Prelims Exam Topics

NAMASTE SCHEME

Context

The Union Ministry of Social Justice and Empowerment announced major progress under the **NAMASTE Scheme, highlighting large-scale profiling, PPE distribution, health insurance coverage, and financial assistance for sanitation workers.**

Background

- The National Action for Mechanised Sanitation Ecosystem (NAMASTE) Scheme is a central sector scheme aimed at eliminating hazardous manual cleaning of sewers and septic tanks by promoting mechanised sanitation.
- It focuses on ensuring dignity, occupational safety, and sustainable livelihoods for sanitation workers while replacing manual scavenging with technology-driven sanitation systems.
- **Launched By:** Ministry of Social Justice and Empowerment and Ministry of Housing and Urban Affairs.

Key Features

- **Worker Safety and Social Protection:** Sewer and septic tank workers are profiled, validated, and provided with PPE kits, health insurance, and Ayushman card support to improve occupational safety and healthcare access.
- **Financial Support through SUY:** Under the Swachhata Udyami Yojana (SUY), upfront capital subsidy is provided for sanitation workers and Sanipreneurs to procure mechanised cleaning vehicles and equipment.
- **Inclusion of Waste Pickers:** Since June 2024, waste pickers engaged in solid waste management have also been included under the scheme, expanding the scope of social protection and formal recognition.

CLIMATE ADAPTATION AND RESILIENCE: PATHWAYS FOR INDIA'S NDCS (2031–35)

Context

India is mainstreaming adaptation into its development strategy through updated Nationally Determined Contributions (NDCs) and localized resilience models.

Current State of Climate Vulnerability in India

- India is the ninth most climate-vulnerable nation globally.
- Between 1995 and 2024, India recorded **430 extreme weather events**, resulting in economic losses of **$170 billion** and affecting 1.3 billion people.

Institutional Models for Climate Resilience

- **NICRA (National Innovations in Climate Resilient Agriculture):** An ICAR initiative covering 448 villages across 151 hotspots, focusing on **climate-smart agriculture** and risk mapping.
- **Tamil Nadu's Climate Resilient Villages (CRV):** Recognized by the **Economic Survey 2025-26** as a "best practice." It utilizes a holistic approach in 11 districts, integrating water management, renewable energy, and alternate livelihoods.

Challenges in Adaptation Financing

- **Budgetary Skew:** While adaptation spending was estimated at **5.6% of GDP in FY22**, the Union Budget 2026–27 remains heavily focused on emission mitigation.
- **Taxonomy Gaps:** The **Draft Framework of Climate Finance Taxonomy (2025)** is currently mitigation-centric, lacking a clear typology to prioritize and fund vulnerable sectors.
- **Global Finance Gap:** Developing nations face an annual financing gap of **$284–$339 billion** through 2035, according to the **UNEP Adaptation Gap Report 2025**.

Strategies for Strengthening Adaptive Capacity

- **Climate Budgeting:** The Ministry of Finance should mandate climate budgeting through State Finance Departments, integrating adaptation targets into annual budgetary planning.
- **Quantifying Benefits:** Highlighting the **ten-fold return on investment** in adaptation (as per WRI) can help attract private and international capital.
- **National Adaptation Plan (NAP):** Operationalizing NDCs through updated **State Action Plans on Climate Change (SAPCCs)** that include regular vulnerability assessments at the block level.
- **Whole-of-Systems Approach:** Moving beyond infrastructure to include skill development, rehabilitation guidelines for climate-displaced populations, and dedicated workforces in climate change cells.
- **Locally Led Adaptation (LLA):** A core theme of COP30, stressing that resilience planning must transition from national mandates to **Panchayati Raj Institutions** and Urban Local Bodies.

COLD SPARK TECHNOLOGY

Context

Following incidents of animal distress and human injury at the Thrissur Pooram festival, experts are advocating for a shift from traditional high-decibel fireworks to "Cold Spark" technology to mitigate health and environmental risks.

Noise Pollution and Public Health

- **Animal Distress:** Decibel levels during festivals like Thrissur Pooram have peaked at **122.4 dB**. Elephants and other animals get disoriented not just by volume but by the specific structure and frequency of the noise, leading to unpredictable behavior and injuries.

Area/ Zone	Category of Area / Zone	Limits in dB(A) Leq Day Time (from 6.00 a.m. to 10.00 p.m.)	Limits in dB(A) Leq Night Time (from 10.00 p.m. to 6.00 a.m.)
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone	50	40

- **The "Silence Zone" Violation:** The National Ambient Noise Monitoring Network mandates **40–50 dB** for silence zones (hospitals/schools). Traditional fireworks, capped legally at **125 dB**, frequently violate these norms, posing risks to neonatal intensive care units (NICUs) and infant brain development.
- **WHO Classification:** The World Health Organization (WHO) identifies noise pollution as the **third most hazardous** environmental threat to human health, following air and water pollution.

Cold Spark Technology

"Cold Sparkulars" offer a noiseless, safer alternative to traditional pyrotechnics by utilizing chemical engineering rather than explosive combustion.

- **Mechanism:** The technology uses a granulated metal alloy powder (typically **titanium and zirconium**). A device equipped with a heater and a fan increases the activation energy of the powder and ejects it into the air.
- **Chemical Reaction:** The heated powder reacts with atmospheric oxygen in a rapid **exothermic reaction**, creating a bright, sparkler-like visual effect without the "bang" of an explosion.
- **Thermal Safety:** Traditional sparklers burn at approximately **1,200°C**, posing extreme fire risks. Cold spark units operate between **60–100°C**, significantly reducing the risk of burn injuries and blazes.
- **Visual Superiority:** Modern arrays can be triggered sequentially to create cascading bursts and vertical "fountains" of light, replicating the grandeur of traditional displays without the associated smoke and sound.

NGT MANDATES MITIGATION OF ARSENIC AND FLUORIDE

Context

The National Green Tribunal (NGT) has issued strict directives to all 28 State governments and the Union Government to address the critical levels of arsenic and fluoride contamination in India's groundwater, citing severe public health risks.

Groundwater Pollutants and Impact

Groundwater Pollutant	Regions Affected	Health Impact
Arsenic	West Bengal, Bihar, and Uttar Pradesh	Arsenicosis, cancer, cardiovascular diseases
Fluoride	Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Gujarat, and Rajasthan	Dental fluorosis, skeletal fluorosis, Knock-knee syndrome

Directives from the National Green Tribunal (NGT)

- **State Responsibility:** All 28 states are impleaded and directed to submit detailed data on contamination levels across districts, villages, and blocks.
- **Central Oversight:** The **Central Ground Water Authority (CGWA)** is tasked with regular monitoring of the mitigation measures adopted by the states to ensure they are effective and timely.
- **Remedial Technologies:** The tribunal highlighted several scientific solutions suggested by the CGWA, including:
    - **Water Filtration Plants:** Localized units for immediate relief.
    - **Ion-Exchange Processes:** Chemical methods to remove specific ions from the water.
    - **Reverse Osmosis (RO):** A comprehensive membrane-based purification technique.

SYNTHETIC BADMINTON SHUTTLES

Context

Governing Body of Badminton, Badminton World Federation (BWF) announced that it would test brands of synthetic shuttlecocks (synths) at Grade 3 and Junior International tournaments. BWF plans to replace the traditional feather shuttles with synths in top-tier tournaments over the long term.

Need for move to Synthetic Shuttlecocks

The Badminton World Federation (BWF) officially approved the transition to synthetic shuttlecocks (synths) in **April 2026** for specific international tiers.

- **The "Feather Crisis":** Traditional shuttles require 16 feathers from the same wing of a goose/duck. Prices have surged **>200%** due to:
    - **Supply Shortages:** Avian flu outbreaks in China (the primary producer) and a shift in livestock farming toward red meat.
    - **High Demand:** Growing popularity in India, Indonesia, and China.
- Sustainability: Reducing the sport's reliance on animal products and high-transportation carbon footprints.
- **BWF Mandate:** Currently approved for **Grade 3** and **Junior International** tournaments to evaluate performance before potentially moving to elite tiers.

Physical Composition and Appearance of Synthetic Shuttles (Synths)

Synthetic shuttles aim to replicate the complex aerodynamics of natural feathers using industrial materials:

- **Appearance:** Distinctive **lemonish yellow** color (unlike the "regal white" of goose feathers).
- **Structure:**
    - **Base:** Retains the traditional natural cork.
    - **Stems:** Constructed from **carbon graphite** or nylon composites for rigidity.
    - **Skirt:** Made of **nylon nano-sheets** with **"chevron holes"** (V-shaped perforations) designed to replicate the air drag of feathers.
- **Finishing:** Components are bound with high-strength thread and coated in **epoxy resin** for extreme durability.
- **Safety Warning:** Some early batches were found to contain a **metal element** in the stock, raising concerns about eye injuries during high-speed smashes.
- **Approved Synthetic Shuttles:**
    - **Victor NCS MAX 12 -** Carbon graphite + Foam Inserts
    - **Yonex Crosswind 70 -** Stiffer nylon base

Key Concerns of Synthetic Shuttles

1. Performance & Feel

- **"Natural Intelligence" Deficit:** Unlike natural feathers, synths do not "self-correct" their flight path during tumbles, making delicate spinning net shots harder to execute.
- **Skill Neutralization:** Coaches fear that the less responsive material will reduce the gap between elite players and lower-tier ones by making "touch" and "deception" less effective.
- **Predictability:** Synths are often described as having a "robotic" or uniform feel that lacks the organic feedback of a goose-feather bird.

2. Aerodynamics (Flight)

- **Speed Management:** Synths lack the "aerodynamic brakes" of feathers. A smash arriving at **400 km/h** instead of a feather's **300 km/h** (due to poor deceleration) disrupts defensive timing.
- **Flight Stability:** Trials have shown synths can be "whimsical," occasionally wobbling or losing speed abruptly mid-flight.

3. Physical Integrity & Safety

- **Catastrophic Failure:** While durable, they don't fray; they **"crumple like a newspaper"** if mishit, becoming unplayable instantly.
- **Metal/Carbon Risks:** Reports of metal elements in the base and carbon graphite splinters pose significant **eye and skin injury risks** during high-velocity play.
- **Component Detachment:** Stability foam or nano-sheets can fly off mid-rally, altering flight immediately.

4. Visuals & Standards

- **Color Shift:** Moving from "regal white" to **"lemonish yellow"** affects visibility in certain stadium lighting.
- **Standardization:** Significant differences remain between approved models (e.g., the stiffer **Victor NCS Max** vs. the softer **Yonex Crosswind**).

PATHOGEN ACCESS AND BENEFIT SHARING (PABS) UNDER WHO'S PANDEMIC AGREEMENT

Context

Negotiations for the Pathogen Access & Benefit Sharing (PABS) framework is in the last stages.

About Pathogen Access & Benefit Sharing (PABS)

- PABS is the operational heart of the Pandemic Agreement. It is being negotiated as a separate "Annex" (specifically under Article 12). Without this Annex, the Agreement has no mechanism to actually distribute vaccines or ensure that data sharing happens fairly.
- PABS is the legally binding mechanism under **Article 12** of the WHO Pandemic Agreement. It operates as a global "quid pro quo": **Rapid Pathogen Access** in exchange for **Fair Benefit-Sharing.**
- Essentially, PABS is a global trade agreement: **Countries share the virus data, and in exchange, they are guaranteed a share of the cure.**
- The PABS system is intended to be a multilateral, legally binding framework that creates an "equal footing" between two demands that were previously disconnected:
    - **Rapid Access:** When a new dangerous pathogen is discovered, countries agree to share:
        - **Physical Samples:** The actual biological material (e.g., a "slime in a vial").
        - **Genetic Sequence Data (GSD):** The digital code or "blueprint" of the virus.
        - **Timeline:** This sharing must be "rapid," allowing scientists and companies to start working on vaccines and tests immediately.
    - **Benefit-Sharing:** In return for this access, pharmaceutical companies that use the PABS materials must sign legally binding contracts with the WHO. These contracts typically include:
        - **20% Rule:** Manufacturers must reserve **20%** of their real-time production of pandemic products (vaccines, treatments, tests).
            - **10% is donated** for free to the WHO.
            - **10% is provided at affordable, non-profit prices.**
        - **Monetary Contributions:** Companies may pay an annual fee to fund global preparedness.

- **Tech Transfer:** Encouraging companies to share their "recipe" so that vaccines can be produced locally in Africa, Asia, and Latin America.

Issues currently being debated under PABS

Feature	The Current "Draft" Reality
The 20% Rule	Manufacturers would be required to give **10% of their production for free** and **10% at non-profit prices** to the WHO.
GSD Tracking	Negotiators are debating how to track users of digital sequence data to ensure that "digital biopiracy" (using data without sharing benefits) doesn't happen.
Standardized Contracts	Instead of case-by-case deals, the WHO wants **standardized, enforceable contracts** that every manufacturer must sign to access the PABS data library.
One Health Scope	There is still a debate on whether PABS should cover only human viruses or also **zoonotic pathogens** found in animals before they jump to humans.

North vs South Debate

- **Global South (The Group for Equity):** Led by countries like India, Brazil, and the African Group, they insist that sharing pathogens *must* be legally tied to benefit-sharing. They refuse to sign a treaty that leaves benefits up to "voluntary" corporate charity.
- **Global North (EU, USA, etc.):** While they agree with the principle, they are concerned that strict mandatory registration and production quotas could stifle innovation or create legal conflicts with intellectual property rights.

Need for Pathogen Access & Benefit Sharing (PABS) Framework

- **Inequity Gap:** During COVID-19, high-income nations reached 50% vaccination by early 2021, while low-income nations remained below 1%.
- **"Data Trap":** Countries like South Africa and India shared genomic data on new variants (like Omicron) immediately, only to be met with travel bans and "last-in-line" status for vaccines. PABS ensures data providers are the first to benefit, not the last.
- **Problem with Goodwill:** Historically, global health relied on voluntary donations (like COVAX), which often resulted in "near-expiry" doses or being outbid by wealthy nations.
- **Legal Shift:** PABS replaces "maybe" with "must." It uses standardized, legally binding contracts so that access to a pathogen's "blueprint" is legally tied to a commitment to share the final product.
- **Digital Loophole:** Modern mRNA technology allows companies to "print" vaccines using only Genetic Sequence Data (GSD) downloaded from the internet, bypassing the need for physical samples.

- **PABS Solution:** It closes the loophole by ensuring that digital access triggers the same benefit-sharing obligations as physical samples, ensuring profit-makers give back to the data-originators.
- **Transparency vs. Fear:** If countries fear economic punishment (like travel bans) or lack of medicine, they may hide new outbreaks (e.g., Bird Flu).
- **"20% Insurance":** By guaranteeing a 20% production reserve (10% free, 10% at cost), PABS provides a national security incentive for countries to report threats early, making the entire world safer.
- **Zoonotic Tracking:** With 75% of new diseases originating in animals, PABS aims to create a unified system to track pathogens before they jump to humans.
- **Unified Surveillance:** It provides the formal structure needed to monitor animal-to-human spillover, ensuring a coordinated global response rather than a fragmented one.

Mains Exam Topics

WOMEN'S POLITICAL RESERVATION

Context

Women constitute nearly half of the global population, yet their presence in legislative bodies remains disproportionately low. Worldwide, they occupy only about one-fourth of parliamentary seats. In India too, women's representation in the Lok Sabha has remained modest hovering around 13–14% even after gradual improvements over the years.

Arguments supporting women's reservation

- **Constitutional backing and substantive equality:** The Constitution permits special provisions for women under Article 15(3). Reservation is viewed as a corrective tool to achieve real equality, not just formal equality.
- **Strengthening representative democracy:** A democratic system should reflect the composition of its population. With women forming nearly half of society, their underrepresentation creates a democratic imbalance.
- **Addressing historical disadvantages:** Long-standing social norms have restricted women's access to education, property, and public participation. Reservation acts as a compensatory mechanism to offset this structural exclusion.
- **Shift in policy priorities**: Studies show that women leaders often focus more on essential services such as healthcare, sanitation, drinking water, and nutrition, thereby improving grassroots welfare outcomes.
- **Greater attention to gender-specific issues:** Women representatives are more likely to highlight concerns like maternal health, gender violence, and child welfare in legislative debates.
- **Achieving critical mass:** Political theory suggests that women need at least one-third representation to influence policy effectively. Reservation helps achieve this threshold faster.
- **Inspirational impact:** Increased visibility of women in leadership roles motivates younger generations, encouraging education, ambition, and participation in public life.

Arguments opposing women's reservation

- **Concerns over meritocracy**: Critics argue that reservations may compromise merit by prioritizing gender over capability, potentially creating perceptions of unfair advantage.
- **Proxy representation issue:** At the local level, there have been instances where elected women representatives are influenced or controlled by male family members, limiting genuine empowerment.
- **Question of capability:** Some argue that reserving seats may unintentionally signal that women require special assistance to succeed, undermining their competence.
- **Unequal benefits among women**: There is a risk that reservation may primarily benefit privileged sections (urban, educated women), leaving marginalized groups underrepresented unless sub-quotas are ensured.
- **Lack of homogeneity**: Women are not a uniform group; their interests vary across caste, class, and region. Hence, a single quota may not address diverse realities.

- **Limitation on voter choice:** Reserving constituencies restricts voters from choosing candidates freely, as options become limited to a specific gender.

Way forward

- **Dual-member constituencies:** Electing two representatives (one man and one woman) from a constituency could ensure inclusion without excluding male candidates.
- **Proportional representation system:** Adopting a party-list system with alternating male and female candidates can ensure balanced representation without reserving constituencies.
- **Mandatory party-level quotas**: Political parties can be required to allocate a fixed percentage of tickets to women, promoting competition and broader participation.
- **Strengthening grassroots participation**: Encouraging women's involvement in student politics, civil society, and local governance can build a strong pipeline of future leaders.

EQUITY DEFICIT IN HIGHER EDUCATION

Context

The University Grants Commission (UGC) Promotion of Equity in Higher Education Institutions Regulations, 2026 have been put on hold by the Supreme Court of India, which noted that certain provisions appear unclear and may be susceptible to misuse.

Concept of Real Equity Gap

The equity gap in higher education refers to the mismatch between the proportion of marginalized social groups in student admissions and their significantly lower presence in academic employment and leadership roles.

Key trends and evidence

- **Employment vs Reservation Norms**: Representation of SC (15%), ST (7.5%), and OBC (27%) communities in teaching and non-teaching positions remains below prescribed reservation levels.
- **Vertical Imbalance:** The disparity widens at higher positions—such as professors and administrators compared to entry-level or support roles.
- **Admissions Picture**: At undergraduate, postgraduate, and doctoral levels, representation is broadly aligned with reservation norms; in some cases (especially STs), it even exceeds expected proportions.
- **Grievance Redressal**: During 2023–24, Equal Opportunity Cells across universities reported hundreds of complaints, with a high resolution rate, particularly in SC/ST-related cases.

Nature of the equity gap

- **Structural Employment Delay**: While admissions can be adjusted annually, employment disparities persist longer due to slower turnover and legacy recruitment patterns.
- **Leadership Representation Deficit:** Marginalized communities remain underrepresented in senior academic and administrative positions, especially in central institutions.
- **Policy Focus Imbalance:** Existing regulations emphasize penalizing discrimination but fall short on enabling equitable hiring and career progression.
- **Data Gaps:** Lack of detailed, group-wise data on complaints limits comprehensive assessment of institutional equity.
- **Risk of Social Fragmentation:** Strict anti-discrimination frameworks, if not paired with integration measures, may unintentionally deepen social divisions.

Underlying causes

- **Historical Recruitment Patterns**: Earlier periods of weak enforcement of reservation policies continue to shape current workforce composition.
- **Conceptual Ambiguity:** Policies often blur the distinction between ensuring equity (fair outcomes) and preventing discrimination (punitive action).
- **Limited Regulatory Scope:** Current mechanisms focus on grievance handling rather than systemic reforms in recruitment and promotion.
- **Institutional Politics:** Identity-based factionalism within campuses sometimes reinforces divisions rather than promoting inclusivity.

Institutional measures

- **UGC Equity Regulations, 2026**: Aimed at addressing discrimination and mandating proactive equity promotion across institutions.
- **Equal Opportunity Cells (EOCs):** Dedicated bodies within universities to address discrimination complaints.
- **SC/ST Cells:** Specialized units to monitor reservation policy implementation and handle related grievances.
- **Equity Helplines:** Support systems introduced to provide immediate assistance in cases of discrimination.

Way forward

- **Prioritize Senior-Level Inclusion:** Focused interventions are needed to improve representation in faculty leadership and decision-making roles.
- **Promote Social Cohesion:** Encourage interaction and integration across groups to reduce identity-based tensions organically.
- **Holistic Crime Reduction Approach**: Instead of isolating identity-based incidents, broader efforts to improve campus safety are essential.
- **Strengthen Regulatory Clarity:** Refine existing regulations to directly address structural inequalities rather than relying mainly on complaint mechanisms.
- **Reduce Identity-Based Polarization:** Promote institutional cultures that discourage divisive politics and emphasize shared academic goals.

INFORMAL SECTOR

Context

Recent worker protests in Noida have highlighted growing vulnerabilities in India's urban informal workforce.

Informal Sector in India

Definition and Scope

- The informal sector refers to economic activities that operate outside formal regulatory and institutional frameworks.
- It includes self-employed workers, daily wage labourers, small vendors, and unregistered enterprises.
- These workers lack job security, written contracts, and social protection, making them highly vulnerable to economic shocks.

Size and Economic Significance

- The informal sector employs nearly 90% of India's workforce, making it the dominant source of livelihood.
- Even in urban areas, formal salaried jobs remain limited, and a large share of workers depend on informal employment.
- Despite its scale, the sector remains under-recognised due to a lack of formal data and institutional coverage.

Key Issues in the Informal Sector

- Employment is largely unstable and low-paying, with no long-term security.
- There is limited access to social security, including health insurance and pensions.
- Workers also suffer from low bargaining power, particularly in urban labour markets.
- Additionally, financial exclusion forces many workers to rely on informal credit systems, leading to debt cycles.

Government Initiatives

- The Code on Social Security, 2020, aims to extend benefits to unorganised workers.
- The e-Shram portal seeks to create a national database for better policy targeting.
- Schemes like PM SVANidhi provide credit support to street vendors.

Challenges of India's Urban Informal Workforce

- Recent protests by workers in Noida reflect the increasing precariousness of urban labour.

Shift in Urban Economic Structure

- Urban centres have undergone a transformation from industrial production hubs to spaces of survival-oriented activities.
- The decline of formal industries, such as textile mills in cities like Mumbai and Ahmedabad, has reduced organised employment. This has led to fragmented labour markets dominated by informal work.

Urbanisation of Survival Economy

- Cities are increasingly focused on social reproduction activities such as housing, food, and basic services rather than industrial output.
- This shift has made urban life more about survival, especially for informal workers managing daily necessities.

Poor Living Conditions and Housing Stress

- A significant portion of the urban poor live in slums and informal settlements. Around 40% reside in such areas, often lacking sanitation and legal protection.
- Workers spend a large share of their income on rent, sometimes up to half their earnings. Many settlements are located in hazard-prone areas, increasing vulnerability.

Impact of Policy and Economic Reforms

- Economic reforms influenced by liberalisation have shifted the state's role from a service provider to a facilitator of markets.
- This has led to the privatisation of essential services like water and electricity, increasing costs for informal workers.

- Urban policies have also promoted gentrification and eviction, reducing access to affordable housing.

Financial Vulnerability and Debt

- Due to a lack of collateral, informal workers often depend on local moneylenders instead of formal banking systems.
- This results in chronic indebtedness and financial instability.

Need for Inclusive Urban Governance

- There is a growing need to integrate informal workers into governance structures.
- Initiatives such as workers' councils can help improve participation and representation in urban decision-making.