitat connectivity** and **biological carrying capacity**.

About Ranthambore Tiger Reserve
● **Location:** Sawai Madhopur, Rajasthan (at the **junction of the Aravali and Vindhya ranges** in eastern Rajasthan).
● It includes **Ranthambore National Park, Sawai Mansingh Sanctuary and Keladevi Sanctuary.**
● **Ranthambor Fort** (A UNESCO World Heritage Site) is located inside the Tiger Reserve.
● **Rivers:** Chambal & Banas
● **Flora:** Tropical dry deciduous and thorn forests; dominated by Dhok trees and grasslands.
● **Fauna:** Tiger, Leopard, Sloth Bear, Jackal, Striped Hyena, Desert fox, Palm civet.

Facts
● **Tiger Reserves in Rajasthan (5):** Sariska, Ranthambore, Mukundara Hills,Ramgarh Visdhari and Dholpur-Karauli Tiger Reserve.
● **Rajasthan does not have any Biosphere Reserve.**

Source:
● **Indian Express - 37 sq km in tiger reserve**

How the new AI chip rule from the US will work

Context
The U.S. government recently introduced a new regulation aimed at controlling global access to U.S.-designed artificial intelligence (AI) chips and technology.

About New Regulations
● **Restricted Chips:** The regulation focuses on **Graphics Processing Units (GPUs)**, initially designed for gaming but now essential for training AI models due to their ability to process multiple data pieces simultaneously.
  ○ GPUs made by **Nvidia,** a leader in the industry, are specifically targeted.

Graphic Processing Unit (GPU)

It is a computer chip that rapidly calculates mathematical operations to display graphics and images.

It is used in Creative content creation, video editing, high-performance computing (HPC), and artificial intelligence (AI).

● **Total Processing Performance (TPP)**:
  ○ The regulation sets caps on **compute power**, a key metric for GPU performance.
  ○ Countries subject to the restriction will have a TPP cap of **790 million** through 2027, equivalent to about **50,000 H100 GPUs**.
● **Exceptions and Exemptions**:
  ○ **Verified End User (VEU) Status**: Companies with special VEU status, like **Amazon Web Services** and **Microsoft Azure**, are exempt from caps. They can access large numbers of GPUs, such as **320,000 advanced GPUs** over the next two years.
  ○ **Small Orders**: Purchases of GPUs up to **1,700 H100 chips** do not count toward the cap, simplifying the process for universities, research organizations and medical institutions.
  ○ **Gaming GPUs**: Purchases of GPUs for gaming purposes are exempt from the restrictions.
● **Countries with Unlimited Access**: **18 countries** are exempt from the caps, including:
  ○ Australia, Belgium, Britain, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, South Korea, Spain, Sweden, Taiwan and U.S.
● **Impact on India:**
  ○ India could benefit from its strategic partnerships with the U.S. as the new AI chip export restrictions target countries like China and Russia.
  ○ The policy may **redirect investments towards India, boosting its role in the global AI and tech ecosystem.**

Source:
● **Indian Express - New AI chip Rules**

Places in News

Diego Garcia
- 15 fishermen of Kanniyakumari district who had ventured into the sea from the **Thengapattinam fishing harbour** were detained near Diego Garcia island for allegedly crossing the maritime boundary.

- **Location:** Central Indian Ocean, part of **Chagos Archipelago.**
- It is the largest of **55 islands** that form the Chagos Archipelago within the **British Indian Ocean Territory (BIOT).**
- It is leased to the United States for a military base.
- **Features:**
  - It is a **coral atoll** with an open lagoon at its northern end.
  - Discovered by the **Portuguese in the 16th century.**
  - Located in the **south of the equator.**

Source:
- [The Hindu - fishermen detained near Diego Garcia](#)

Chagos Archipelago
- Britain and Mauritius recently announced significant progress in their negotiations to finalise a deal regarding the sovereignty of the Chagos Islands.
- **Significance of Chagis Archipalego:**
  - **Strategic location & USA's presence in the region:** The archipelago maintains US presence in the Indian Ocean which is critical especially in the ongoing situation in West Asia.
  - **Global Choke Point:** The island is also crucial for the USA as an outpost to monitor Malacca Strait, a global choke point vital to China.

- **Location:** 500 km to the South of Maldives archipelago in the Indian ocean.
- It comprises around **58** islands.
- Mauritius, which gained independence from **Britain in 1968,** has consistently maintained its claim over the Chagos Islands.
- **In 2019, the International Court of Justice (ICJ)** dismissed the UK's right to govern the Chagos Islands and called on its government to withdraw from the archipelago.

Source:
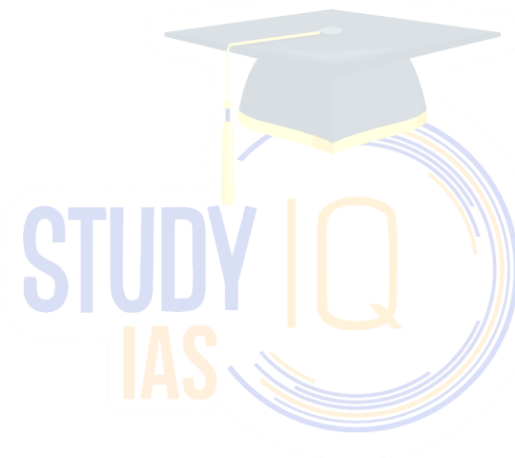- **The Hindu - Chagos Islands**

News in Shorts

Pneumatic Tribometer

- It is a device that measures friction and wear between two surfaces using a load cell sensor and pneumatic loading technology.
- It's used to study tribology, the science of friction, lubrication and wear.
- **Applications:**
    - **Brake pad testing:** To test the friction and wear of brake pads.
    - **Railway testing:** To measure the coefficient of friction (COF) between train wheels and the railway.

Source:
- **The Hindu - something to measure**

Editorial Summary

Indian Diaspora

Context
During the inauguration of the 18th Pravasi Bharatiya Divas (PBD), Prime Minister Narendra Modi referred to the Indian diaspora as "India's ambassadors to the world."

Significance of Indian Diaspora
- **Economic Contributions**: Remittances from the Indian diaspora significantly bolster India's economy.
  - **E.g.,** India maintained its position as the world's top recipient of remittances in 2024, with inflows reaching a record $129 billion.
- **Soft Power Projection**: The diaspora serves as India's cultural ambassadors, promoting Indian traditions, cuisine, and values globally.
- **Political Influence**: Indian-origin leaders and lawmakers in more than 30 countries strengthen India's diplomatic and strategic ties.
  - **E.g.,** In the United States, Vice President Kamala Harris, of Indian descent. Additionally, the 2024 U.S. presidential race featured Indian-American candidates such as Nikki Haley and Vivek Ramaswamy.
- **Knowledge Transfer**: The diaspora plays a vital role in advancing technology, research, and innovation through their expertise in global industries.
  - **E.g.,** Initiatives like the integration of the Unified Payments Interface (UPI) with international payment systems have been facilitated by collaborations with Indian-origin professionals abroad, enhancing India's digital payment infrastructure
- **Philanthropic Contributions**: They support social and developmental projects in India through charity and funding for educational, health, and infrastructure initiatives.
- **Global Advocacy**: Indian-origin communities act as advocates for India's interests in global forums, influencing public opinion and policies.

Facts
- The strength of the India-origin community worldwide is over **35 million** — about 15.85 million NRIs and 19.57 million PIOs.
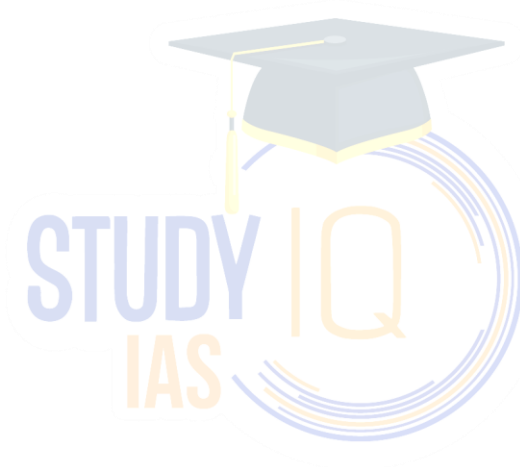
Concerns Regarding Indian Diaspora
- **Discrimination and Racism**: Rise in far-right populism has led to visa restrictions, xenophobia, and challenges in foreign nations.
- **Conflict Zones**: Many Indians in regions like West Asia face risks due to political instability and wars.
- **OCI Revocations**: Arbitrary actions such as denying or revoking Overseas Citizenship of India (OCI) cards can alienate the diaspora.
- **Economic Migration**: The "brain drain" from India reflects the lack of adequate domestic economic opportunities.
- **Exclusionary Policies**: There is a need to make diaspora engagement inclusive and non-partisan, avoiding political favoritism.
- **Cultural Assimilation vs. Identity**: Balancing assimilation in host countries with the preservation of Indian cultural identity remains a challenge.

How the Indian Diaspora Can Help Achieve the Vision of Viksit Bharat

● **Investments in Infrastructure**: Channeling diaspora investments towards India's infrastructure and development projects.
● **Knowledge Partnerships**: Engaging Indian-origin experts in science, technology, and education for skill development in India.
● **Global Market Access**: Facilitating market penetration for Indian goods and services using their influence in global trade.
● **Innovation & Entrepreneurship**: Promoting start-ups and fostering entrepreneurial ecosystems in India through mentorship and funding.
● **Philanthropy for Social Development**: Supporting grassroots projects in health, education, and rural development.
● **Policy Advocacy**: Acting as intermediaries to shape favorable global policies for India in trade, environment, and security.

Source: The Hindu: Indian Abroad

Violence Against Women and the Role of Men in Addressing It

Context
- Despite decades of advocacy, violence against women remains a pervasive issue globally. Nearly one in three women has experienced violence at the hands of men.
- This violence is not only a women's issue but also a critical societal concern that necessitates the active engagement of men in addressing and transforming traditional notions of masculinity.

The Role of Men and Challenging Masculinities
- Men are often seen as perpetrators of violence, but they can also be key agents of change.
- Traditional views of masculinity, which equate manhood with strength, aggression, and control, need to be redefined.
- A shift towards values such as equality, empathy, and non-violence is essential for fostering healthier relationships and creating a safer society.
- From early childhood, boys are socialized into norms that promote dominance and emotional suppression.
- These harmful ideas not only affect women but also limit men's emotional well-being and relationships.
- Recognizing and reshaping these norms is vital for creating a more equitable world.

The Importance of Role Models
- Positive role models are crucial in demonstrating equitable behaviors.
- Public figures can normalize gender equality by actively participating in caregiving responsibilities.
- **E.g.,** A prominent Indian cricketer sparked national dialogue on shared parenting by publicly committing to paternity leave, showcasing how equitable relationships can redefine masculinity.

Initiatives Engaging Men in Gender Equality
- **UNESCO's Transforming MENtalities Initiative:** Encourages men to engage with gender issues as active participants, not just allies, fostering alternative masculinities based on equality and empathy.
- **Key Programs Documented in India:** A report titled "Engaging Men and Boys: A Report on Pathways to Gender Equality in India" by UNESCO and the International Center for Research on Women (ICRW) highlights ten pioneering programs across India that engage men and boys. Some of them are
    - **Mardon Wali Baat (A Man's Thing):** This initiative by The YP Foundation uses storytelling and social media to promote positive masculinities among young men, encouraging them to critically examine limiting narratives.
    - **Gender Equity Movement in Schools (GEMS)**: A collaboration between ICRW and Rajasthan's Department of Education, GEMS employs interactive classroom activities to help adolescent boys understand the harms of toxic masculinity.
    - **Dekh Rekh (Caring for Each Other):** This program encourages men's participation in family nutrition and planning, addressing gender bias through everyday actions.
    - **Hamari Shaadi (Our Marriage):** Focused on promoting equitable roles within marriage, this initiative fosters discussions around shared responsibilities.
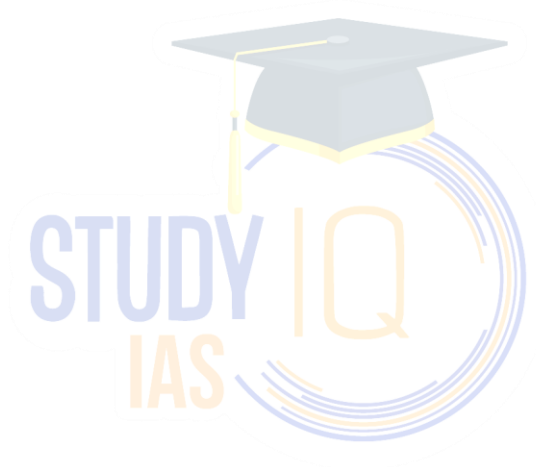
Conclusion
The path to achieving true gender equality is complex and requires the active participation of men in dismantling toxic masculinity. Men must recognize their role as contributors to change by challenging stereotypes and questioning the privileges granted by patriarchy. By reshaping their

identities and embracing vulnerability, men can significantly impact the journey toward a more equitable society.

As we move into the new year, it is essential to celebrate those men who are transforming mentalities and championing equality, working towards a world free from violence where everyone can thrive regardless of gender.

Source: The Hindu: Transforming 'men'-talities, redefining masculinity

Concerns Over Transparency in India's Electoral Process

Context
- In the 2024 general elections and past instances, questions were raised about electoral transparency due to discrepancies in voter turnout data and reluctance to disclose key electoral records like Form 17C (which tracks voter turnout and votes).
- Allegations of election manipulation, such as the Chandigarh mayor election case, added to public mistrust.

Central Government Action
- **Amendment to Rule 93(2) of the Conduct of Election Rules, 1961:** Limited public access to election-related records by specifying that only certain "papers as specified in these rules" would be open to inspection.
    - This change narrowed the scope of transparency, potentially barring access to records like Form 17C and CCTV footage.
- Timing of the amendment raised suspicion, as it followed a Punjab and Haryana High Court ruling directing the Election Commission of India (ECI) to share election records.

Concerns Associated with ECI's Role
- **Lack of Transparency:** ECI failed to disclose voter turnout data in absolute numbers immediately after voting phases, leading to confusion and distrust.
    - Refused to proactively share Form 17C, citing:
        - Risks of misuse (e.g., morphing).
        - Lack of technical facilities to scan/upload documents.
    - These reasons were widely criticized as implausible and inconsistent with modern digital capabilities.
- **Stonewalling Requests:** Political parties, including the Biju Janata Dal (BJD), alleged discrepancies in voter turnout figures but were denied access to Form 17C despite legal provisions under the Representation of the People Act, 1951.
- **Questionable Justifications:** Claimed there was no legal mandate for broader dissemination of Form 17C beyond candidates and polling agents.
    - Critics argued that withholding this data undermined accountability and fairness in elections.
- **Delayed Statistical Reports:** ECI released 42 statistical reports in December 2024 but omitted data from Form 17C, leaving discrepancies unresolved.

Supreme Court's Stance
- **Electoral Bonds Scheme:** In 2024, the Supreme Court struck down the scheme, declaring it violated the voter's fundamental right to information.
    - This demonstrated the Court's commitment to transparency in electoral processes.
- **Challenge to Rule 93(2) Amendment:** A case challenging the amendment is pending before the Supreme Court.
    - Critics argue that restricting public access to election records is incompatible with democratic norms.
    - The judiciary is expected to address concerns over electoral transparency and accountability.

Source: The Hindu: Resisting transparency, eroding public trust