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Monday, August 31, 2026



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IMPORTANT INSIGHTS

India-China Border Talks Advance Boundary Delimitation and Institutionalised Border Management Through an Eight-Point Consensus

Recent Developments:

- India and China reached an **eight-point consensus** during the **25th round of Special Representatives' (SR) Talks** on the boundary question held in Beijing on **25 August 2026**.
- The Indian side was represented by **National Security Adviser Ajit Doval**, while the Chinese side was represented by **Foreign Minister Wang Yi**.
- Both countries agreed to advance discussions on an **"Early and Substantial Harvest"** in boundary delimitation and improve mechanisms for managing the **Line of Actual Control (LAC)**.
- The consensus focuses on maintaining **peace and tranquillity**, strengthening military communication, improving border management and sustaining dialogue on a **fair, reasonable and mutually acceptable settlement**.
- The two sides also agreed to hold the **26th round of SR Talks in India in 2027**.

India-China Boundary Dispute:

Nature and Extent of the Dispute:

- India and China have differing perceptions of the alignment of the **LAC**, resulting in overlapping territorial claims and periodic face-offs.
- India considers the boundary to extend for approximately **3,488 km**, while the two countries have not mutually agreed upon a clearly demarcated international boundary.
- The dispute is generally divided into the **Western Sector, Middle Sector and Eastern Sector**.

Western Sector – Aksai Chin:

- China controls approximately **38,000 square kilometres** of territory in Aksai Chin, which India considers part of the Union Territory of Ladakh.
- The sector has major strategic importance because it connects Tibet with Xinjiang and lies close to India's sensitive northern frontier.

Middle Sector – Himachal Pradesh and Uttarakhand:

- The Middle Sector covers relatively smaller areas of disagreement along parts of **Himachal Pradesh and Uttarakhand**.
- Territorial differences in this sector are comparatively limited, making it potentially more manageable for negotiated progress.

Eastern Sector – Arunachal Pradesh:

- China claims approximately **90,000 square kilometres** of territory administered by India as Arunachal Pradesh.
- China rejects the **1914 McMahon Line** and refers to parts of the region as **Zangnan**, while India considers Arunachal Pradesh an integral and inalienable part of its territory.

Evolution of the India-China Boundary Negotiation Framework:

Historical Institutional Framework:

- India and China have developed multiple diplomatic and military mechanisms to prevent differences along the boundary from escalating into armed conflict.
- The **1993 Agreement on Peace and Tranquillity** established the principle of maintaining stability along the LAC pending a final settlement.
- The **1996 Agreement on Confidence-Building Measures (CBMs)** introduced military confidence-building arrangements along the border.
- The **2003 mechanism of Special Representatives** elevated boundary negotiations to a political level.
- The **2005 Agreement on Political Parameters and Guiding Principles** provided an important framework for pursuing a final boundary settlement.
- The **Working Mechanism for Consultation and Coordination (WMCC)**, established in 2012, provides a diplomatic mechanism for handling border-related issues.

Impact of the 2020 Eastern Ladakh Crisis:

- The crisis in eastern Ladakh significantly disrupted bilateral relations and demonstrated the fragility of existing confidence-building mechanisms.
- The experience reinforced India's position that **peace and tranquillity in border areas are essential for the normal development of bilateral relations**.
- Consequently, preventing local incidents from escalating into wider strategic confrontation has become a central objective of recent negotiations.

Towards an “Early and Substantial Harvest”: – –

Meaning of the New Approach:

- The latest consensus seeks to pursue practical and incremental progress instead of waiting exclusively for a comprehensive final settlement.
- Both countries reaffirmed their commitment to a **fair, reasonable and mutually acceptable solution** based on the **2005 Political Parameters and Guiding Principles** and subsequent SR-level understandings.
- An **Early and Substantial Harvest** does not imply immediate resolution of the entire boundary dispute; rather, it indicates an attempt to achieve meaningful progress in appropriate areas and mechanisms.

New Mechanisms Under the WMCC:

- The **Expert Group on Boundary Delimitation** will advance discussions on areas where progress in identifying an agreed boundary alignment may be possible.
- The **Working Group on Border Management** will focus on practical measures for maintaining stability along the disputed frontier.
- Both mechanisms will initially finalise their respective **Terms of Reference (ToR)**, which will determine their scope and operational priorities.

Delimitation and Demarcation:

- **Delimitation** refers to determining and agreeing upon the legal alignment of an international boundary.
- **Demarcation** refers to physically marking an already agreed boundary on the ground through pillars, markers or other recognised methods.

- Therefore, progress in delimitation represents an important political and legal step but does not automatically amount to complete physical demarcation.

Strengthening Military Communication and Border Management:

Additional Communication Mechanisms:

- India and China agreed to establish **two additional meeting points** for General-level or Senior Highest Military Commander-level interactions.
- They also agreed to create **two additional military hotlines in the Eastern and Middle Sectors**.
- Existing diplomatic and military mechanisms, including the **WMCC and local commander-level meetings**, will continue to address ground-level situations.

Strategic Significance:

- Additional communication channels can reduce the possibility of **misunderstanding, miscalculation and unintended escalation**.
- Rapid communication is particularly important because differing perceptions of the LAC can lead patrols of the two sides to encounter each other unexpectedly.
- Institutionalised communication creates a structured process for resolving incidents before they acquire wider political or military consequences.
- Improved understanding of the LAC in appropriate areas could also contribute to more predictable border management, although it remains distinct from a final settlement of the boundary question.

Trans-Border Rivers and the Brahmaputra:

Importance of River Cooperation:

- India and China agreed to hold the next meeting of the **Expert-Level Mechanism on Trans-Border Rivers** in September.
- Discussions are expected to include **hydrological data sharing, renewal of relevant Memoranda of Understanding and broader trans-border river management**.
- Such cooperation is important because several rivers originating on the Tibetan Plateau flow downstream into India.

Brahmaputra River Concerns:

- The **Brahmaputra**, known as the **Yarlung Tsangpo** in Tibet, originates in the Tibetan region before entering India and subsequently flowing into Bangladesh.
- India's concerns include the availability of timely hydrological information, flood forecasting, ecological impacts, sediment movement and the possible downstream implications of upstream infrastructure projects.
- Reliable data sharing is important for **disaster preparedness, flood management, water security and protection of downstream populations**.
- Cooperation on trans-border rivers demonstrates that environmental and resource-security issues can require sustained engagement even when broader strategic relations remain difficult.

Significance of the Eight-Point Consensus for India:

From Crisis Management to Institutional Management:

- The consensus represents an attempt to strengthen regular institutional mechanisms rather than relying exclusively on ad hoc crisis diplomacy.
- Better military communication can improve the management of local incidents and reduce escalation risks.

Preserving India's Strategic Interests:

- India can pursue diplomatic engagement while simultaneously maintaining **military preparedness and infrastructure development** along the LAC.
- Dialogue does not eliminate the need for credible deterrence because unresolved territorial differences and strategic competition continue to shape the bilateral relationship.

Creating Space for Broader Engagement:

- Greater stability along the border can create conditions for cooperation and communication in other areas of the bilateral relationship.
- However, progress in broader relations will depend upon sustained implementation of border-management commitments and avoidance of renewed ground-level tensions.

Challenges and Limitations:

Unresolved Territorial Claims:

- Fundamental differences over the alignment of the boundary and the LAC remain unresolved.
- An institutional mechanism can manage disputes more effectively, but it cannot automatically reconcile competing territorial claims.

Trust Deficit:

- The legacy of the 2020 crisis has created a significant strategic and military trust deficit.
- The effectiveness of new mechanisms will depend upon consistent implementation and adherence to mutually agreed procedures.

Difference Between Management and Settlement:

- Improved hotlines, meetings and crisis-management mechanisms can stabilise the border without producing a final political settlement.
- Therefore, progress should be assessed through concrete outcomes rather than diplomatic declarations alone.

Way Forward:

- India should follow a **dual-track approach of credible deterrence and sustained diplomacy**.
- Military preparedness, border infrastructure and surveillance capabilities should be strengthened alongside diplomatic engagement.
- Progress in boundary delimitation should be **incremental, verifiable and consistent with established agreements**.

- Communication mechanisms should be regularly tested and institutionalised to ensure their effectiveness during crises.
- Cooperation on trans-border rivers should prioritise **timely data sharing, disaster preparedness and environmental security**.
- Any normalisation of bilateral relations should remain linked to the sustained maintenance of **peace and tranquillity along the border**.

Conclusion:

The 25th India-China Special Representatives' Talks represent an important effort to move from episodic crisis management towards **institutionalised border management**. The proposed Early and Substantial Harvest, new military communication channels and continued engagement through the WMCC can reduce the risk of accidental escalation. However, the fundamental boundary dispute remains unresolved. For India, the most prudent approach is to combine **diplomatic engagement with strategic preparedness**, while pursuing gradual, verifiable and mutually acceptable progress towards a long-term settlement.

Nepal Flash Flood Disaster Exposes Himalayan Vulnerability to Compound Hazards and Demands Risk-Sensitive Mountain Development

Recent Developments:

- A catastrophic **flash flood and debris-flow disaster** struck the Nepal–China Himalayan border region on **26 August 2026**, causing extensive deaths, disappearances and destruction of settlements, roads, bridges and other critical infrastructure.
- Preliminary scientific analysis indicates that the disaster was most likely initiated by a **glacial collapse and debris avalanche** in the Langtang region, rather than by a conventional Glacial Lake Outburst Flood alone.
- The United States Geological Survey identified a source area on a glaciated mountain cliff on the northern side of **Langtang Lirung**, where the collapse generated energy equivalent to approximately a magnitude **5.2 earthquake** and produced a debris flow that travelled nearly **100 kilometres** downstream.
- The collapsing ice and rock incorporated water, sediment and additional debris as it moved downslope, eventually producing a rapidly moving, debris-laden flood through the **Lhende Khola, Bhote Koshi and Trishuli river systems**.
- The disaster also created concerns about **secondary natural-dam and lake formation**, demonstrating how one high-altitude hazard can generate subsequent flooding and complicate rescue operations.
- The event highlights the growing importance of understanding **compound and cascading hazards** in the Himalayas, where glacier instability, avalanches, landslides, extreme precipitation and flash floods can interact.
- The disaster has direct relevance for India because Himalayan rivers such as the **Koshi, Gandak and Karnali** originate in or pass through Nepal before entering India, making upstream disasters important for downstream flood management and disaster preparedness.

Understanding the Major Himalayan Hazards:

Flash Floods:

- A **flash flood** is a sudden and rapidly developing flood in which water levels rise within a short period, leaving limited time for evacuation and response.

- Flash floods can be triggered by **cloudbursts, intense rainfall, rapid snow or glacier melt, Glacial Lake Outburst Floods, landslide-dammed lake failures and sudden releases from natural or artificial barriers**.
- The Himalayas are particularly vulnerable because steep slopes, narrow valleys and high river gradients allow large volumes of water to travel rapidly towards downstream settlements.
- Himalayan flash floods frequently carry **boulders, sediment, mud and construction debris**, converting ordinary flooding into highly destructive debris flows.
- A **flash flood differs from a normal riverine flood** primarily in its speed and warning time; riverine floods generally develop more gradually, whereas flash floods can occur within a very short period after the triggering event.
- The destructive potential of a Himalayan flash flood therefore depends not only on the quantity of water but also on the amount of sediment and debris incorporated into the flow.

Avalanches:

- An **avalanche** is the rapid downslope movement of snow, ice, rock or a mixture of these materials under the influence of gravity.
- A snow avalanche generally develops when accumulated snow becomes unstable because of a **weak internal layer, heavy snowfall, rapid warming, wind loading, vibration or another trigger**.
- An **ice avalanche or glacier avalanche** occurs when a portion of a glacier or hanging glacier suddenly detaches and moves downslope at high velocity.
- A **rock avalanche** involves the rapid collapse and downslope movement of a large mass of rock.
- An **ice-rock avalanche** combines ice and rock and can become particularly destructive because the moving mass can entrain snow, water, sediment and additional material during its descent.
- The recent Nepal disaster is important because scientific evidence points towards a **glacial collapse and debris avalanche**, which subsequently generated flooding, rather than a simple snow avalanche.

Glacial Lake Outburst Floods:

- A **Glacial Lake Outburst Flood, or GLOF**, occurs when water stored in a glacial lake is suddenly released because the natural dam containing the lake fails or is overtopped.
- Glacial lakes commonly form when retreating glaciers leave behind depressions that accumulate meltwater and become enclosed by **moraine or ice dams**.
- A GLOF can be triggered by an **ice or rock avalanche entering the lake, earthquake, intense rainfall, rapid snow or glacier melt, dam erosion or structural weakening of the moraine**.
- The sudden release of stored water can generate a powerful downstream flood carrying large quantities of sediment, boulders and debris.
- GLOFs are particularly dangerous because a relatively small high-altitude lake can release a very large volume of water within a short period.

GLOF and Glacial Collapse – Key Difference:

- A GLOF begins with the sudden release of water from an existing glacial lake, whereas a **glacial collapse begins with the failure or detachment of a glacier or ice-rock mass**.
- In a GLOF, the primary stored hazard is **water behind a natural dam**; in a glacial collapse, the initial moving material is **ice, rock and associated debris**.
- However, the two hazards can interact because a glacial or rock avalanche can enter a glacial lake, displace its water and trigger a GLOF.
- Therefore, Himalayan disasters should not always be classified into isolated categories because one hazard can become the trigger for another.

Landslide-Dammed Lake Outburst Flood:

- A **landslide-dammed lake outburst flood** occurs when a landslide blocks a river and creates a temporary natural lake that subsequently breaches.
- The resulting flood can be extremely destructive because the temporary dam is generally unstable and lacks the engineering controls of a conventional reservoir.
- This mechanism demonstrates another important Himalayan hazard chain: **landslide → river blockage → temporary lake → dam failure → flash flood**.

How Himalayan Hazards Become Compound and Cascading Disasters:

Typical Hazard Cascade:

- **Climate warming and permafrost degradation** can weaken high-altitude rock and ice.
- **Glacier or rock instability** can trigger a glacial collapse or ice-rock avalanche.
- The moving mass can enter a river channel and **incorporate water, sediment and debris**.
- The resulting surge can produce a **flash flood and debris flow** downstream.
- The flood can subsequently trigger **landslides, river blockage and temporary natural lakes**.
- Failure of these secondary barriers can generate another **outburst flood**, extending the disaster geographically and temporally.
- Thus, a Himalayan disaster can develop as a **cascading hazard system** rather than as a single isolated event.

Why the Himalayan Region Is Increasingly Vulnerable:

Geological and Tectonic Fragility:

- The Himalayas are **young and tectonically active fold mountains** formed through the continuing convergence of the Indian and Eurasian plates.
- Active structures including the **Main Central Thrust, Main Boundary Thrust and Himalayan Frontal Thrust** contribute to continuing tectonic deformation and seismic vulnerability.
- Steep slopes, fractured rocks and unstable geological formations increase susceptibility to **earthquakes, landslides, rockfalls and mass wasting**.
- The Government's updated seismic classification places the Himalayan arc in the highest **Seismic Zone VI**, reflecting its extremely high tectonic activity and earthquake vulnerability.
- The **2015 Gorkha Earthquake** demonstrated how a major earthquake can destabilise mountain slopes and trigger thousands of secondary landslides.
- Earthquakes can therefore function as **hazard multipliers**, increasing the probability of landslides, river blockages and subsequent floods.

Climate Change and Cryospheric Instability:

- Climate change is altering the Himalayan **cryosphere**, including glaciers, snow cover and permafrost.
- **Elevation-dependent warming** can accelerate glacier retreat and contribute to permafrost degradation at high altitudes.
- Permafrost acts as a natural binding mechanism within frozen mountain terrain; its degradation can weaken slopes and increase the probability of **rockfalls, avalanches and glacier-related collapses**.
- Glacier retreat can enlarge glacial lakes and increase the potential for **GLOFs**.
- The **2023 South Lhonak Lake disaster in Sikkim** demonstrated the destructive potential of glacial-lake failure.
- The **2021 Chamoli disaster** similarly highlighted the interaction between unstable high-altitude ice-rock systems, rapid mass movement and downstream flooding.

- Climate change should not automatically be treated as the sole cause of an individual disaster, but warming conditions can increase the background vulnerability of the Himalayan cryosphere.

Hydrological Extremes:

- Changing precipitation patterns can increase the occurrence of intense and localised rainfall events, including **cloudbursts**.
- Steep Himalayan gradients allow extreme rainfall to generate rapid runoff and **high-velocity flash floods**.
- When water interacts with loose sediment, rocks and construction debris, the resulting flow can become a destructive **debris torrent**.
- The 2013 **Kedarnath disaster** demonstrated how extreme rainfall, glacial-lake processes and fragile terrain can combine to generate catastrophic flooding.

Human Factors Amplifying Himalayan Disaster Risk:

Unsustainable Infrastructure Development:

- Rapid construction of roads, tunnels, hydropower projects, buildings and tourism facilities can increase pressure on fragile mountain systems.
- **Unscientific vertical slope cutting** can remove natural support and increase landslide susceptibility.
- Road widening can alter drainage patterns, remove vegetation and expose fractured rock surfaces.
- The **Char Dham road-development experience** has raised concerns regarding the balance between connectivity objectives and Himalayan ecological and geological limits.
- Infrastructure planning should therefore incorporate detailed **geological, hydrological and slope-stability assessments** before construction.

Hydropower and Tunnel-Related Risks:

- Hydropower is important for energy security and regional development, but tunnelling and blasting can disturb geological structures and groundwater pathways.
- Changes in underground drainage can affect **pore-water pressure, groundwater availability and slope stability**.
- The **Joshimath subsidence crisis** highlighted the importance of understanding interactions between geological conditions, groundwater systems, urbanisation and infrastructure.
- Hydropower development should therefore incorporate **basin-level cumulative assessment** rather than relying only on isolated project-level evaluations.

Construction Debris and River-System Modification:

- Improper disposal of excavated muck from roads and tunnels can increase sediment loads and obstruct natural drainage channels.
- During extreme floods, accumulated debris can become part of destructive debris flows and increase the erosive power of floodwaters.
- Disposal of construction material near river channels can reduce channel capacity and increase downstream flood risk.
- Scientific muck disposal, designated dumping sites and strict monitoring are therefore essential.

Governance and Regulatory Gaps:

Project-Wise Environmental Assessment:

- Conventional **Environmental Impact Assessment** may fail to capture the cumulative effects of multiple roads, tunnels, hydropower projects, settlements and tourism facilities within the same landscape.
- A project that appears manageable individually may produce significant risks when combined with other projects.
- **Strategic Environmental Assessment** and landscape-level cumulative impact assessment can provide a broader understanding of combined impacts on slopes, rivers, habitats and communities.

Weak Land-Use and Floodplain Regulation:

- Construction on active floodplains, river terraces and natural drainage channels increases exposure to flash floods and debris flows.
- Urban expansion can convert natural flood-storage areas into high-risk settlements.
- Effective land-use planning should incorporate **hazard zonation, floodplain mapping and restricted-development zones**.
- Disaster risk should be treated as a fundamental planning parameter rather than an issue addressed only after a disaster occurs.

Important Committees and Policy Lessons:

Mishra Committee, 1976:

- The **Mishra Committee** examined land subsidence in Joshimath and recommended restricting construction in unstable and landslide-prone areas until detailed investigations were completed.
- It also advised against indiscriminate **tree cutting and boulder removal** for construction and road works.
- Its recommendations remain relevant because Himalayan urbanisation continues to expand into geologically sensitive terrain.

J. C. Pant Committee, 1999:

- The **J. C. Pant Committee** examined disaster management in India and emphasised stronger institutional mechanisms, preparedness and capacity building.
- Its recommendations included stronger **building standards, disaster-management institutions, training, financial preparedness and Standard Operating Procedures**.
- Its broader policy lesson was the need to move from a predominantly response-oriented approach towards **risk reduction and preparedness**.

Measures for Reducing Himalayan Disaster Risks:

Ecological Carrying Capacity and Cumulative Assessment:

- Major infrastructure projects should undergo **carrying-capacity assessment, cumulative impact assessment and detailed geological investigation**.
- Development should be planned at the **landscape and river-basin level** rather than treating each project as an isolated intervention.
- Active floodplains, unstable slopes and ecologically sensitive areas should receive stricter construction controls.

Springshed Management and Water Security:

- **Springshed management** should be expanded because springs are important water sources for Himalayan communities.
- Hydrogeological mapping can identify spring recharge areas and help prevent activities that disrupt underground water pathways.
- Community participation, long-term monitoring and recharge interventions should form an integral part of springshed management.
- Such measures can simultaneously strengthen **water security, ecosystem resilience and climate adaptation**.

Nature-Based Slope Stabilisation:

- Himalayan slope management should combine conventional engineering with **nature-based solutions** wherever technically suitable.
- Vegetation-based stabilisation, bio-engineering, erosion control, drainage management and appropriately designed retaining structures can reduce ecological disturbance.
- Deep-rooted vegetation, hydroseeding, suitable geotextiles and vegetative terraces can complement conventional engineering interventions.

Modern Multi-Hazard Early-Warning Systems:

- Himalayan disaster management requires integrated **Multi-Hazard Early Warning Systems** capable of monitoring rainfall, river discharge, glacier behaviour and slope movement.
- **Satellite-based Interferometric Synthetic Aperture Radar, Automated Weather Stations, Doppler weather radars, river-level sensors and satellite telemetry** can improve real-time monitoring.
- Early-warning systems must be connected to **last-mile communication, evacuation routes and community preparedness**.
- Monitoring should focus on hazard chains rather than individual hazards because glacier collapse, landslides and floods can evolve rapidly.

Risk-Sensitive Mountain Tourism:

- Himalayan tourism should shift from high-density and poorly regulated expansion towards **regulated, low-impact and sustainable tourism**.
- Tourist carrying capacity, waste management, traffic regulation and emergency-response infrastructure should be incorporated into destination planning.
- Tourism revenue can support local conservation and disaster-resilience measures through appropriate institutional mechanisms.

Climate-Resilient Development:

- Climate adaptation and **disaster-risk reduction** should be integrated into infrastructure, urban planning, water management and tourism policies.
- Development projects should account for projected changes in rainfall intensity, glacier behaviour, temperature and hydrological regimes.
- The objective should not be to stop Himalayan development but to ensure that development remains compatible with **geological, ecological, hydrological and cryospheric limits**.

India-Nepal Dimension:

Transboundary River Risks:

- Disasters originating in Nepal can affect downstream Indian areas because several Himalayan river systems cross the international boundary.
- **Real-time hydrological data sharing, flood forecasting and coordinated emergency preparedness** can reduce downstream losses.
- India and Nepal therefore have a shared interest in strengthening cooperation on river monitoring, flood forecasting, watershed management and emergency communication.
- Transboundary disaster management should complement existing bilateral mechanisms relating to rivers, water resources and flood control.

Regional Himalayan Cooperation:

- Himalayan hazards transcend political boundaries because glaciers, river basins, ecosystems and atmospheric processes operate across national borders.
- India, Nepal, Bhutan and other Himalayan countries can strengthen cooperation in **glacier monitoring, earthquake preparedness, landslide mapping, hydrological forecasting and early-warning systems**.
- Regional scientific cooperation can improve data availability and help develop risk models suited to the complex geography of the Hindu Kush Himalayan region.

India's Preparedness and Government Measures:

National GLOF Risk Mitigation Programme:

- The Central Government approved the **National Glacial Lake Outburst Flood Risk Mitigation Project** for **Arunachal Pradesh, Himachal Pradesh, Sikkim and Uttarakhand** with a total financial outlay of **₹150 crore**.
- The project has a central share of **₹135 crore** from the National Disaster Mitigation Fund, while the four states contribute **₹15 crore** from their own resources.
- Its objective is to reduce loss of life and damage to critical infrastructure arising from **GLOFs and related hazards**.

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Glacial-Lake Monitoring:

- The **Central Water Commission** monitors **902 glacial lakes and water bodies** larger than 10 hectares in the Himalayan river basins during the monitoring period using remote-sensing techniques.
- Such monitoring helps identify significant changes in lake water-spread areas and potentially hazardous expanding lakes.
- Continuous monitoring is important because GLOF risk depends not only on lake size but also on **dam stability, upstream triggers, downstream exposure and possible cascade pathways**.

Way Forward:

- India should adopt a **risk-sensitive Himalayan development model** in which geological, ecological and hydrological limits become fundamental planning parameters.
- Infrastructure decisions should be based on **carrying capacity, cumulative impact and hazard vulnerability**, rather than solely on economic or connectivity objectives.

- Himalayan states should strengthen land-use regulation, floodplain zoning, slope-stability standards and construction monitoring.
- Disaster-management institutions should move further from post-disaster relief towards **anticipatory action, prevention, mitigation and preparedness**.
- Modern satellite and ground-based monitoring should be integrated with community-level warning systems so that scientific information reaches vulnerable populations rapidly.
- Springs, forests, wetlands and natural drainage systems should be treated as **protective ecological infrastructure**.
- India and Nepal should strengthen transboundary cooperation in river monitoring, flood forecasting, emergency communication and disaster response.
- The Himalayan policy framework should recognise that **development can reduce vulnerability only when infrastructure is designed around mountain ecology rather than imposed upon it**.

Conclusion:

The Nepal disaster demonstrates that Himalayan disasters increasingly need to be understood as **interconnected hazard cascades rather than isolated events**. A glacial collapse or ice-rock avalanche can generate debris flows, obstruct rivers, trigger flash floods and create secondary natural-dam or lake hazards. Climate change may increase the instability of glaciers and permafrost, while unplanned infrastructure, land-use change and weak regulation can amplify exposure and vulnerability.

The policy challenge is therefore not to choose between development and conservation but to establish **risk-sensitive mountain development** based on carrying capacity, cumulative impact assessment, scientific infrastructure design, ecosystem-based approaches and multi-hazard early-warning systems. For India, this approach is essential not only for protecting Himalayan communities but also for safeguarding downstream populations, water security, strategic infrastructure and transboundary river systems.

Value Addition for UPSC:

Key Concepts for Mains:

- **Flash Flood:** A rapidly developing flood characterised by a sudden rise in water levels and limited warning time.
- **Avalanche:** The rapid downslope movement of snow, ice, rock or a combination of these materials under gravity.
- **Glacial Collapse:** The sudden detachment or failure of a glacier or part of a glacier, potentially generating an ice-rock avalanche and downstream flooding.
- **GLOF:** The sudden release of water stored in a glacial lake due to failure or overtopping of its natural dam.
- **Compound Hazard:** Multiple hazards occurring simultaneously or sequentially and amplifying the overall disaster impact.
- **Cascading Disaster:** A primary hazard triggering secondary and tertiary hazards, such as glacial collapse causing debris flow and flash flooding.
- **Carrying Capacity:** The level of human activity and development that an ecosystem can sustain without unacceptable ecological degradation.
- **Risk-Sensitive Development:** Development planning that incorporates hazard exposure, vulnerability and disaster risk into infrastructure, investment and land-use decisions.

Hazard Cascade for Mains Answers:

Climate warming / permafrost degradation → glacier or slope instability → ice-rock avalanche or glacial collapse → debris flow → river surge → flash flood → landslide / river blockage → temporary natural lake → possible outburst flood.

Mains Answer Value Point:

- “The Himalayas should not be viewed merely as a frontier for infrastructure expansion; they should be treated as a high-risk ecological and geological system whose carrying capacity must guide development.”

Judicial Appointments and Collegium Transparency: Balancing Judicial Independence, Merit, Accountability and Public Confidence in India

Recent Developments:

- The debate over **transparency in judicial appointments** has resurfaced as concerns continue over how the **Collegium system** balances judicial independence with accountability and public confidence.
- The Supreme Court has increasingly moved towards greater institutional disclosure, including placing information relating to the judicial appointment process in the public domain.
- On **5 May 2025**, the Supreme Court published details of the appointment process for the Supreme Court and High Courts, including the roles of the High Court Collegia, State Governments, Government of India and Supreme Court Collegium.
- The Court also uploaded details of High Court appointments approved between **9 November 2022 and 5 May 2025**, including the source of candidates, recommendation and appointment dates, special-category information and whether a candidate was related to a sitting or retired judge.
- The Supreme Court has also moved towards greater financial transparency by deciding that **judges' asset declarations** should be placed on its website.
- The current Supreme Court Collegium continues to publish appointment and transfer resolutions, demonstrating that transparency within the Collegium remains an evolving institutional practice rather than a settled framework.

What is the Collegium System of Judicial Appointments?

Nature and Constitutional Basis:

- The **Collegium system** is a judicially evolved mechanism for recommending appointments and transfers of judges of the Supreme Court and High Courts.
- The term “**Collegium**” is **not mentioned in the Constitution**, as the Constitution originally provided for judicial appointments through executive appointment after consultation with specified constitutional authorities.
- **Article 124(2)** provides for appointment of Supreme Court judges by the President after consultation with such judges of the Supreme Court and High Courts as the President considers necessary, with consultation with the Chief Justice of India constitutionally significant.
- **Article 217(1)** provides for appointment of High Court judges by the President after consultation with the Chief Justice of India, the Governor of the State and the Chief Justice of the concerned High Court.

- The Collegium system therefore represents a **judicial interpretation of the constitutional expression “consultation”**, rather than an express constitutional provision.

Evolution through the Three Judges Cases:

- **First Judges Case, S.P. Gupta v. Union of India, 1981:** The Supreme Court held that “consultation” did not mean “concurrence”, thereby giving greater primacy to the executive in judicial appointments.
- **Second Judges Case, Supreme Court Advocates-on-Record Association v. Union of India, 1993:** The Supreme Court reversed the earlier interpretation and held that the opinion of the Chief Justice of India should have primacy, subject to consultation with senior judges, thereby establishing the Collegium system.
- **Third Judges Case, Special Reference No. 1 of 1998:** The Supreme Court expanded the Supreme Court Collegium to the **Chief Justice of India and four senior-most judges**.
 - The **Supreme Court Collegium** consists of the Chief Justice of India and four senior-most judges of the Supreme Court.
 - The **High Court Collegium** consists of the Chief Justice of the concerned High Court and two senior-most judges of that High Court.
- **NJAC Judgment, 2015:** The Supreme Court struck down the **99th Constitutional Amendment Act, 2014** and the **National Judicial Appointments Commission Act, 2014**, holding that judicial independence is part of the Constitution’s **Basic Structure**.

Why is Collegium Transparency a Major Constitutional Issue?

Opacity and Limited Public Scrutiny:

- The principal criticism is that the Collegium has historically functioned through **closed-door deliberations**, limiting public understanding of how candidates are assessed.
- The absence of a comprehensive statutory framework specifying every stage of selection creates uncertainty regarding the relative weight given to **merit, integrity, experience, seniority, representation and institutional requirements**.
- Limited disclosure can create perceptions that judicial appointments depend on personal networks rather than clearly identifiable institutional criteria.

Absence of a Uniform Evaluation Framework:

- There is no single publicly codified evaluation matrix that comprehensively explains how candidates are compared on **legal competence, quality of judgments, professional integrity, judicial temperament, experience and social representation**.
- The absence of transparent criteria makes it difficult for unsuccessful candidates and the wider public to understand why one candidate was preferred over another.
- The Supreme Court’s 2025 publication of appointment-related data represents an important move towards **institutionalised disclosure**, although it does not by itself create a complete objective evaluation framework.

Concerns Regarding Nepotism and “Uncle Judges”:

- Limited transparency has contributed to recurring allegations of **familial preference and professional networks** influencing judicial appointments.
- Such perceptions are particularly significant because judicial legitimacy depends not only on actual independence but also on the public perception that appointments are based on **merit and constitutional values**.
- The Supreme Court’s publication of information concerning whether recommended candidates have familial links with sitting or retired judges is therefore relevant to transparency and public accountability.

Limited Diversity and Representation:

- Judicial diversity is relevant to institutional legitimacy because courts adjudicate disputes involving different social, economic and regional groups.
- The appointment process requires greater systematic attention to the representation of **women, Scheduled Castes, Scheduled Tribes, Other Backward Classes, minorities and different professional backgrounds.**
- The Supreme Court's 2025 disclosure of special-category information for High Court appointees provides a useful basis for analysing representation trends.

Arguments in Favour of Greater Transparency:***Strengthening Public Confidence:***

- Courts derive institutional legitimacy from the **rule of law, impartiality and public confidence.**
- Greater disclosure of procedures and broad reasons can reduce speculation and demonstrate that judicial appointments are based on constitutional considerations rather than personal preference.
- Transparency can therefore strengthen the legitimacy of judicial independence rather than weaken it.

Promoting Merit-Based Appointments:

- Clearly stated criteria can encourage selection based on **professional competence, integrity, judicial temperament and constitutional commitment.**
- Objective criteria can also make it easier to identify inconsistencies and correct systemic biases.

Improving Institutional Accountability:

- Transparency creates an institutional record that allows Parliament, legal professionals, civil society and citizens to understand how the appointment mechanism operates.
- Accountability does not necessarily require disclosure of every confidential deliberation; it can be achieved through **procedural transparency, reasoned decisions and appropriate disclosure.**

Arguments for Confidentiality:***Protecting Candidates:***

- Full disclosure of adverse information concerning unsuccessful candidates may permanently damage their professional reputation even when the information is incomplete, disputed or confidential.
- Confidentiality can therefore protect candidates from unnecessary reputational harm.

Encouraging Candid Deliberations:

- Collegium members may need to discuss sensitive information relating to **integrity, professional conduct, judicial temperament and suitability.**
- Completely public deliberations could discourage frank assessments and make judges reluctant to communicate concerns about candidates.

Protecting Judicial Independence:

- Excessive external scrutiny could create opportunities for political, media or interest-group pressure.

- Confidentiality can help protect the judiciary from **executive influence and political bargaining**.
- However, confidentiality should protect genuinely sensitive information rather than become a blanket justification for institutional opacity.

Judicial Independence and Transparency: The Constitutional Balance:

Basic Structure and Separation of Powers:

- **Judicial independence** is an essential component of the Constitution's Basic Structure and protects adjudication from political interference.
- **Article 50** directs the State to take steps to separate the judiciary from the executive in the public services of the State.
- Judicial independence does not mean institutional immunity from accountability because constitutional institutions must remain answerable to constitutional principles.
- The appropriate objective is therefore **independence with institutional accountability**, rather than independence without scrutiny.

Transparency versus Confidentiality:

- Transparency should focus on **procedures, criteria, institutional safeguards, broad reasoning and statistical information**.
- Confidentiality should remain available for sensitive intelligence, personal information, adverse material and information whose disclosure could unfairly harm an individual.
- A **sanitised disclosure model** can therefore provide accountability without compromising legitimate confidentiality.

Important Judicial Decisions Relevant to Transparency:

Secretary, State of Karnataka v. Umadevi, 2006:

- The Supreme Court emphasised that public employment must follow **constitutional requirements of equality and non-arbitrariness**.
- Although the judgment concerned public employment rather than the Collegium itself, its broader principles are relevant to debates over fairness and objectivity in public appointments.

Subhash Chandra Agarwal Judgment, 2019:

- The Supreme Court held that the office of the Chief Justice of India falls within the **Right to Information Act, 2005**, subject to legitimate limitations.
- The judgment demonstrated that judicial independence and transparency under the Right to Information framework can coexist when disclosure is balanced against competing constitutional interests.

MediaOne Judgment, 2023:

- The Supreme Court expressed strong reservations about excessive reliance on **sealed-cover procedures** and emphasised the importance of transparency and open justice.
- The broader principle is relevant to judicial administration because unexplained institutional decisions can weaken public confidence.

NJAC Judgment, 2015:

- The Supreme Court invalidated the National Judicial Appointments Commission framework because it considered the proposed arrangement inconsistent with the constitutionally protected **independence of the judiciary**.
- The judgment established that reform of judicial appointments must preserve judicial independence as part of the Basic Structure.

Global Practices in Judicial Appointments:

<i>Country</i>	<i>Appointment Mechanism</i>	<i>Transparency and Accountability Features</i>
United Kingdom	Judicial Appointments Commission	Independent statutory body, public vacancy advertisements, structured assessment and participation of non-judicial members.
South Africa	Judicial Service Commission	Multi-stakeholder constitutional body, public nominations and public interviews of shortlisted candidates.
United States	Presidential nomination and Senate confirmation	Executive nomination followed by public scrutiny and confirmation hearings before the Senate Judiciary Committee.
India	Collegium system	Judicial primacy in recommendations, institutional consultation and increasing publication of appointment-related information.

- Global comparisons demonstrate that **judicial independence can coexist with structured transparency**, although institutional models must reflect each country's constitutional structure.
- India need not replicate foreign models because judicial appointments must remain consistent with the constitutional principle of judicial independence.

Structural Reforms Needed in the Collegium System:

Pre-Notifying Vacancies:

- Anticipated vacancies should be identified sufficiently early to improve planning and reduce delays in appointments.
- A predictable timeline can also improve transparency and institutional coordination between the judiciary and executive.

Objective Evaluation Matrix:

- A publicly known framework should identify broad parameters such as **legal competence, quality of judgments, integrity, professional experience, judicial temperament, efficiency and diversity**.
- Quantitative indicators should not mechanically determine appointments because judicial quality cannot always be reduced to numerical performance.

Permanent Institutional Research Secretariat:

- A professional research and screening mechanism can assist the Collegium through **background verification, data compilation, professional assessment and conflict-of-interest checks**.
- Such a mechanism can reduce dependence on informal networks and improve consistency in decision-making.

Reasoned and Sanitised Decisions:

- The Collegium should provide **broad reasons** for recommendations and reconsideration decisions wherever disclosure does not compromise confidential information.
- Sensitive personal information and intelligence inputs should remain protected.
- This approach can create a balance between **reasoned decision-making and legitimate confidentiality**.

Strengthening the Memorandum of Procedure:

- The **Memorandum of Procedure** should establish clearer timelines, responsibilities and consultation requirements for the judiciary and executive.
- A predictable procedure can reduce delays and improve accountability without disturbing the constitutional role of the judiciary.

Improving Diversity:

- The appointment process should systematically monitor **gender, social, regional and professional diversity**.
- Diversity should not replace merit but should be considered as an important component of a representative and legitimate judiciary.

Way Forward:

- India should pursue a **middle path between complete opacity and excessive disclosure**.
- The Collegium should disclose its broad selection criteria, procedural stages, relevant statistical information and adequately reasoned decisions.
- Confidential information relating to national security, personal privacy and sensitive professional assessments should remain protected.
- The judiciary and executive should establish **time-bound coordination mechanisms** to reduce vacancies and delays.
- A professional research and verification mechanism can improve the quality and consistency of recommendations.
- Regular publication of appointment data can facilitate evidence-based assessment of **merit, diversity, familial links and institutional representation**.
- Any future statutory or constitutional reform must preserve the **independence of the judiciary as part of the Basic Structure**.
- The ultimate objective should be to ensure that judicial appointments are perceived as **merit-based, impartial, transparent and constitutionally protected**.

Conclusion:

Judicial independence and transparency are **complementary constitutional values rather than inherently contradictory principles**. Judicial independence protects courts from political pressure, while transparency strengthens public confidence that this independence is being exercised responsibly.

The Collegium system emerged primarily to protect judicial independence after the Three Judges Cases, but its legitimacy increasingly depends upon whether it can demonstrate **fairness, objectivity and accountability**. The Supreme Court's recent disclosure initiatives, including publication of appointment-process information and judges' asset declarations, indicate movement towards greater institutional openness.

The way forward is therefore not to expose every confidential deliberation but to create a **transparent architecture around a confidential core**. Clear criteria, predictable procedures, institutional screening, diversity monitoring, reasoned and sanitised decisions, and time-bound appointments can strengthen both judicial independence and public trust.

India's R&D Ecosystem Faces Funding Concentration and Governance Barriers Despite Rapid Growth in Science, Technology and Innovation

Recent Developments:

- The NITI Aayog report, “Ease of Doing Research & Development in India”, released in April 2026, identifies persistent institutional, financial, administrative and human-resource barriers that constrain India’s research ecosystem. The exercise drew inputs from **400+ institutional leaders and 850+ scientists and researchers**.
- The report highlights a significant concentration of research funding, noting that the **IIT system receives more than 80% of ANRF’s R&D funding**, which may restrict funding opportunities for other higher-education and research institutions.
- India’s **Gross Expenditure on Research and Development (GERD)** remains around **0.64% of GDP**, substantially below major research economies. The Economic Survey 2025–26 places the corresponding figures at **3.48% for the United States, 2.43% for China and 4.91% for South Korea**.
- The report also identifies fragmented funding systems, cumbersome grant procedures, weak industry participation, shortage of research personnel and limited conversion of research into commercial technologies as major constraints.
- The **₹1 lakh crore Research, Development and Innovation (RDI) Scheme**, approved in 2025, represents a major policy shift towards strengthening **private-sector-led R&D and deep-tech innovation**.

Status of Research and Development in India:

Low R&D Intensity:

- India has substantially increased its absolute R&D expenditure, but **R&D intensity has remained low at around 0.64% of GDP** for several years.
- India therefore faces a gap between its economic ambitions and the scale of investment required to become a leading **knowledge and technology economy**.
- Leading economies devote considerably larger shares of national income to R&D, enabling sustained investment in advanced laboratories, frontier technologies, skilled researchers and high-risk innovation.

Limited Private-Sector Participation:

- India’s R&D ecosystem remains substantially dependent on **government funding**, whereas business enterprises contribute a much larger share of R&D expenditure in major innovation economies.
- The Economic Survey 2025–26 reports that the **business sector contributes about 41% of India’s GERD**, compared with **77% in China, 75% in the United States and 79% in South Korea**.
- Increasing private participation is essential because commercial R&D can accelerate **technology development, patenting, productisation, deep-tech entrepreneurship and industrial competitiveness**.

Concentration of Research Funding:

- The NITI Aayog report notes that **more than 80% of ANRF R&D funding goes to the IIT system**, indicating a concentration of competitive research funding in a relatively small group of institutions.
- Concentration is not inherently undesirable because premier institutions may possess advanced infrastructure and research capacity, but excessive concentration can weaken the development of **State universities, emerging institutions and regional research ecosystems**.
- A broader funding base can help build research capacity beyond established centres of excellence and improve geographical and institutional diversity.

Major Challenges in India's R&D Ecosystem:

Administrative and Compliance Burden:

- Researchers often spend significant time navigating **multiple portals, approvals, financial procedures and compliance requirements**, reducing the time available for actual research.
- The NITI Aayog consultation found that researchers seeking grants may have to interact with independent systems operated by different ministries and funding agencies.
- A fragmented application architecture also makes it difficult to obtain a national picture of **who is receiving funding, from which agency and for what research objective**.

Rigid Procurement and Financial Rules:

- Researchers face difficulties in procuring specialised equipment, reallocating funds, hiring project personnel and making timely research-related expenditures.
- Scientific research often involves uncertainty and rapidly changing technological requirements, making excessive rigidity particularly unsuitable for frontier research.
- Greater financial flexibility should therefore be combined with **outcome-based accountability and transparent auditing**.

Fragmented Research Governance:

- India's R&D ecosystem involves multiple ministries, departments, laboratories, universities and funding agencies with overlapping mandates.
- Limited coordination can result in **duplication of research, delayed approvals, fragmented databases and inefficient utilisation of public resources**.
- The NITI Aayog report therefore advocates integrated governance mechanisms and better visibility across publicly funded research programmes.

Human-Resource Constraints and Brain Drain:

- India produces a large pool of **science, technology, engineering and mathematics graduates**, but the availability of researchers, laboratory technicians and interdisciplinary specialists remains inadequate.
- Researchers also face concerns regarding **career progression, fellowship availability, remuneration, research infrastructure and long-term funding security**.
- Limited domestic opportunities can encourage highly skilled researchers to move to countries offering stronger research ecosystems and more predictable career pathways.

Weak Translation and Commercialisation:

- India has expanded its scientific publications and patent activity, but laboratory-level discoveries do not consistently become **commercial technologies, startups, industrial products or scalable solutions**.
- The major policy challenge is therefore to strengthen the complete **research-to-market pipeline**, covering fundamental research, proof of concept, technology readiness, intellectual property, financing and industrial deployment.

Recommendations of the NITI Aayog Report:***Unified Project Management System:***

- A **Unified Project Management System** can create a common digital architecture for planning, funding, monitoring and evaluating publicly funded R&D projects.
- Such a system can improve coordination, reduce duplication and provide greater visibility over public expenditure on research.

Simplification of Research Procedures:

- India should develop **single-window digital systems** for research grants, procurement, approvals and financial reporting.
- Researchers should receive greater flexibility in using grants while maintaining clear **outcome-based monitoring and financial accountability**.

Strengthening Industry–Academia Collaboration:

- Universities, national laboratories, industries and startups should be connected through **research parks, innovation clusters, collaborative doctoral programmes and industry-funded research**.
- Stronger collaboration can improve technology transfer and reduce the gap between academic research and industrial requirements.

Improving Research Careers:

- India should provide more predictable career pathways, competitive fellowships, adequate research infrastructure and long-term funding opportunities.
- The report recommends increasing **postdoctoral fellowships in science and technology by 20% annually for the next few years** to strengthen the national postdoctoral ecosystem.
- A proposed **Vigyan Nidhi** platform can provide structured digital support for postdoctoral researchers, mobility grants and industry-linked research opportunities.

Broadening the Research Funding Base:

- ANRF should strengthen funding access for **State universities, emerging research institutions and other higher-education institutions** while maintaining excellence-based competitive selection.
- Research funding should balance **excellence, inclusion, institutional capacity-building and strategic national priorities**.

Major Government Initiatives:

Research, Development and Innovation Scheme:

- The **₹1 lakh crore RDI Scheme** was approved in July 2025 to catalyse private-sector participation in high-impact R&D and strategic technologies.
- The scheme focuses on areas such as **deep technology, quantum computing, robotics, space, artificial intelligence, energy security and climate technologies**.
- The RDI Fund operates through a two-tier structure under ANRF and seeks to mobilise private capital for transformative research and innovation.

Anusandhan National Research Foundation:

- The **Anusandhan National Research Foundation**, established under the 2023 Act with its statutory provisions coming into force in February 2024, seeks to provide strategic direction to India's research and innovation ecosystem.
- ANRF is intended to strengthen collaboration among **academia, industry, government and research institutions** and expand the national research base.
- Its catalytic funding model increasingly seeks to use public funding to unlock larger contributions from industry, philanthropy and other non-governmental sources.

National Quantum Mission:

- The **National Quantum Mission** seeks to develop capabilities in quantum computing, quantum communication, quantum sensing and quantum materials.
- It is important for India's technological-sovereignty because quantum technologies have applications in defence, cybersecurity, communications, healthcare and advanced computing.

National Supercomputing Mission:

- The **National Supercomputing Mission**, launched in 2015, provides advanced computing infrastructure to universities, research institutions and government agencies through the **National Knowledge Network**.
- High-performance computing is increasingly important for climate modelling, drug discovery, materials science, artificial intelligence and strategic research.

India Semiconductor Mission and IndiaAI Mission:

- The **India Semiconductor Mission** seeks to establish an integrated semiconductor and display-manufacturing ecosystem and reduce dependence on critical technology imports.
- The **IndiaAI Mission** aims to build accessible computing infrastructure and strengthen artificial intelligence capabilities for Indian research, startups, industry and public-sector applications.
- These initiatives demonstrate the shift from conventional R&D support towards **mission-oriented technological capability building**.

Way Forward:

From Funding to an Integrated Innovation Ecosystem:

- India needs to move from a predominantly **government-funded research model** towards a diversified ecosystem involving government, industry, universities, startups, philanthropy and international collaboration.
- Public funding should remain important for fundamental and high-risk research because such research may have uncertain commercial returns but significant long-term national benefits.

From Publications to Products:

- Research policy should place greater emphasis on **technology readiness levels, patents, prototypes, technology licensing, startups and industrial adoption**, without undermining basic science.
- Dedicated translational funding can bridge the gap between laboratory discoveries and commercially viable technologies.

From Institutional Concentration to Distributed Excellence:

- India should develop multiple regional and thematic research centres rather than relying disproportionately on established institutions.
- Competitive funding should reward excellence while simultaneously building capacity in **State universities and emerging research institutions**.

From Compliance-Driven to Outcome-Based Governance:

- Research institutions should receive greater operational autonomy accompanied by transparent **milestone-based evaluation, independent audits and measurable outcomes**.
- Digital monitoring can reduce administrative friction without weakening accountability.

Conclusion:

India's R&D challenge is not merely a question of increasing expenditure; it is also a question of **how effectively research resources are allocated, governed, connected and translated into societal and economic value**. The NITI Aayog report highlights the need to reduce administrative barriers, diversify funding, improve researcher careers, strengthen industry-academia linkages and coordinate the fragmented research ecosystem.

The **RDI Scheme, ANRF, National Quantum Mission, National Supercomputing Mission, India Semiconductor Mission and IndiaAI Mission** provide important building blocks for a technology-driven development strategy. However, India must complement these initiatives with higher R&D intensity, stronger private-sector participation and wider institutional access to competitive research funding.

The ultimate objective should be to build an **open, distributed, industry-linked and mission-oriented R&D ecosystem** capable of converting India's demographic and scientific capabilities into technological leadership, strategic autonomy and inclusive economic growth.

Value Addition for UPSC:

Key Data Points:

- **GERD:** Around **0.64%** of GDP.
- **Business-sector share of GERD:** About **41%** in India, compared with **77% in China, 75% in the United States and 79% in South Korea.**
- **ANRF funding concentration:** More than **80%** of ANRF R&D funding goes to the IIT system, according to the NITI Aayog report.
- **RDI Scheme:** **₹1 lakh crore** corpus for strengthening private-sector-led R&D.
- **NITI Aayog consultation:** **400+ institutional leaders and 850+ scientists and researchers** contributed to the exercise.

Heatwaves and Lightning Enter India's Notified Disaster Framework, Transforming Climate Risk Financing and Disaster Resilience

Recent Developments:

- The **Ministry of Home Affairs** has added **heatwaves and lightning** to India's nationally notified list of disasters, taking the total number of notified disasters to **14**.
- The decision follows the recommendation of the **Sixteenth Finance Commission (FC-XVI)** and the new operational framework for disaster-risk funds for **2026–27 to 2030–31**. The FC-XVI specifically recommended national recognition of both hazards because of their increasing severity, frequency and mortality.
- The change removes the earlier financial disadvantage faced by heatwaves, under which States could generally treat heatwaves as **local disasters** and use only a limited portion of their State Disaster Response Fund.
- Heatwaves can now be addressed through both **immediate relief mechanisms under the SDRF** and **long-term risk-reduction measures under the SDMF**.
- The reform is significant because extreme heat is no longer only a meteorological or public-health concern; it is increasingly a **disaster-governance, fiscal and development challenge**.

Why Recognition of Heatwaves as a Notified Disaster Matters:

Earlier Funding Constraint:

- Before national notification, States could classify heatwaves as **local disasters** and utilise SDRF resources subject to a ceiling of up to **10% of their annual SDRF allocation**.
- This arrangement created an asymmetry because disasters such as floods and cyclones had access to the regular notified-disaster framework, while heatwaves faced additional financial restrictions.
- The new framework places **heatwaves on a more equal financial footing** with other nationally notified disasters.

Shift from Relief to Risk Reduction:

- The reform enables States to address both the **immediate consequences** and the **underlying vulnerability** associated with extreme heat.
- SDRF resources can support eligible **relief and compensation**, while SDMF resources can support longer-term measures such as **cooling infrastructure, early-warning systems and heat-resilient public facilities**.
- This represents a shift from a predominantly **response-oriented approach** towards a more comprehensive disaster-risk-reduction framework.

India's Disaster Finance Architecture:

Constitutional and Institutional Basis:

- Under **Article 280 of the Constitution**, the Finance Commission recommends principles governing financial transfers and disaster-management funding arrangements.
- The **Disaster Management Act, 2005** provides the broader statutory framework for disaster management in India.
- Disaster financing operates through State-level and national-level mechanisms designed to ensure that States can respond to disasters while receiving additional assistance when their own resources are inadequate.

Sixteenth Finance Commission Recommendations:

- The FC-XVI recommended approximately **₹2.04 lakh crore** for State-level disaster funds for **2026–27 to 2030–31**, representing a substantial increase over the previous Finance Commission's allocation.
- The State-level allocation comprises two principal components:
 - **State Disaster Response Fund (SDRF)**: Approximately **₹1.64 lakh crore**, intended primarily for disaster response and relief.
 - **State Disaster Mitigation Fund (SDMF)**: Approximately **₹0.41 lakh crore**, intended for measures that reduce disaster risk and vulnerability.
- The FC-XVI also recommended **₹79,406 crore** for national disaster funds during the same award period.
- Allocation among States incorporates a **Disaster Risk Index**, which considers factors such as hazard, exposure and vulnerability, alongside historical expenditure considerations.

Role of National Disaster Funds: Best Institute for OAS/IAS

- National-level disaster funds supplement State resources when the magnitude of a disaster exceeds the State's financial capacity.
- This architecture reflects the principle that **disaster response is primarily State-led but financially supported through cooperative fiscal federalism**.
- The framework therefore combines State-level responsibility with national-level fiscal support.

Growing Heat Risk in India:

Increasing Exposure:

- Extreme heat is becoming a major climate-risk multiplier because it affects **health, labour productivity, agriculture, water demand, electricity consumption and urban infrastructure**.
- A district-level assessment by the **Council on Energy, Environment and Water** found that **57% of India's 734 districts**, covering approximately **76% of the population**, face high to very high heat risk.

- The assessment considers multiple dimensions of risk rather than temperature alone, including **hazard, exposure and vulnerability**.
- Rising **night-time temperatures** are particularly concerning because warmer nights reduce the body's ability to recover from daytime heat exposure.
- Increasing humidity can further intensify heat stress by reducing the effectiveness of **evaporative cooling through sweating**.

Climate and Development Linkages:

- Heatwaves disproportionately affect **outdoor workers, agricultural labourers, construction workers, elderly persons, children and economically vulnerable households**.
- Extreme heat can reduce labour productivity, increase cooling demand and place additional pressure on electricity and water systems.
- Therefore, heat resilience must be integrated into **urban planning, public health, labour policy, housing, water management and energy planning**.

Heat Action Plans and Implementation Gap:

Role of Heat Action Plans:

- The **National Disaster Management Authority** has promoted **Heat Action Plans (HAPs)** to help States, districts and cities identify heat risks and implement short-, medium- and long-term interventions.
- A comprehensive HAP should include **risk mapping, early warning, public communication, healthcare preparedness, cooling arrangements, water availability and targeted protection of vulnerable groups**.
- India has expanded the number of HAPs considerably, but their quality and implementation capacity remain uneven.

Major Implementation Challenges:

- Many local governments lack adequate **technical expertise, dedicated financing, reliable risk data and institutional coordination**.
- Earlier assessments found that many HAPs relied on departments to identify or reallocate their own resources instead of having dedicated financial mechanisms.
- The new access to SDMP resources creates an opportunity to convert HAPs from **planning documents into financially supported resilience programmes**.
- States should therefore develop **appraisable, location-specific projects** instead of relying only on broad policy commitments.

What Can Disaster Funds Finance for Heat Resilience?:

Immediate Response under SDRF:

- SDRF resources can support eligible **relief measures and compensation** associated with notified heatwave impacts.
- Effective response requires reliable identification and reporting of heat-related deaths, illnesses and livelihood losses.
- Health departments should therefore integrate heat surveillance with disaster-management systems.

Long-Term Mitigation under SDMF:

- SDMF resources can support **cooling shelters, heat-resilient public infrastructure, early-warning systems, urban greening, reflective surfaces and climate-sensitive planning**.
- Investments should prioritise vulnerable settlements, high-risk occupational groups and areas with limited access to cooling and healthcare.
- Projects should be preceded by **risk and vulnerability assessments** so that scarce mitigation funds are directed towards locations with the greatest potential risk reduction.

Strengthening Health Surveillance and Loss-and-Damage Data:

Need for Better Heat-Health Data:

- Accurate data on heat-related mortality and morbidity is essential because disaster financing increasingly depends on **verified loss and damage**.
- Existing surveillance systems primarily identify recognised heatstroke cases but may underestimate the wider burden of heat-aggravated **cardiovascular, respiratory and renal conditions**.
- India therefore needs a stronger **heat-attributable mortality and morbidity surveillance system** integrating meteorological, health and demographic information.

Data for Evidence-Based Governance:

- District-level heat-risk mapping should combine **temperature, humidity, population vulnerability, occupational exposure, health infrastructure and urban characteristics**.
- Such integrated datasets can improve targeting of HAPs, SDMF investments and emergency interventions.

Technology and Innovative Financing:

Multi-Hazard Early Warning Systems:

- India should strengthen real-time warning systems by integrating meteorological observations, satellite data, health surveillance and local communication networks.
- The **Cell Broadcast Alert System** can disseminate warnings for hazards such as lightning, flash floods, thunderstorms and other events requiring rapid public alerts.
- Similar systems can support heat warnings by providing **location-specific and time-sensitive alerts** to vulnerable populations.

Parametric Insurance:

- States can explore **parametric insurance**, under which predetermined payouts are automatically triggered when an agreed temperature threshold or other measurable condition is reached.
- Such instruments can provide faster financial support without waiting for lengthy post-disaster damage assessments.
- Parametric mechanisms should complement, rather than replace, public disaster-financing systems and social-protection measures.

Key Priorities for the Road Ahead:

Universal and Risk-Based Heat Planning:

- Every high-risk district and urban local body should develop a **risk-informed Heat Action Plan** based on local climate, demographic and infrastructure conditions.
- HAPs should be linked directly with **State budgets, SDMF projects and municipal development plans**.

Build Local Technical Capacity:

- States should establish dedicated technical teams capable of preparing **costed, scientifically appraised and fundable mitigation projects**.
- Universities, research institutions, civil-society organisations and specialised agencies can support local governments through technical assistance and capacity building.

Integrate Heat Resilience into Development:

- Heat resilience should become part of **building codes, urban design, transport planning, labour regulations, housing policy and public-health systems**.
- Nature-based solutions such as urban forests, wetlands, water bodies and shaded public spaces can reduce heat exposure while generating wider environmental benefits.

Protect Vulnerable Communities:

- Heat action should prioritise **informal workers, agricultural labourers, elderly persons, children, low-income households and people living in poorly ventilated housing**.
- Labour regulations can incorporate heat-rest schedules, drinking-water access, shaded workspaces and flexible working hours during extreme heat.

Conclusion:

The recognition of **heatwaves and lightning as nationally notified disasters** represents an important evolution in India's disaster-governance framework. It aligns disaster financing more closely with the country's changing risk profile and enables States to combine **immediate relief with long-term mitigation**.

However, financial eligibility alone cannot create resilience. The effectiveness of the reform will depend on converting Heat Action Plans into **well-designed, adequately financed and locally implemented projects**, strengthening heat-health surveillance, improving technical capacity and integrating climate resilience into development planning.

India should therefore move from a **reactive disaster-response model towards anticipatory, risk-informed and climate-resilient governance**. The objective should be not merely to compensate communities after extreme heat causes losses, but to reduce exposure and vulnerability before the disaster occurs.

Value Addition for UPSC:

Key Data Points:

- **Notified disasters: 14**, following the addition of heatwaves and lightning.
- **State disaster funds recommended by FC-XVI:** Approximately **₹2.04 lakh crore** for 2026–27 to 2030–31.
- **SDRF:** Approximately **₹1.64 lakh crore** under the detailed FC-XVI recommendation.
- **SDMF:** Approximately **₹0.41 lakh crore** under the detailed FC-XVI recommendation.
- **National disaster funds: ₹79,406 crore** recommended for the same period.
- **Heat-risk exposure: 57% of Indian districts**, representing approximately **76% of the population**, face high to very high heat risk.



QUESTIONS

1. Consider the following pairs of geographic entities and their associated sectors along the India-China border:

- (1) Aksai Chin : Western Sector
- (2) McMahon Line : Eastern Sector
- (3) Zangnan : Middle Sector
- (4) Himachal Pradesh frontier : Middle Sector

How many of the above pairs are correctly matched?

- (A) Only one
- (B) Only two
- (C) Only three
- (D) All four

2. Consider the following spatial progression of major river systems from upstream high-altitude Himalayan catchments in Nepal across international borders into India:

- (1) Lhende Khola / Bhote Koshi upper tributaries
- (2) Trishuli river mainstem
- (3) Lower Koshi river system entering Northern Bihar

Which of the following represents the correct north-to-south (upstream-to-downstream) drainage sequence?

- (A) 1-2-3
- (B) 2-1-3
- (C) 3-1-2
- (D) 1-3-2

3. Consider the following constitutional provisions and principles related to the Indian Judiciary:

- (1) Article 124(2) mandates that Supreme Court judges are appointed by the President after consultation with specified judges.
- (2) Article 217(1) governs the appointment of High Court judges through consultation involving the Chief Justice of India, the State Governor, and the High Court Chief Justice.
- (3) Article 218(2) establishes the Collegium system as a statutory body for judicial transfers.
- (4) Judicial independence is recognized as part of the Basic Structure of the Indian Constitution.

Which of the statements given above are correct?

- (A) 1 and 2 only
- (B) 1, 2 and 4 only
- (C) 3 and 4 only
- (D) 1, 2, 3 and 4

4. Consider the following national funding initiatives and mission-mode schemes in India:

- (1) Anusandhan National Research Foundation (ANRF)
- (2) Research, Development and Innovation (RDI) Scheme
- (3) National Quantum Mission
- (4) National Supercomputing Mission

How many of the above schemes operate with a central focus on leveraging public funds through a two-tier catalytic structure specifically to mobilize private capital for deep-tech innovation?

- (A) Only one
- (B) Only two
- (C) Only three
- (D) All four

5. Match the following:

List-I (Disaster Architecture / Instrument)	List-II (Core Operational Feature / Principle)
(1) State Disaster Response Fund	(W) Distribution matrix evaluating hazard, exposure, and vulnerability for interstate fiscal allocations
(2) State Disaster Mitigation Fund	(X) Direct real-time mass emergency messaging pushing location-based alerts to mobile handsets
(3) Cell Broadcast Alert System	(Y) Primary state-level financial pool dedicated to immediate emergency relief and ex-gratia assistance
(4) Disaster Risk Index	(Z) Dedicated financial allocation reserved for long-term structural risk-reduction projects

Which of the following is the correct matching option?

- (A) 1-Z, 2-Y, 3-W, 4-X
- (B) 1-Y, 2-Z, 3-W, 4-X
- (C) 1-Z, 2-Y, 3-X, 4-W
- (D) 1-Y, 2-Z, 3-X, 4-W

ANSWER KEY

1 – Answer (C), 2 – Answer (A), 3 – Answer (B), 4 – Answer (A), 5 – Answer (D)



OAS HUB

DAILY CHRONICLE CURRENT AFFAIRS



In today's fast-changing world, staying updated with current affairs is essential for both academic success and professional growth. Awareness of national and international events not only broadens general knowledge but also sharpens critical and analytical thinking skills. It enables individuals to form well-informed opinions, which are crucial for competitive examinations, group discussions, interviews, and impactful essay writing.

Being well-informed reflects adaptability, awareness, and intellectual curiosity—qualities that are highly valued in a competitive environment. A strong grasp of contemporary issues enhances confidence, widens perspective, and prepares individuals to tackle real-world challenges effectively, ultimately opening the door to better opportunities and long-term personal and career advancement.

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