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FOR UPSC CIVIL SERVICE EXAMINATION

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VIDHVATH IAS ACADEMY



1. Mission Jal Raksha: Rajnandgaon's Science and Community-Led Water Model

Key Highlights & Summary

- **Proactive Monsoon Preparedness:** Rajnandgaon district (Chhattisgarh) spearheaded *Mission Jal Raksha* under the national #CatchTheRain campaign, focusing on source sustainability and aquifer recharge.
- **Scientific Integration:** Utilized GIS mapping, remote sensing, aquifer mapping, Digital Elevation Models (DEM), and ridge-to-valley planning to strategically locate recharge structures.
- **Innovative Engineering:** Converted over 500 defunct borewells into recharge shafts and constructed 600+ deep injection wells integrated with 1,700+ mini percolation tanks to penetrate hard-rock terrain.
- **Community-Led Movement (*Jan Bhagidari*):** Mobilized Gram Panchayats, farmers, and women for water budgeting, behavioral change, and shifting 70% of summer paddy cultivation to low-water-requiring crops.
- **Measurable Outcomes:** Constructed over 60,000 recharge structures across 662 villages, geo-tagged 2,500+ water bodies, generated 51+ lakh person-days of employment, and raised average groundwater levels by ~2.04 meters.



Essential Definitions

- **Ridge-to-Valley Approach:** A soil and water conservation strategy where treatment begins at the highest elevation (ridge) to check run-off velocity before reaching the lowest point (valley).
- **Managed Aquifer Recharge (MAR):** Purposeful recharge of water to aquifers for subsequent recovery or environmental benefit using methods like deep injection wells and recharge shafts.
- **Jan Bhagidari:** Active public participation and community ownership in governance and development initiatives.

Legal and Constitutional Framework

- **Article 48A (Directive Principles):** Mandates the State to protect and improve the environment and safeguard forests and wildlife.
- **Article 51A(g) (Fundamental Duties):** Obligates every citizen to protect and improve the natural environment, including lakes and rivers.
- **Seventh Schedule (State List - Entry 17):** Water supplies, irrigation, drainage, embankments, and storage fall primarily under State domain.
- **Jal Shakti Abhiyan: Catch The Rain (JSA:CTR):** A nationwide campaign launched under the National Water Mission focusing on rainwater harvesting structures, geo-tagging water bodies, and scientific water conservation.
- **Environment (Protection) Act, 1986:** Serves as the overarching legislation enabling regulatory guidelines by the Central Ground Water Authority (CGWA) for extraction and management.

Conclusion

Mission Jal Raksha demonstrates that combining modern spatial technologies with decentralised community participation (*Jan Bhagidari*) creates a sustainable, replicable model for climate resilience, rural



employment generation, and long-term groundwater security across drought-prone and hard-rock terrains in India.

UPSC Relevance

- **GS Paper II:** Governance, Government policies and interventions, decentralization through Panchayati Raj Institutions (PRIs).
- **GS Paper III:** Conservation, environmental impact assessment, sustainable agriculture, water resource management, and disaster risk reduction.

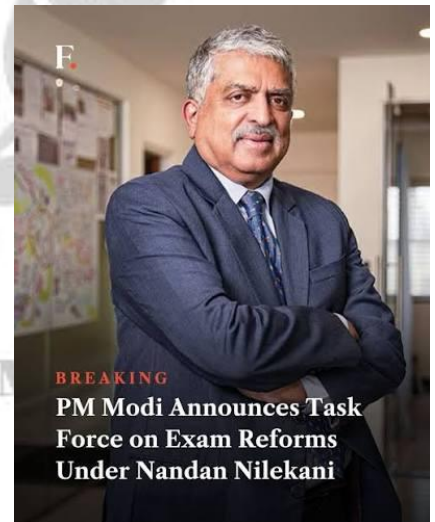
2. High-Powered Task Force on Examination Reforms Under Nandan Nilekani

Key Highlights & Summary

- **Constitution of Panel:** Prime Minister Narendra Modi announced the formation of a high-powered task force on examination reforms, chaired by tech pioneer and former UIDAI Chairman Nandan Nilekani.
- **Technology-Driven Reforms:** The task force will focus on leveraging advanced technology, secure digital infrastructure, and biometric verification to modernize competitive and public examinations.
- **Plugging Systemic Vulnerabilities:** Priorities include reforming question paper generation, encrypted digital transmission, secure Computer-Based Testing (CBT) centers, and audit mechanisms to prevent paper leaks and malpractices.
- **Institutional Restructuring:** The initiative aims to overhaul operational protocols of testing bodies like the National Testing Agency (NTA), standardizing vendor selection and third-party logistics management.
- **Restoring Public Trust:** The overarching objective is to safeguard youth interests, maintain meritocracy, and establish a tamper-proof, transparent, and resilient examination ecosystem across the country.

Essential Definitions

- **Computer-Based Testing (CBT):** An assessment delivery mechanism where candidates take exams using computer terminals over a secure network, minimizing paper-handling risks and human interference.
- **Public Examination:** Standardized competitive or selection tests conducted by statutory or designated public bodies (e.g., UPSC, NTA, SSC) for academic admissions or government recruitment.



Legal and Constitutional Framework

- **Article 315–323 (Part XIV of Constitution):** Mandates the establishment and functions of Public Service Commissions (UPSC and State PSCs) to ensure impartial, merit-based public appointments.
- **Seventh Schedule (Entry 25, Concurrent List):** Education, including technical education, medical education, and universities, lies under the joint domain of both the Parliament and State Legislatures.
- **Public Examinations (Prevention of Unfair Means) Act, 2024:** A central law providing stringent penal provisions—including non-bailable imprisonment and heavy fines—against organized syndicates, paper leaks, and cheating in public tests.



Conclusion

The Nilekani Task Force marks a critical transition toward technology-enabled, tamper-proof examination administration in India. Combining technological safeguards with strict legal enforcement under the 2024 Act will protect meritocracy, restore candidate confidence, and strengthen the integrity of public institutions.

UPSC Relevance

- **GS Paper II:** Government policies and interventions, administrative reforms, role of technology in governance, institutional accountability, and transparency in public recruitment systems.

3. PM Interacts with Participants of Viksit Vibrant Village Program 2026

Key Highlights & Summary

- **Empowering Youth in Border Governance:** Prime Minister Narendra Modi interacted with youth representatives from ~250 districts participating in the Viksit Vibrant Village Program 2026 under the *Mera Yuva Bharat (MY Bharat)* platform.
- **Paradigm Shift in Border Strategy:** Reaffirmed the policy transition of viewing border settlements not as the "last villages" of the nation, but as the "first villages" of India, receiving primary focus for infrastructure and security.
- **Youth Immersion and Integration:** Selected youth visited remote frontier regions (Himachal Pradesh, Uttarakhand, Ladakh) to foster cross-cultural understanding under the banner of *Ek Bharat, Shreshtha Bharat*.
- **Reversing Out-Migration:** Emphasized that infrastructure growth—all-weather roads, grid electricity, tap water, telecom, and internet—prevents forced migration and strengthens grassroots border resilience.
- **Boosting Border Tourism and Local Economy:** Urged youth to act as brand ambassadors for border tourism, local arts, and regional products, driving economic growth and self-reliance (*Atmanirbhar Bharat*).



Essential Definitions

- **Vibrant Villages Programme (VVP):** A Centrally Sponsored Scheme launched to ensure holistic development of strategic border villages, enhancing infrastructure, basic amenities, and local livelihoods to curb out-migration.
- **MY Bharat (Mera Yuva Bharat):** An autonomous body serving as a technology-driven umbrella platform for youth development and youth-led governance initiatives across India.
- **First Villages Concept:** A strategic framework prioritizing international border settlements for priority infrastructure, socio-economic saturation, and national defense integration.

Legal and Constitutional Framework

- **Article 1(1) & Article 2:** Pertaining to the territory of India and admission/establishment of new states or border administration units.



- **Seventh Schedule (Union List - Entry 1 & 2):** Covers Defense of India and Armed Forces; border area security and infrastructure fall within the primary mandate of the Central Government.
- **Border Area Development Programme (BADP):** A core departmental framework managed by the Ministry of Home Affairs (MHA) to meet the special development needs of people living near international land borders.
- **Directive Principles of State Policy (Article 38 & 39):** Mandates the State to promote public welfare, minimize inequalities in facilities, and ensure equal livelihood opportunities across remote geographies.

Conclusion

The Viksit Vibrant Village initiative seamlessly merges strategic border defense with socio-economic empowerment. By reframing border communities as India's primary sentinels and leveraging youth participation, the government ensures sustainable border management, national integration, and inclusive development toward a *Viksit Bharat 2047*.

UPSC Relevance

- **GS Paper II:** Government policies and interventions, issues relating to development and management of social sector, and functioning of autonomous platforms like MY Bharat.
- **GS Paper III:** Security challenges and their management in border areas, linkages of organized crime with terrorism, infrastructure development, and internal security strategy.

4. India's Weightlifting Triumph at Commonwealth Games: Mirabai Chanu and Rishikanta Win Medals

Key Highlights & Summary

- **Golden Hat-Trick for Mirabai:** Saikhom Mirabai Chanu secured her third consecutive Commonwealth Games gold medal in the women's 48kg category, following her victories at Gold Coast (2018) and Birmingham (2022).
- **New Games Records:** Mirabai set new Commonwealth Games records with an 85kg lift in snatch and a total lift of 190kg (105kg clean and jerk).
- **Historic Silver for Rishikanta:** Rishikanta Singh Chanambam won silver in the men's 60kg category with a total lift of 264kg (119kg snatch + 145kg clean and jerk), becoming the first male weightlifter from Manipur to win a Commonwealth Games medal.
- **Weightlifting Dominance:** India's weightlifting tally highlights its consistent contribution to national sport, amassing 33 medals across the last three Commonwealth Games editions.
- **International Podium:** Nigeria's Ruth Asuquo Nyong and Malaysia's Irena Jane Henry took silver and bronze in the women's 48kg class, while Malaysia's Mohamad Aniq Kasdan won gold in the men's 60kg class.



Essential Definitions

- **Snatch:** A weightlifting movement where the barbell is lifted overhead from the platform to full arm extension in one continuous motion.



- **Clean and Jerk:** A two-part weightlifting discipline where the barbell is first lifted from the ground to the shoulders (clean) and then thrust above the head (jerk).
- **Target Olympic Podium Scheme (TOPS):** A flagship program of the Ministry of Youth Affairs and Sports to assist India's top athletes with elite training, coaching, and international exposure.

Legal and Constitutional Framework

- **Seventh Schedule (State List - Entry 33):** Sports, entertainment, and amusements fall within the primary constitutional mandate of individual State Governments.
- **National Sports Development Code of India, 2011:** A regulatory framework ensuring transparency, good governance, financial accountability, and fair selection policies across National Sports Federations (NSFs).
- **Article 51A(j) (Fundamental Duties):** Encapsulates the civic obligation to strive toward excellence in all spheres of individual and collective activity, including sports, so that the nation constantly rises to higher levels of endeavor and achievement.

Conclusion

The stellar performance of Indian lifters underlines the success of target-oriented athlete support systems and robust grassroots infrastructure. Continued policy backing and decentralised sports promotion in regions like the North-East remain crucial for sustaining excellence on global platforms.

UPSC Relevance

- **GS Paper II:** Government policies and interventions for sports development, governance of National Sports Federations, and social inclusion through athletics.
- **GS Paper III:** Human resource development, talent identification programs, and regional infrastructure development in the North-Eastern states.

5. Revanth Reddy Proposes Lowering Age Limit for Entering Parliament and State Assemblies to 21

Key Highlights & Summary

- **Youth Empowerment Slogan:** Telangana Chief Minister A. Revanth Reddy proposed a new national slogan, "Jai Jawan, Jai Kisan, and Jai Yuva," emphasizing political inclusion for Gen Z (born roughly 1997–2012).
- **Lowering Eligibility Age:** Proposed reducing the minimum age to contest elections for State Legislative Assemblies and Parliament from 25 years to 21 years.
- **Legislative Strategy:** Announced plans to pass a resolution in the Telangana Legislative Assembly in August 2026 and forward it to the Centre.
- **Parliamentary Pressure via Private Member's Bill:** Suggested introducing a Private Member's Bill in Parliament through Opposition parties to push for national legislative action.
- **Integration with National Reforms:** Recommended discussing the proposal alongside major upcoming electoral initiatives, including the Delimitation Bill, Women's Reservation Bill, and expansion of Lok Sabha seats.



Essential Definitions

- **Gen Z:** The demographic cohort born approximately between 1997 and 2012, representing young adults and first-time political stakeholders.
- **Private Member's Bill:** A legislative proposal introduced in either House of Parliament by any Member of Parliament who is not a member of the Council of Ministers.
- **Joint Parliamentary Committee (JPC):** An ad-hoc committee set up by Parliament for detailed scrutiny of complex legislative proposals or issues requiring inter-party consultation.

Legal and Constitutional Framework

- **Article 84(b):** Mandates a minimum age of 25 years to contest elections for the Lok Sabha and 30 years for the Rajya Sabha.
- **Article 173(b):** Prescribes a minimum age of 25 years to contest State Legislative Assembly elections and 30 years for State Legislative Councils.
- **61st Constitutional Amendment Act, 1988:** Lowered the voting age in India from 21 to 18 years under Article 326, expanding youth participation in elections.
- **73rd and 74th Constitutional Amendments, 1992:** Set the minimum age requirement at 21 years to contest elections to rural and urban local bodies (Panchayats and Municipalities).



Conclusion

Lowering the eligibility age to 21 for parliamentary and assembly elections aligns youth candidacy thresholds with local governance standards, transforming India's demographic dividend into direct political representation and policy participation.

UPSC Relevance

- **GS Paper II:** Indian Constitution (historical underpinnings, amendments, significant provisions), Parliament and State Legislatures (structure, functioning, conduct of business, and Private Member Bills), and issues relating to democratic governance and youth participation.

6. Strategic Autonomy: Do Not Surrender to China, Do Not Depend on the U.S.

Key Highlights & Summary

- **Strategic Dilemma:** The erratic political shifts in Washington create uncertainty, but shifting toward an unreciprocated economic or diplomatic reset with China poses equal risk.
- **Pitfalls of Business-Led Reset:** Domestic corporate lobbies advocating for cheap Chinese capital, Active Pharmaceutical Ingredients (APIs), and machinery ignore Beijing's long-term containment policy.
- **Pattern of Chinese Aggression:** China continuously alters status quo along the Line of Actual Control (LAC) using "salami-slicing" tactics, issuing stapled visas, and weaponizing supply chain dominance.



- **Economic Leverage as Security Risk:** China's annual trade surplus over India exceeds \$100 billion; surrendering leverage built post-Galwan (restrictions on Chinese apps/investments) hands Beijing an economic kill-switch.
- **Myth of Reciprocity:** Beijing seeks a unipolar Asia, continuously blocks India at the UN Security Council (UNSC) and Nuclear Suppliers Group (NSG), and supports adversaries strategically.
- **Way Forward:** India must practice strategic patience, accelerate supply chain resilience, diversify global trade partnerships, and bolster domestic manufacturing capabilities.



Essential Definitions

- **Strategic Autonomy:** A nation's capacity to pursue independent foreign policy objectives based on national interest without being constrained by allied commitments or external coercion.
- **Salami-Slicing Tactics:** A series of small, incremental covert or overt actions performed to achieve a larger strategic goal that would be difficult to accomplish all at once.
- **Asymmetric Dependency:** A situation in bilateral economic ties where one nation relies far more heavily on another for critical inputs and trade, creating strategic vulnerability.

Legal and Constitutional Framework

- **Article 51 (Directive Principles of State Policy):** Directs the State to promote international peace and security, maintain just and honorable relations between nations, and foster respect for international law.
- **Foreign Trade (Development and Regulation) Act, 1992:** Empowers the Central Government to formulate, regulate, and restrict foreign trade policies to protect domestic economic interests and national security.
- **Public Procurement (Preference to Make in India) Order:** Administrative mechanism deployed to restrict foreign procurement in sensitive infrastructure and national security projects.

Conclusion

Navigating great-power rivalry requires India to avoid subordinating national interest to an unpredictable partner while resisting economic capitulation to a hostile neighbor. Sustainable security lies in internal fortification, industrial self-reliance, and balanced global trade diversification.

UPSC Relevance

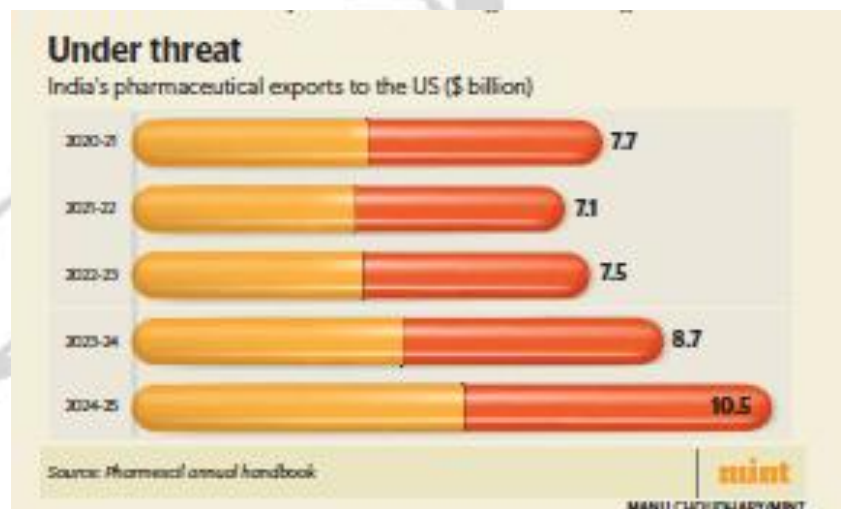
- **GS Paper II:** India and its neighborhood-relations, bilateral and global groupings involving India, and the effect of policies of developed and developing countries on India's interests.
- **GS Paper III:** Indian economy and issues relating to planning, mobilization of resources, growth, development, and supply chain security.



7. US Phased Tariffs on Generic Drugs: Implications for Indian Pharmaceutical Sector

Key Highlights & Summary

- **Proposed Phased Tariffs:** The US administration announced a phased tariff structure on generic drugs, keeping tariffs at 0% for two years, raising them to 100% after two years, and subsequently to 200% after another year to force reshoring.
- **Critical Market Exposure:** The US is India's largest pharmaceutical export market, generating \$9.7 billion in 2025 (accounting for ~37% of overall Indian drug exports).
- **Volume Dominance:** India supplies nearly half (~47%) of all generic prescriptions dispensed in the US, making American market stability vital for Indian drugmakers.
- **Viability and Timeline Concerns:** Industry experts view the 2-year reshoring window as unrealistic due to complex plant setups, regulatory inspections, approval delays, and high domestic US manufacturing costs.
- **Corporate Hedging Strategies:** Indian firms are exploring options like technology transfers to US partners while diversifying revenue streams across non-US global markets to mitigate revenue risks.
- **Strategic Bargaining Tool:** Similar to past tariff threats on patented drugs, these proposals are widely seen as leverage to compel localized manufacturing and price adjustments rather than immediate absolute bans.



Essential Definitions

- **Generic Drugs:** Bioequivalent, low-cost off-patent copies of original pharmaceutical molecules that match the brand-name drug in dosage, safety, strength, quality, and performance.
- **Reshoring:** The policy and process of returning the manufacturing of goods back to the home country from overseas operational bases.
- **Technology Transfer:** Formal licensing or sharing of technical knowledge, manufacturing processes, and formulations between entities to enable local production.

Legal and Constitutional Framework

- **Article 21 (Right to Life and Health):** Guarantees right to health; global trade shocks affecting drug sector revenues can impact domestic healthcare R&D and affordable medicine availability.
- **Foreign Trade (Development and Regulation) Act, 1992:** Governs Indian export promotion policies, enabling government intervention to cushion critical export sectors from protectionist foreign tariffs.



- **WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS):** Balances patent protection with public health flexibilities, underpinning global generic drug production and export frameworks.
- **WTO General Agreement on Tariffs and Trade (GATT - Article I & II):** Regulates Most-Favoured-Nation (MFN) principles and binding tariff ceilings to prevent discriminatory or excessive unilateral trade barriers.

Conclusion

While proposed tariffs aim to reshore US pharmaceutical manufacturing, structural cost differentials make full replacement of Indian generic supplies economically unviable. Indian pharmaceutical exporters must accelerate technology partnerships, expand into emerging global markets, and shift toward high-value biosimilars to maintain long-term resilience.

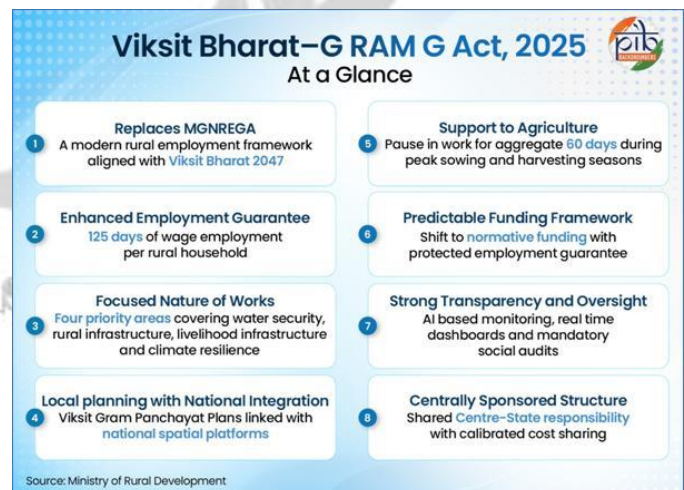
UPSC Relevance

- **GS Paper II:** Bilateral, regional, and global groupings and agreements involving India and affecting India's interests; effect of policies of developed countries on India's economy.
- **GS Paper III:** Indian economy (exports, industrial policy, trade barriers), Intellectual Property Rights (IPR) issues, and generic healthcare management.

8. VB-GRAM G: Revamped Rural Employment Scheme Drives Women's Economic Leadership

Key Highlights & Summary

- **Surge in Female Participation:** Women contributed over 63% of the 46.2 million person-days generated under the Viksit Bharat–Guarantee for Rozgar and Aajeevika Mission (Gramin) (VB-GRAM G) in its first 20 days (1–20 July 2026).
- **Leadership at Worksites:** Around 61% of worksites have appointed women as supervisors (*mates*), strengthening workplace monitoring, community engagement, and grassroots leadership.
- **Diversified Work Options:** Expanded scope beyond manual labor includes social audits, nursery management, vermicompost units, self-help group infrastructure, storage facilities, and rural *haats*.
- **Institutional Support Systems:** Dedicated childcare provisions mandate appointing a paid worker to manage children at worksites where five or more children below five years are present.
- **Expanded Rights and Wages:** Statutory employment guarantee increased to 125 days per household per year (up from 100 days), with national average daily wages raised to ₹327.4 per day.
- **Revised Cost-Sharing:** Modern funding model transitions from 100% central wage funding to a 60:40 ratio between Centre and States (90:10 for North-Eastern and Himalayan States).





Essential Definitions

- **Person-Day:** A metric representing one person employed for one full working day; standard measure for quantifying total labor generated under public works programs.
- **Worksite Supervisor (*Mate*):** A designated worker responsible for monitoring attendance, measuring physical output, maintaining worksite records, and managing on-site facilities.
- **Social Audit:** A process through which local communities inspect, monitor, and evaluate the execution and financial propriety of government schemes.

Legal and Constitutional Framework

- **Article 39(a) & (d) (Directive Principles):** Directs the State to secure adequate means of livelihood for all citizens and ensure equal pay for equal work for both men and women.
- **Article 42 (Directive Principles):** Mandates the State to make provision for securing just and humane conditions of work and for maternity relief.
- **Viksit Bharat–Guarantee for Rozgar and Aajeevika Mission (Gramin) Act:** Statutory framework replacing MGNREGA to guarantee 125 days of wage employment per rural household while embedding dedicated gender-responsive childcare provisions.

Conclusion

By blending expanded job opportunities, childcare support, and higher statutory guarantees, VB-GRAM G transforms rural employment from simple wage relief into a powerful engine for gender-inclusive development and decentralised rural leadership.

UPSC Relevance

- **GS Paper II:** Government policies and interventions for development in various sectors, welfare schemes for vulnerable sections, and functioning of Panchayati Raj Institutions.
- **GS Paper III:** Issues related to employment, inclusive growth, women's participation in the labor force, rural infrastructure creation, and public finance management.

9. Nepal Seeks Indian Recognition for National Identity Card (NID) as Travel Document

Key Highlights & Summary

- **Diplomatic Request:** Nepal has formally requested India to recognize its National Identity Card (NID) as a valid travel document for Nepali citizens visiting India.
- **Expanding Identity Proofs:** If approved, the NID will serve as the third valid identification document for Nepali citizens traveling by air and land, alongside existing citizenship certificates and passports.
- **Diplomatic Channels Mobilized:** The proposal was forwarded by Nepal's Department of Immigration via its Ministry of Home Affairs and Ministry of Foreign Affairs to Indian authorities and the Indian Embassy in Kathmandu.
- **Modernization of Identification:** Nepal launched the biometric NID in 2018 to modernize public administration, make digital banking secure, and gradually phase out traditional paper citizenship certificates.



- **Current Travel Reciprocity:** Nepali citizens currently use passports or citizenship certificates, while Indian citizens travel to Nepal using Indian passports or Voter ID cards issued by the Election Commission of India.

Essential Definitions

- **National Identity Card (NID):** A biometric digital identification card issued by Nepal containing unique personal and biometric details to streamline governance, banking, and public service delivery.
- **Open Border System:** A boundary arrangement allowing unrestricted movement of citizens across international borders without formal visa requirements, subject to designated identity verifications.
- **Citizenship Certificate:** A traditional physical document certifying a person's legal nationality, currently used as primary legal identity in Nepal.

Legal and Constitutional Framework

- **1950 India-Nepal Treaty of Peace and Friendship:** Serves as the bedrock of bilateral relations, granting reciprocal rights to citizens of both nations regarding travel, residence, employment, and property ownership without requiring visas.
- **Passports (Entry into India) Act, 1920:** Governs the regulation and exemption of travel documents and identity requirements for foreign nationals entering Indian territory.
- **Article 51 (Directive Principles of State Policy):** Mandates India to foster peaceful international relations, respect treaty obligations, and maintain mutual goodwill with neighboring countries.

Conclusion

Recognizing Nepal's biometric NID as an official travel document will modernize border verification, facilitate seamless cross-border mobility, and reinforce socio-economic ties under the open border framework, provided robust security integration is maintained between both security establishments.

UPSC Relevance

- **GS Paper II:** India and its neighborhood-relations, bilateral treaties and agreements (1950 Treaty of Peace and Friendship), regional integration, and border management issues.
- **GS Paper III:** Internal security challenges through open borders, security verification mechanisms, and digital public infrastructure in regional governance.

10. Fields Medal 2026: China's Strategic Investments Fuel Mathematical and Scientific Breakthroughs

Key Highlights & Summary

- **Historic Fields Medal Milestone:** Two Chinese nationals—Yu Deng and Hong Wang—were among four recipients of the 2026 Fields Medal, marking the first time Chinese nationals have won the honor.
- **Cohort of Global Laureates:** The other 2026 medalists are John Pardon (USA) and Jacob Tsimerman (Canada), recognized at the International Congress of Mathematicians in Philadelphia.
- **Massive Resourcing and R&D Growth:** China increased its national R&D expenditure from under 1% of GDP in 2000 to approximately 2.6% of a significantly expanded GDP economy.



- **Expanding Global Talent Pool:** China's researcher base grew more than threefold in two years to over 2.28 million, ranking among the highest globally alongside top OECD nations.
- **Dominance in Mathematical Olympiads:** Chinese teams have consistently led the International Mathematical Olympiad (IMO), claiming rank one in all but eight editions since 2000.
- **Underpinning Technological Dominance:** Mathematical proficiency directly accelerates China's artificial intelligence capabilities, advanced computing models, and foundational research ecosystems.

Essential Definitions

- **Fields Medal:** Highest international award in mathematics, presented every four years by the International Mathematical Union (IMU) to outstanding researchers under 40 years of age.
- **Purchasing Power Parity (PPP):** An economic metric comparing economic productivity and standards of living across nations by adjusting currency values to equal buying power.
- **Basic Research:** Systematic foundational study directed toward fuller knowledge or understanding of fundamental science rather than immediate commercial application.

Legal and Constitutional Framework

- **Article 51A(h) (Fundamental Duties):** Directs Indian citizens to develop scientific temper, humanism, and the spirit of inquiry and reform.
- **Science, Technology, and Innovation Policy (STIP):** India's strategic policy framework guiding public and private investment into critical emerging technology, basic research, and core scientific workforce development.
- **Anusandhan National Research Foundation (ANRF) Act, 2023:** Statutory body established to seed, grow, and promote R&D and foster a culture of research across Indian universities and academic institutions.

Conclusion

China's mathematical breakthroughs showcase how sustained R&D investment, elite university backing, and foundational STEM promotion yield global leadership. For India, building critical research infrastructure and retaining scientific talent are crucial to converting its demographic potential into global innovation leadership.

UPSC Relevance

- **GS Paper II:** Government policies and interventions in higher education, institutional R&D capacity building, and global talent competitiveness.
- **GS Paper III:** Science and Technology—developments and their applications, achievements of Indians in science & technology, technology indigenization, and R&D funding models.

11. Indus Waters Treaty: India's Upstream Push and Pakistan's Hydro-Diplomacy

Key Highlights & Summary

- **Strategic Shift and Abeyance:** Following security concerns and cross-border hostility, India placed the 1960 Indus Waters Treaty (IWT) in abeyance, asserting that "blood and water cannot flow together".



- **Accelerated Hydropower Projects:** India is expediting major projects on the Western Rivers (Chenab basin), including the 1,856 MW Sawalkot, 1,000 MW Pakal Dul, 850 MW Ratle, 624 MW Kuru, and 540 MW Kwar projects to prevent water wastage.
- **Ujh Multipurpose Project:** Located on a tributary of the Ravi, the project secures water storage for irrigation and drinking water while preventing unutilized flows across the International Boundary.
- **Flushing and Maintenance Operationalization:** India is restoring reservoir capacity through low-level outlet drawdown flushing and sediment management—practices long delayed by Pakistan's technical objections.
- **Domestic Crisis in Lower Riparian:** Pakistan suffers from severe domestic water mismanagement, losing nearly 30-40% of canal water to seepage while letting ~35 million acre-feet (MAF) flow unutilized into the sea annually.
- **Evolving Hydrological Realities:** Climate variability, population expansion, and clean energy demands require modernizing dam infrastructure beyond the 1950s technological assumptions under which the treaty was drafted.



Essential Definitions

- **Run-of-the-River Project:** Hydropower facilities generating electricity from natural river flow with minimal or no water storage behind dams.
- **Drawdown Flushing:** An engineering mechanism releasing water through low-level outlets to flush accumulated sediment and maintain active reservoir volume.
- **Lower Riparian State:** A country located downstream along a river system, dependent on water originating from or passing through upper riparian nations.

Legal and Constitutional Framework

- **Indus Waters Treaty (1960):** Brokered by the World Bank, giving India exclusive rights over Eastern Rivers (Ravi, Beas, Sutlej) and allocating Western Rivers (Indus, Jhelum, Chenab) to Pakistan, while allowing India specified non-consumptive uses including hydropower generation.
- **Article 253 of the Constitution:** Grants Parliament the power to make laws for the whole or any part of India to implement any international treaty, agreement, or convention.
- **Seventh Schedule (Entry 56, Union List):** Authorizes the Central Government to regulate and develop inter-state rivers and river valleys in the national interest.

Conclusion

India's strategic acceleration of river infrastructure balances clean energy transition with national security priorities. Addressing modern hydrological realities and optimizing assigned water shares remains crucial for long-term regional stability and energy transition goals.

UPSC Relevance

- **GS Paper II:** India and its neighborhood relations, transboundary water treaties, international dispute settlement mechanisms, and foreign policy dynamics.



- **GS Paper III:** Infrastructure development (energy and hydropower), water resource management, climate adaptation, and internal security aspects of transboundary water governance.

12. Unprecedented Wave of Floods Hits Upper Assam: Causes, Impact, and Structural Challenges

Key Highlights & Summary

- **Catastrophic Impact:** Severe flooding in Upper Assam (Sivasagar, Charaideo, and Jorhat districts) affected over 7 lakh people, displaced 1.15 lakh into relief camps, and resulted in at least 66 flood-related fatalities.
- **Swollen Brahmaputra Tributaries:** Heavy upstream rainfall caused major Brahmaputra tributaries—Dikhow, Dhansiri, Disang, Janji, and Darika—to flow above critical danger levels.
- **Upstream Extreme Weather:** High-intensity rainfall in upstream hilly regions (such as Mon district in Nagaland recording 137 mm in 8–9 hours) triggered sudden downpour runoffs and landslides.
- **Compounding Anthropogenic Drivers:** Excessive river valley excavation, unregulated hillside mining, and deforestation in watershed areas severely reduced vegetation cover and accelerated topsoil erosion.
- **Heavy Siltation and Reduced Carrying Capacity:** Massive influx of washed-down mud and silt raised riverbed elevations, drastically reducing carrying capacity and impeding post-flood drainage.

Essential Definitions

- **Cloudburst vs. Heavy Rainfall Event:** A cloudburst is defined as localized rainfall exceeding 100 mm per hour over a small geographical area, whereas prolonged high-intensity rainfall delivers comparable volumes over several hours.
- **River Carrying Capacity:** The maximum volume of water and sediment load a river channel can transport within its banks without overflowing into adjoining floodplains.
- **Watershed Siltation:** Accumulation of loose soil, rock fragments, and organic matter in riverbeds caused by runoff from denuded, un-vegetated slopes.

Legal and Constitutional Framework

- **Article 21 (Right to Life and Safe Environment):** Guarantees right to basic human safety, livelihood protection, and disaster response during climate crises.
- **Disaster Management Act, 2005:** Provides statutory authorization for the National Disaster Management Authority (NDMA) and State Disaster Management Authorities (SDMA) to execute emergency relief, rescue, and risk mitigation protocols.
- **National Water Policy, 2012:** Mandates integrated river basin planning, non-structural flood control measures, flood plain zoning, and erosion management.
- **Environment (Protection) Act, 1986:** Empowers central and state authorities to restrict illegal riverbed mining, environmental degradation, and unsustainable land-use changes in ecologically fragile catchments.





Conclusion

Addressing Assam's recurrent flood disaster requires shifting from reactive disaster response to proactive, cross-border watershed management. Implementing comprehensive afforestation, regulating riverbed excavation, integrating real-time regional hydrometeorological forecasting, and adopting nature-based river basin solutions are essential to build climate resilience.

UPSC Relevance

- **GS Paper I:** Physical geography of India (Brahmaputra river system, monsoon mechanics, and extreme weather phenomena).
- **GS Paper III:** Disaster and disaster management (floods, landslides, climate change adaptation), environmental degradation (deforestation, siltation), and sustainable infrastructure.

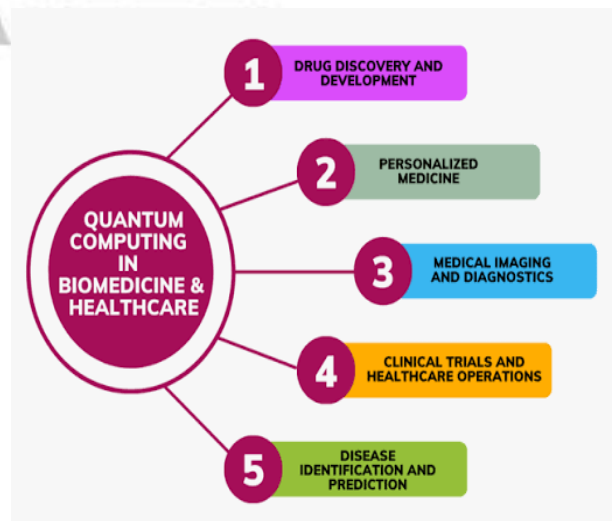
13. Quantum Computing and Artificial Intelligence in Immunology and Precision Medicine

Key Highlights & Summary

- **Technological Synergies in Healthcare:** Researchers at Technical University of Denmark (DTU) combined a photonic quantum computer with AI to design specialized peptides that bind effectively to Human Leukocyte Antigen (HLA) molecules.
- **Overcoming Data Asymmetry:** Photonic quantum computing generates a richer, correlated random starting distribution, enabling AI to explore a broader search space for rare, underrepresented HLA types.
- **Addressing Large Search Spaces:** Out of hundreds of billions of possible amino acid sequences, quantum-guided AI models efficiently filter potential candidates that bind stably to HLA molecules.
- **Applications in Personalised Medicine:** Successful peptide binding serves as the critical initial step for developing targeted cancer vaccines, neoantigen therapies, and customized immunotherapies.
- **Experimental Laboratory Validation:** In vitro testing confirmed that quantum-designed peptides successfully stabilized complex HLA molecules across diverse and historically hard-to-predict immune profiles.

Essential Definitions

- **Photonic Quantum Computing:** A quantum processing mechanism that uses individual light particles (photons) as qubits to process complex, multi-dimensional information simultaneously through quantum principles.
- **Peptides:** Short chains of amino acids that form the fundamental building blocks of proteins, functioning as molecular markers on cell surfaces for immune system detection.
- **Human Leukocyte Antigen (HLA):** Highly variable surface proteins that hold up peptides to allow immune cells to distinguish between native health cells and foreign or diseased pathogens.





Legal and Constitutional Framework

- **Article 21 (Right to Health):** Implicitly guarantees citizens access to public health protection, advanced biomedical research, and life-saving personalized medical technologies.
- **National Quantum Mission (NQM):** Approved by the Union Cabinet to seed, nurture, and scale up scientific and industrial R&D in quantum technology across health, defense, and computing domains.
- **National Bio-Pharma Mission (Innovate in India):** An industry-academia collaborative initiative aiming to accelerate early-stage development of biopharmaceuticals, vaccines, and precision therapeutics.
- **Drugs and Cosmetics Act, 1940:** Establishes the regulatory baseline for validating computational, preclinical, and clinical trials of AI-generated bio-therapeutic agents before public usage.

Conclusion

Integrating quantum computing with artificial intelligence transforms molecular research by replacing brute-force computational searches with precise simulations. Applying these technologies to immunology accelerates targeted drug discovery, mitigates global health disparities in genomics, and advances sustainable precision oncology.

UPSC Relevance

- **GS Paper III: Science and Technology**—developments and applications in everyday life; awareness in fields of IT, Computers, Robotics, Nanotechnology, and Biotechnology; bio-therapeutics and healthcare innovation.

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