Today's Prelims Topics

National Air Quality Resource Framework of India

Context
Delhi has been ranked the world's most polluted capital for the sixth consecutive year in IQAir's 2024 World Air Quality Report. The need for an airshed-based approach, as suggested by NARFI, is gaining traction.

About National Air Quality Resource Framework of India (NARFI)
● **NARFI** is an initiative under the **Office of the Principal Scientific Advisor (PSA) to the Government of India**.
● It was launched by **NIAS (National Institute of Advanced Studies)** to create a **scientific framework for air quality management** across India.
● The framework helps in **mapping pollution sources, identifying airsheds, and implementing data-driven policies**.
● **Key Objectives of NARFI:**
  ○ **Airshed-Based Approach** – Moves beyond state boundaries to address air pollution at a regional level.
  ○ **Data-Driven Decision Making** – Uses satellite imagery, ground-based sensors, and AI models to track pollution.
  ○ **Policy Integration** – Aligns national and regional pollution control strategies.
  ○ **Public Awareness & Collaboration** – Engages multiple stakeholders like government bodies, researchers, and industries.

What are Airsheds?
● An **airshed** is a **geographic region where air pollutants circulate and mix due to meteorological and topographical factors**.
● It is **similar to a watershed** (which governs the flow of water) but applies to **air movement and pollution spread**.
● **Delhi's Airshed** spans **six states (Punjab, Haryana, UP, Rajasthan, Himachal Pradesh, Uttarakhand)**.
● Other important airsheds in India include:
  ○ **Indo-Gangetic Plain Airshed** (Delhi, UP, Bihar, West Bengal, Punjab)
  ○ **Central India Airshed** (Madhya Pradesh, Chhattisgarh, Maharashtra)
  ○ **Western India Airshed** (Gujarat, Maharashtra, Rajasthan)
● **Why is an Airshed Approach Necessary?**
  ○ **Traditional state-wise policies fail** because pollution travels beyond state borders.
  ○ **E.g.** Delhi's pollution comes from stubble burning in Punjab & Haryana and industrial activity in UP.
  ○ The **airshed model** ensures **a coordinated effort** between multiple states for effective pollution control.

Source:
● **Indian Express - United by Smog**

PM-VIKAS Scheme

Context

The Union Government has recently launched the PM-VIKAS scheme for upliftment of minority communities.

About PM-VIKAS (Pradhan Mantri Virasat Ka Samvardhan)

- It is a **Central sector scheme** under the **Ministry of Minority Affairs (MoMA)**.
- It aims to empower **minority** and artisan communities through inclusive development.
- PM-VIKAS is an integrated scheme combining (5) existing schemes of MoMA viz. **Seekho aur Kamao, USTTAD, Hamari Dharohar, Nai Roshni and Nai Manzil.**
- **Scheme Components:**
  - **Skilling and Training:** Includes traditional (arts & crafts) and non-traditional (NSQF compliant) skill training.
  - **Leadership and Entrepreneurship:** Focuses on leadership development and entrepreneurship support, particularly for women.
  - **Education:** Provides open schooling opportunities (8th, 10th, and 12th) for school dropouts.
  - **Infrastructure Development:** Development of "Vishwakarma Villages" (hub and spoke model) to promote art, craft, tourism and commerce.

Minorities
- The Constitution of India does not define the term **"Minority".**
- The Central Government has notified **six** communities as minority communities under **Section 2(c) of the National Commission for Minorities Act, 1992.**
  - Muslims, Christians, Sikhs, Buddhists, Zoroastrians (Parsis), and Jains.
  - As per census 2011, the percentage of minorities in India's population is **19.3%.**

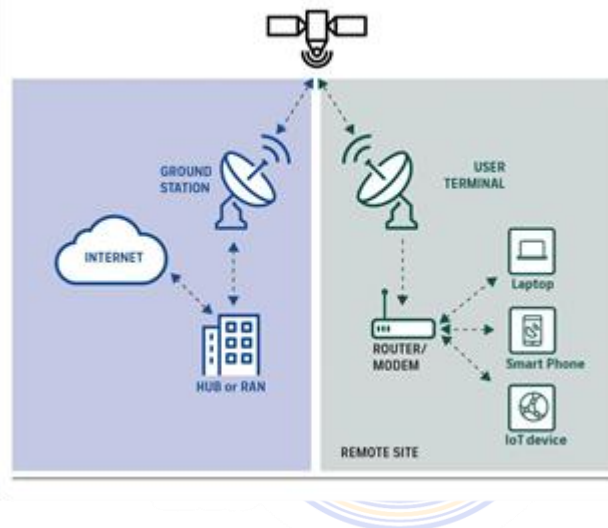**Source:**
- **PIB - PM VIKAS**

Starlink

Context

Recently Bharti Airtel and Reliance Jio have signed separate agreements with SpaceX to bring Starlink internet services to India.

About Starlink

- Starlink is a **satellite-based internet service** developed by **SpaceX (founded by Elon Musk).**
- It uses a constellation of **low Earth orbit (LEO) satellites** (orbiting at ~550 km) to deliver high-speed, low-latency broadband.
- It supports high data-rate activities like streaming, gaming and video calls, making it popular in: **Remote areas, Disaster zones & Locations with restricted internet access.**
- The project was launched in 2019 and aims to deploy 42,000 small satellites in low Earth orbit (LEO) (under 2,000 km altitude).
- Currently, around **7,000** Starlink satellites are operational in space at an altitude of **547 km.**

What is Satellite Internet ?

- It is a type of internet connection that uses satellites to provide broadband service.
- This technology enables users to access the internet from virtually anywhere, particularly in remote or underserved areas where traditional terrestrial internet infrastructure is lacking.
- It **does not** require cables, fibre or phone lines.
- **How Does Satellite Internet Work?**
    - **User Device to Satellite:** The **user's device** sends signals to a **Starlink satellite** in space.
    - **Satellite to Ground Station:** The **satellite transmits the signal** to a **ground station**, which is connected to the Internet.
    - **Data Retrieval and Transmission:** The ground station **retrieves requested data** and sends it back via the satellite to the **user's dish**.

How Does Starlink Control Access?

- **Signal Encryption**: Prevents hacking or interception of satellite transmissions.
- **Geofencing**: Terminals are geographically restricted to areas authorized for service.
    - **E.g.** A Starlink device bought in the U.S. might not work in India unless its geographic location is reconfigured.
- **Challenges**:
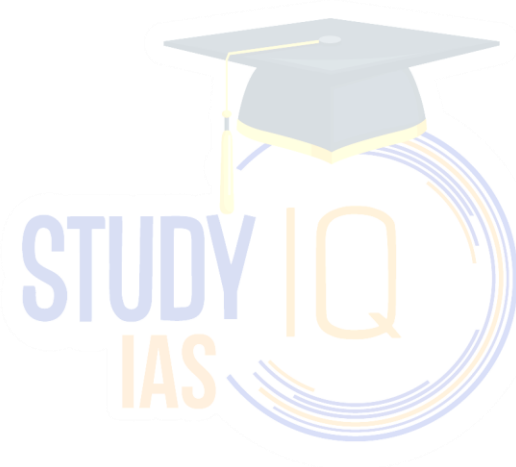   - Precise international border coverage is difficult due to:

- - ■ Contested borders.
    - ■ Satellites transmitting across moving boundaries.
  - ○ Devices purchased abroad may bypass restrictions if not regulated.

Why Are the Starlink Deals Significant for India?
- **Bridging the Digital Divide:**
  - ○ India is the **world's second-largest Internet market**, yet 670 million people (out of 1.4 billion) lack Internet access (as per a 2024 GSMA report).
- **Enhancing Nationwide Connectivity:** Starlink can provide **broadband in remote and underserved areas** where **fibre-optic or wireless networks are scarce**.
- **Potential Economic and Social Impact:**
  - ○ **Supports digital inclusion** by providing **high-speed Internet** in rural areas.
  - ○ **Boosts education, healthcare, and e-commerce** in **remote regions**.
  - ○ **Enables better disaster response** by ensuring **uninterrupted connectivity** in emergencies.

Source:
- **Indian Express - Starlink**

PM-YUVA 3.0: Prime Minister's Scheme for Mentoring Young Authors

Context
Recently The Ministry of Education, Department of Higher Education has launched PM-YUVA 3.0 (Prime Minister's Scheme for Mentoring Young Authors).

About PM-YUVA 3.0
- It is an **Author Mentorship Programme** aimed at training young and budding authors (below 30 years of age) to promote reading, writing, and book culture in India.
- A **total of 50 authors** will be selected through an **All India Contest** conducted on **MyGov.in**.
- **Implementing Agency:** National Book Trust (NBT).
  - NBT is a publishing house and autonomous organization under the Union Education Ministry that promotes reading and the production of books in India.
  - It was established in **1957.**
- **Objectives of PM-YUVA 3.0:**
  - **Promote Indian Heritage and Knowledge System** - Encourage young writers to explore India's **rich literary and cultural heritage**.
  - **Encourage Creative and Innovative Perspectives -** Young authors will write on themes that reflect India's **past, present, and future contributions**.
  - **Capacity Building and Nation Building -** With **66% of India's population being youth**, initiatives like PM-YUVA 3.0 can **develop future creative leaders**.

Themes of PM-YUVA 3.0
- **Contribution of Indian Diaspora in Nation Building:** Highlight the role of the Indian diaspora in India's development across political, economic, and socio-cultural spheres.
- **Indian Knowledge System -** Explore historical wisdom, traditional knowledge and their role in national development.
- **Makers of Modern India (1950-2025) -** Cover contributions of visionaries in fields such as education, science, economy, and social empowerment.

Source:
- **PIB - PM YUVA 3.0**

Mission Amrit Sarovar

Context
Indian Railways will desilt, excavate and construct new water bodies near railway lines as part of Mission Amrit Sarovar.

About Amrit Sarovar Mission
- It was launched on **24th April 2022** by the **Government of India** to develop and rejuvenate **75 water bodies** in **each district of the country**.
- It aims to promote **water conservation** and improve **groundwater recharge**.
- **Target**: Construct or rejuvenate **50,000 Amrit Sarovars** across **India**.
  - As of **October 2024**, over **68,000 ponds** have been completed across the country.
- **Size**: Each water body will have an approximate area of **one acre** and hold around **10,000 cubic meters of water**.
- The initiative is being implemented through **convergence of various government schemes**.
  - MGNREGA, Pradhan Mantri Krishi Sinchayee Yojana, AMRUT Mission, Jal Shakti Abhiyan etc.
- **Objectives of Mission Amrit Sarovar:**
  - Water Conservation and Rainwater Harvesting.
  - Increase Groundwater Recharge.
  - Sustainable Development & Rural Employment
  - Promote Community Participation.

Source:
- **The Hindu - Mission Amrit Sarovar**

Places in News

Byrnihat

- According to the **World Air Quality Report 2024** by **IQAir**, a Swiss air quality monitoring company, **Byrnihat (Meghalaya-Assam border)** has been ranked as the **most polluted city in the world**.
- **PM2.5 concentration: 128.2 µg/m³**, far exceeding the **WHO's guideline of 5 µg/m³**.

Reasons for Severe Pollution

- **Industrialization in Byrnihat:**
  - Byrnihat is **20 km from Guwahati** and **65 km from Shillong**, in **Meghalaya's Ri-Bhoi district**.
  - Over the years, it has developed into an **industrial hub** spanning in both **Meghalaya (Byrnihat Export Promotion Industrial Park - EPIP)** and **Assam (Tamulikuchi, Kamrup district)**.
- **Major Industries:**
  - Coke production, cement manufacturing, ferro alloys, steel, distillation and brickmaking.
  - Industries flourished due to **proximity to coal reserves** in Meghalaya and **water supply from the Umtru River**.
- **Additional Factors:**
  - **Vehicular Emissions:** Byrnihat is a major transit point for heavy diesel vehicles transporting industrial materials.
  - Unpaved Roads and Road Dust.
  - **Its Basin-like topography** prevents pollutant dispersal.

Source:
- **Indian Express - Byrnihat**

Fuego Volcano

- A powerful eruption of Guatemala's Volcán de Fuego recently triggered strong explosions, pyroclastic flows, endangering nearby communities.

- **Location:** It is a stratovolcano located in **Guatemala**, southwest of Guatemala City.
- It is one of Central America's most active volcanoes.
- **Guatemala lies on the Pacific "Ring of Fire"** and experiences frequent seismic and volcanic activity.
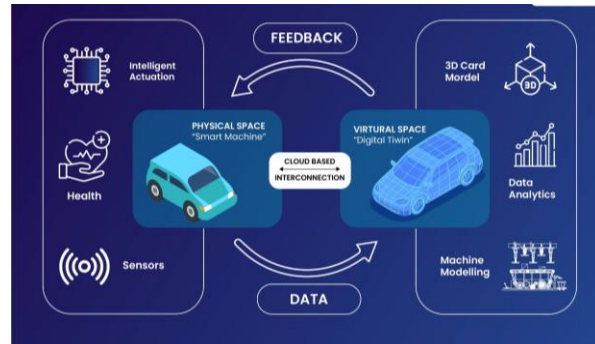- **Guatemala Bordering Countries:** Mexico, Belize, Honduras and El Salvador.

Source:
- **Republic World - Fuego Volcano**

News in Shorts

Digital Twin Technology

- A **Digital Twin** is a **virtual representation of a physical object, system, or process** that is continuously updated with real-time data.
- It **mirrors** the real-world entity by integrating **IoT sensors, AI, big data, and machine learning** to analyze and optimize performance.
- Used in **predictive maintenance, real-time monitoring, and simulation-based decision-making**.

Applications of Digital Twin Technology
- **Manufacturing & Industry 4.0:** Optimizes factory operations and **predicts machine failures** before they occur.
- **Smart Cities & Infrastructure:** Simulates traffic patterns, water supply, and urban development.
    - E.g. **Singapore's Smart Nation Initiative** uses a city-wide digital twin.
- **Healthcare & Biotechnology:** Creates digital twins of **human organs** for personalized treatments.
- **Aerospace & Defense:** Enhances aircraft maintenance and mission simulations.
- **Automotive & Transportation:** Helps in **autonomous vehicle testing** and predictive maintenance.
    - E.g. **Tesla's self-driving AI** relies on digital twin simulations.

Source:
- **PIB - Digital Twin Technology**

Mycelium Bricks

- Mycelium bricks are an innovative, sustainable building material made by combining **fungal mycelium** (the root-like network of fungi) with organic waste like agricultural byproducts.
- They are **lightweight, biodegradable, and fire-resistant** alternatives to traditional bricks.
- Mycelium is the vegetative part of a fungus, consisting of a network of thin, branching filaments called **hyphae.**
- **Production Process**:
    - Created by combining **husk, sawdust, and fungal spores**.
    - The **fibrous network** solidifies into a **lightweight structure** within **a few days**.
- **Advantages of Mycelium Bricks:**
    - **Eco-Friendly: Biodegradable**, reducing **waste pollution**. **Lower carbon footprint** compared to fired clay bricks.

- ○ **Lightweight:** Easier to transport and handle.
- ○ **Good Thermal Insulation:** Can be used as **panelling material** in **interior design**.

Source:
- ● **The Hindu - Mycelium Bricks**

British Royal Society

- ● Several members of the British Royal Society have written open letters calling for Elon Musk's expulsion from its membership.

About British Royal Society
- ● The Royal Society of London (commonly known as the British Royal Society) is one of the world's oldest and most prestigious scientific institutions.
- ● It was founded on **November 28, 1660**, during the reign of **King Charles II**, who granted it a **Royal Charter in 1662**.
- ● Some of the greatest minds in history have been members, including: **Isaac Newton, Charles Darwin, Albert Einstein & Stephen Hawking.**

Key Functions & Contributions
- ● **Advancing Scientific Research:**
  - ○ Funds and supports **cutting-edge scientific research** in multiple disciplines & publishes **scientific journals**.
- ● **Fellowship & Membership:**
  - ○ **Fellows of the Royal Society (FRS)** are elected **for life** based on **significant scientific achievements**.
  - ○ The fellowship includes **over 1,700 members**, with **more than 80 Nobel Prize winners**.
- ● **Policy & Science Advocacy:**
  - ○ Promotes **STEM education** and public engagement in science.
  - ○ Works on global issues like **climate change, AI, and biotechnology**.

Source:
- ● **The Hindu - British Royal Society**

Editorial Summary

The dangerous illusion cast by development rankings

Context
California wildfires highlight the ecological cost of high-consumption development models, contrasting with aspirational metrics like the HDI, which overlook environmental sustainability.

Issues in the Development Processes of Developed Nations
● **High Resource Consumption:** Developed nations like the US and EU consume resources at unsustainable levels, requiring multiple Earths to sustain their lifestyles.
● **Environmental Degradation:** High HDI scores come at the cost of ecological destruction, including greenhouse gas emissions, deforestation, and pollution.
● **Unequal Distribution of Wealth:** Affluence benefits a few, while the environmental and social costs are borne collectively, especially by poorer nations.
● **Misleading Development Metrics:** HDI focuses on life expectancy, education, and income but ignores environmental costs, creating a flawed picture of progress.
● **Planetary Boundaries Overshoot:** High-income countries have already breached key ecological limits, causing climate instability and biodiversity loss.
● **Relativist Benchmarking:** Even the PHDI ranks nations against each other rather than against absolute ecological thresholds, masking unsustainable practices.
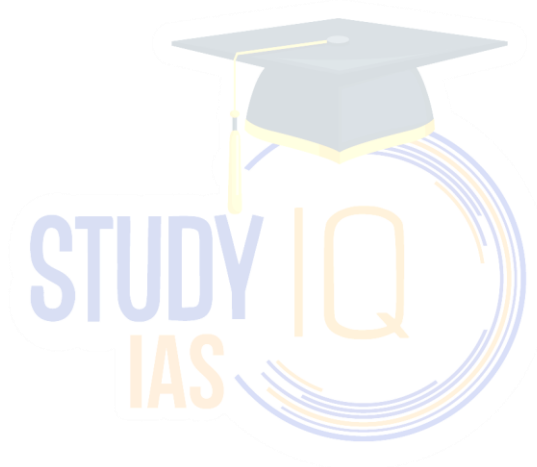
Best Examples of Sustainable Development
● **Costa Rica:** Achieved high life expectancy and literacy with a low resource footprint.
  ○ Investment in renewable energy and forest conservation aligns development with ecological balance.
● **Sri Lanka:** Strong health and education outcomes despite limited resources.
  ○ However, political instability and social tensions highlight the need for social justice alongside sustainability.
● **Bhutan:** Measures development through Gross National Happiness (GNH), balancing economic growth with environmental and social well-being.
● **New Zealand:** Focus on a "Wellbeing Budget" to align economic goals with social and environmental priorities.
● **Germany:** Transitioned to renewable energy (Energiewende), aiming for carbon neutrality while maintaining industrial strength.
● **Netherlands:** Pioneered circular economy practices, focusing on recycling and reducing waste to minimize resource consumption.

What Needs to Be Done
● **Redefine Development Metrics:** Move beyond GDP and HDI to include environmental and social justice indicators.
  ○ Develop absolute benchmarks based on planetary boundaries.
● **Promote Low-Impact Lifestyles:** Encourage sustainable consumption and production patterns.
  ○ Shift towards renewable energy and circular economies.
● **Support Middle-Income Models:** Learn from Costa Rica and Sri Lanka in balancing human development with ecological limits.
● **Global Cooperation and Equity:** Ensure that developing countries have access to sustainable technology and funding.
  ○ Address historical emissions and unequal environmental burdens.

- **Invest in Social and Environmental Justice:** Ensure equitable access to resources and opportunities within and among nations.
  - Strengthen political and social stability through inclusive governance.
- **Decentralized and Adaptive Development:** Develop local solutions tailored to ecological and social realities.
  - Encourage community-based and indigenous models of sustainability.

Source: The Hindu: The dangerous illusion cast by development rankings

Resolving the vexatious fishing dispute

Context
Last week, the Leader of the House in the Sri Lankan Parliament, Bimal Rathnayake, called upon the Indian and Tamil Nadu governments to take "decisive action" against " illegal fishing in Sri Lankan waters".

Pernicious Practice
- **Illegal Fishing and Bottom Trawling:** Indian fishermen, mainly from Tamil Nadu and Puducherry, have been crossing the International Maritime Boundary Line (IMBL) into Sri Lankan waters for fishing.
  - The primary concern is **bottom trawling**, a fishing method where heavy nets are dragged along the seafloor, which:
    - Destroys marine ecosystems and breeding grounds.
    - Results in high levels of bycatch (unintended marine species).
    - Depletes fish stocks, harming the livelihoods of Sri Lankan fishermen.
- **Asymmetric Economic Relationship:** Indian fishermen from Tamil Nadu are economically stronger and equipped with better vessels and technology.
  - Northern Sri Lankan fishermen, still recovering from the civil war, rely on traditional and less invasive fishing methods.
  - This economic disparity fuels resentment and complicates diplomatic efforts.
- **Limited Fishing Grounds for Indian Fishermen:** Indian waters in the Palk Bay are rocky and have coral reefs, limiting fishing opportunities.
  - The **Tamil Nadu Marine Fishing Regulation Act, 1983** restricts fishing along the coastline.
  - Deep-sea fishing as an alternative is costly and requires longer voyages (~3 weeks), making it economically challenging.

Future Outlook and Way Forward
- **Diplomatic Engagement and Dialogue:** Resumption of bilateral talks between Indian and Sri Lankan fishermen is essential.
  - India and Tamil Nadu governments have supported talks; Sri Lanka's NPP government needs to facilitate them.
  - The last dialogue was held in November 2016, highlighting the need for renewed engagement.
- **Alternative Livelihood Promotion:** Governments need to promote **alternative livelihoods** to reduce dependence on bottom trawling:
    - **Seaweed cultivation**
    - **Open sea cage cultivation**
    - **Sea/ocean ranching**
- **Deep-Sea Fishing Promotion:** The ₹1,600-crore **Palk Bay deep-sea fishing scheme** could be merged with the ₹20,050-crore **Pradhan Mantri Matsya Sampada Yojana**.
  - Higher subsidies and support for deep-sea fishing vessels can encourage Indian fishermen to transition away from bottom trawling.
- **Policy Reforms and Resource Sharing:** Establish a **Joint Fisheries Management Mechanism** to allow shared fishing rights under regulated conditions.
  - Introduce **seasonal fishing bans** to enable marine stock regeneration.
  - Promote sustainable fishing practices through training and incentives.
- **Ecological Restoration and Monitoring:** Strict enforcement against illegal bottom trawling.
  - Ecological restoration efforts to revive marine biodiversity in the Palk Bay region.
  - Enhanced maritime surveillance to prevent illegal fishing.

- **Political and Economic Support:** Both governments should provide compensation and incentives to fishermen transitioning to sustainable practices.
  - Establish a fund for fishermen affected by changing fishing regulations and environmental shifts.

Conclusion

The Palk Bay fisheries dispute requires a balanced approach that addresses both environmental and economic concerns. While Sri Lanka seeks protection for its fisherfolk, India needs to provide viable alternatives to its fishermen. Dialogue, policy reforms, and sustainable fishing practices hold the key to resolving this long-standing issue.

Source: The Hindu: Resolving the vexatious fishing dispute

On perceptions about Europe: Job prospects

Context

The perception of Europe as a land of better job opportunities has been growing among Indians, particularly among the younger and more educated population.

Why Europe is Becoming a Land of Opportunities for Indians

- **Better Job Opportunities:** Many Indians believe Europe offers better employment opportunities than India, especially in smaller towns where job prospects are limited.
  - Structured career growth, professional development programs, and access to high-skilled jobs in countries like Germany, the UK, and France attract Indian job seekers.
- **Higher Wages:** Many believe that workers in Europe earn more for the same work compared to India.
  - Those with family in Europe are more likely to perceive a substantial wage difference.
- **Career Growth and Professional Value:** Indian professionals feel their skills are better valued in European markets, with higher salaries, social security, and better working conditions.
- **Lifestyle Advantages:** Many believe life in Europe is more comfortable than in India due to better healthcare, infrastructure, and social welfare.
  - Younger and educated Indians are more attracted to the European lifestyle.
- **Educational Pathway:** Many Indian students pursue higher education in Europe, which often leads to post-study work opportunities.
  - This creates a pipeline for long-term career benefits.
- **Influence of Indian Diaspora and Social Media:** Success stories from the Indian diaspora, social media influence, and word-of-mouth recommendations reinforce the perception of Europe as a land of opportunity.

Source: The Hindu: On perceptions about Europe: job prospects and the Russia-Ukraine war

Automated Permanent Academic Account Registry (APAAR) ID for school students

Context
Parents and activists fear that opting out of the Education Ministry's APAAR ID for school students could become nearly impossible, despite **enrolment being officially voluntary**.

About APAAR ID
- **Initiative By**: Ministry of Education.
- **Introduced Under:** National Education Policy (NEP) 2020.
- **Key Features:**
  - **Lifelong Academic Identity:** Each student gets a unique 12-digit ID.
  - **Centralized System**: Manages academic records in one place.
  - **Credit Transfer**: Facilitates the transfer of credits between institutions
  - **Lifelong Identity:** Stays with the student throughout their educational and professional career
  - Additionally it has features to; Preserving student achievements, Streamlines credit recognition, Enhance educational flexibility & Credit transfer across institutions.
- **Registration Process:**
  - **Parental Consent:** Due to the sensitive nature of personal data involved, parental consent is required for students below 18 years of age.
    - Parents can obtain and submit the consent form through their child's school or the official APAAR website.
  - **Student Registration:** Students need to register on the Academic Bank of Credit (ABC) portal by creating an account on DigiLocker, providing their Aadhaar number and other necessary details.
  - **APAAR ID Generation:** Upon successful registration and verification, the system generates the unique 12-digit APAAR ID, which is then linked to the student's DigiLocker account for secure access.

Concerns Over APAAR ID Implementation
- **Voluntary vs. Implied Mandate:** While the Ministry of Education states that APAAR ID enrolment is voluntary, a January circular from the Central Board of Secondary Education (CBSE) instructed schools to ensure **"100% saturation" of APAAR IDs for all students**.
  - This directive has been interpreted by many schools as a mandate, raising concerns about whether opting out is truly possible.
- **Data Privacy and Security Issues:** The APAAR ID system links to Aadhaar and stores sensitive personal and academic data.
  - Advocacy groups like the Internet Freedom Foundation have warned about the lack of robust data protection measures for minors' information.
  - There is currently no legal framework mandating APAAR IDs, which raises questions about data security and consent.
- **Challenges in Aadhaar Linking:** Some parents have faced issues linking their child's Aadhaar to APAAR due to spelling mismatches between school records and the UIDAI database.
  - CBSE has advised schools to direct such parents to Common Service Centres for document correction, adding to the enrolment burden.

Way Forward
- **Ensure Clear Voluntary Consent:** The Education Ministry should issue a formal directive clarifying that APAAR ID enrolment is voluntary and prohibit schools from enforcing it as mandatory.

- **Strengthen Data Privacy Protections:** Introduce a legal framework to safeguard students' sensitive data, ensuring transparency, consent, and accountability in data collection and usage.
- **Simplify Aadhaar Linking Process:** Provide support for resolving Aadhaar mismatches directly at schools or through online platforms to reduce the burden on parents.

Source: The Hindu: APAAR ID system voluntary, but activists and parents raise concern over growing mandates