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GS Paper II: Current Affairs

1. Strengthening India's Research and Innovation Ecosystem through the Anusandhan National Research Foundation (ANRF)

a. Introduction

A recent policy discussion has highlighted that India has a unique opportunity to transform from a consumer of technology into a global innovation hub by strengthening its research and development (R&D) ecosystem. The Anusandhan National Research Foundation (ANRF), supported by enhanced public investment in research and development, is expected to play a central role in achieving this objective.

b. Background Context

Research and development (R&D) is a key driver of technological advancement, industrial competitiveness and long-term economic growth. Countries with strong research ecosystems are better positioned to develop frontier technologies, create high-value industries and strengthen their strategic autonomy.

Although India has achieved notable success in sectors such as space technology, pharmaceuticals, digital public infrastructure and information technology, its overall investment in research and development remains considerably below that of major innovation-driven economies. Strengthening research institutions, encouraging private investment and fostering collaboration among academia, industry and government have therefore become national priorities.

Recognising these challenges, the Anusandhan National Research Foundation (ANRF) has been established to provide an integrated institutional framework for advancing research, innovation and technology development across the country.

The Foundation seeks to address existing gaps through targeted financial support and stronger institutional collaboration.



c. Key Features

India's current research and development ecosystem is characterised by relatively low public and private investment, making institutional reforms and enhanced funding essential.

- India currently spends only 0.64% of its Gross Domestic Product (GDP) on research and development, substantially lower than many leading innovation economies.
- Private industry contributes less than half of India's total R&D expenditure, whereas in many advanced economies the private sector accounts for nearly 75% of total research investment.

To address these gaps, the Government has introduced major funding initiatives.

- The Research, Development and Innovation (RDI) Fund provides ₹1 lakh crore over six years to encourage private-sector investment and accelerate innovation.
- The Anusandhan National Research Foundation Core Fund allocates ₹50,000 crore over five years to strengthen fundamental scientific research and promote excellence across universities and research institutions.
- The Foundation seeks to establish strong partnerships among universities, research institutions, industry, start-ups, philanthropic organisations and the Indian diaspora, creating an integrated national innovation ecosystem.

These initiatives are expected to strengthen India's technological capabilities and global competitiveness.

d. Significance

The Anusandhan National Research Foundation has the potential to transform India's research and innovation landscape in several important ways.

- **Technological Self-Reliance:** It will strengthen indigenous research in strategically important sectors such as semiconductors, artificial intelligence, quantum technologies, biotechnology and advanced materials.
- **Reduced Import Dependence:** Greater domestic innovation will reduce reliance on imported technologies and enhance resilience against geopolitical uncertainties and global supply chain disruptions.
- **Commercialisation of Research:** The Foundation seeks to promote the development of indigenous technologies, intellectual property and market-ready products.
- **Stronger Industry-Academia Collaboration:** By fostering partnerships between universities, industry and start-ups, ANRF can bridge the longstanding gap between academic research and industrial application.
- **Talent Retention:** A vibrant research ecosystem will help retain talented scientists, engineers and researchers while attracting global expertise and investment.
- **Knowledge-Based Economy:** In the long term, stronger research capabilities will enhance industrial competitiveness, productivity and India's transition towards a knowledge-driven economy.

Despite its transformative potential, several structural challenges continue to constrain India's research ecosystem.

e. Challenges

Several long-standing constraints continue to affect the growth of India's research and innovation ecosystem.

- **Low R&D Expenditure:** Overall investment in research and development remains inadequate to support globally competitive scientific research.
- **Limited Private-Sector Participation:** Relatively low private investment reduces industrial innovation and technology commercialisation.
- **Weak Industry-Academia Linkages:** Limited collaboration between universities and industry restricts the translation of research into commercially viable technologies.
- **Scarcity of Patient Capital:** Deep-technology research requires sustained long-term financing, which remains limited in India's innovation ecosystem.
- **Brain Drain:** Migration of highly skilled researchers and scientists to foreign institutions continues to weaken domestic research capacity.

- **Commercialisation Gap:** A significant disconnect persists between laboratory research and the successful commercialisation of innovative products and technologies.

Addressing these constraints will be critical for realising the full potential of the ANRF.

f. Way Forward

- Progressively increase research and development expenditure towards internationally competitive levels while encouraging greater private-sector participation.
- Strengthen collaboration among universities, research institutions and industry through joint research programmes, technology transfer offices and innovation clusters.
- Expand venture capital, incubation support and long-term financing for deep-technology start-ups and research-driven enterprises.
- Attract, retain and nurture scientific talent through competitive research funding, modern laboratories and attractive career opportunities.
- Align public procurement policies, regulatory frameworks and intellectual property regimes to encourage the adoption and commercialisation of indigenous technologies.
- Enable the Anusandhan National Research Foundation to function as an effective coordinating institution promoting multidisciplinary research, international collaboration and mission-oriented innovation.

Conclusion

The Anusandhan National Research Foundation (ANRF) represents a landmark institutional reform aimed at transforming India's research and innovation ecosystem. By fostering collaboration among government, academia, industry, start-ups and philanthropic organisations, it has the potential to strengthen technological self-reliance, accelerate innovation and enhance India's global competitiveness. Its long-term success, however, will depend upon sustained investment, stronger private-sector participation, effective commercialisation of research and the creation of a vibrant, globally competitive innovation ecosystem.

GS Paper II: International Relations

2. Updating the Indus Waters Treaty: Towards a Modern Framework for Transboundary Water Governance

a. Introduction

Following India's decision to keep the Indus Waters Treaty (1960) in abeyance after the Pahalgam terrorist attack, renewed attention has focused on the need to review and modernise the treaty to reflect present-day hydrological, environmental, technological and geopolitical realities.

The Indus Waters Treaty (IWT), signed in 1960 with the World Bank as a signatory to certain provisions, governs the sharing of the waters of the Indus River system between India and Pakistan.

River System	Allocation
Eastern Rivers (Ravi, Beas and Sutlej)	Exclusive use by India
Western Rivers (Indus, Jhelum and Chenab)	Primarily allocated to Pakistan, with limited non-consumptive and specified uses permitted to India

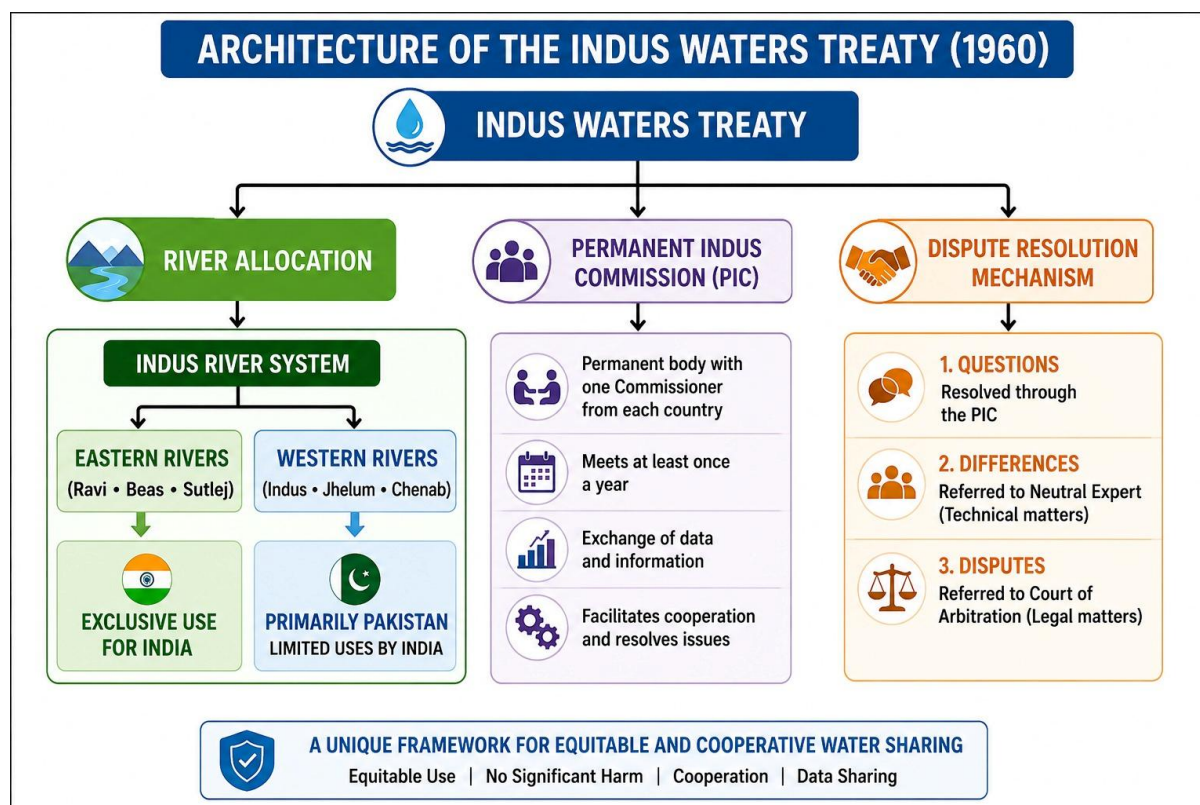
The treaty also established the Permanent Indus Commission (PIC) as the principal institutional mechanism for cooperation and dispute resolution.

b. Background Context

The Indus Waters Treaty is widely regarded as one of the world's most enduring transboundary water-sharing agreements, having remained operational through several periods of political and military tension between India and Pakistan.

However, the treaty was negotiated more than six decades ago under hydrological, technological and developmental conditions that have changed significantly. Rapid population growth, rising water demand, climate change and advances in water management now require a more comprehensive and adaptive framework for governing the Indus basin.

These evolving realities have intensified the debate on updating the treaty to address contemporary water governance challenges.



c. Why the Treaty Needs Updating

Changing Hydrological and Climatic Conditions

- Climate change has significantly altered river flows, glacier melt patterns, precipitation and the frequency of extreme weather events across the Himalayan region.
- Growing populations, urbanisation and agricultural expansion have increased pressure on limited water resources, making efficient and adaptive water management increasingly important.
- Advances in hydrology, remote sensing, forecasting and water management technologies have transformed the scientific understanding of river basin management since the treaty was negotiated in 1960.

Gaps in the Existing Treaty

The treaty primarily focuses on the allocation and utilisation of river waters and does not adequately address several contemporary challenges.

It lacks comprehensive provisions relating to:

- Groundwater management.

- Water quality and pollution control.
- Environmental and ecological flows.
- Climate change adaptation.
- Integrated river basin management.
- Modern digital systems for hydrological data collection and real-time information sharing.

Further, the treaty follows a river-allocation approach, assigning specific rivers to each country, rather than adopting a flexible basin-wide framework capable of responding to changing hydrological conditions.

These limitations underscore the need for a more adaptive and science-based framework for transboundary water governance.

d. Significance of Modernisation

Updating the treaty could strengthen long-term water security while promoting sustainable and cooperative management of the shared river basin.

- **Integrated River Basin Management:** A modern framework would enable basin-wide planning based on contemporary scientific knowledge rather than fixed allocations designed for the conditions of the 1960s.
- **Climate Resilience:** It would improve preparedness for droughts, floods and changing river flows by incorporating climate adaptation and disaster management mechanisms.
- **Comprehensive Water Governance:** Modernisation could strengthen cooperation on groundwater management, pollution control, ecological conservation and environmental flows.
- **Technology-Driven Management:** Real-time hydrological data sharing, digital monitoring systems and advanced forecasting technologies would improve transparency and informed decision-making.
- **Alignment with Global Practices:** Updated provisions would bring the treaty closer to evolving international principles of sustainable and cooperative transboundary water governance.

Despite these potential benefits, meaningful reform faces significant political and diplomatic constraints.

e. Challenges

Several obstacles complicate efforts to modernise the treaty.

- **Political Mistrust:** Persistent tensions between India and Pakistan continue to limit the scope for constructive negotiations.
- **Security Linkages:** Water issues remain closely intertwined with broader security concerns, making technical discussions vulnerable to political developments.
- **Diplomatic Impasse:** Pakistan has not responded to India's notices issued in 2023 and 2024 seeking modification of the treaty.
- **Politicisation of Water:** Increasing securitisation of water resources may reduce opportunities for scientific cooperation and evidence-based water management.

Addressing these challenges will require sustained dialogue and a pragmatic, forward-looking approach.

f. Way Forward

- Strengthen the Permanent Indus Commission (PIC) as the principal platform for technical dialogue, confidence-building and dispute resolution.
- Update the treaty to incorporate provisions relating to climate resilience, groundwater governance, environmental flows, water quality standards and modern hydrological data-sharing mechanisms.
- Promote basin-level scientific cooperation through joint research, improved monitoring systems and regular information exchange while safeguarding India's developmental, environmental and strategic interests.
- Wherever feasible, insulate technical cooperation on water management from broader political disputes to ensure long-term sustainability of the shared river basin.
- Encourage adaptive, science-based and ecosystem-oriented water governance capable of responding to changing climatic, ecological and socio-economic conditions.

Conclusion

The Indus Waters Treaty has played a vital role in sustaining water cooperation between India and Pakistan for more than six decades. However, profound changes in climate, hydrology, technology and developmental needs since its adoption underscore the need for periodic review and modernisation. A contemporary framework grounded in scientific evidence, environmental sustainability and adaptive water governance can strengthen long-term water security while safeguarding India's legitimate developmental and strategic interests and promoting stable management of the shared river basin.

Reader's Note — About This Current Affairs Compilation

Dear Aspirant,

This document is part of the PrepAlpine Current Affairs Series — designed to bring clarity, structure, and precision to your daily UPSC learning.

While every effort has been made to balance depth with brevity, please keep the following in mind:

1. Orientation & Purpose

This compilation is curated primarily from the UPSC Mains perspective — with emphasis on conceptual clarity, analytical depth, and interlinkages across GS papers.

However, the PrepAlpine team is simultaneously developing a dedicated Prelims-focused Current Affairs Series, designed for:

- factual coverage
- data recall
- Prelims-style MCQs
- objective pattern analysis

This Prelims Edition will be released separately as a standalone publication.

2. Content Length

Some sections may feel shorter or longer depending on topic relevance and news density. To fit your personal preference, you may freely resize or summarize sections using any LLM tool (ChatGPT, Gemini, Claude, etc.) at your convenience.

3. Format Flexibility

The formatting combines:

- paragraphs
- lists
- tables
- visual cues

—all optimised for retention.

If you prefer a specific style (lists → paras, paras → tables, etc.), feel free to convert using any free LLM.

4. Monthly Current Affairs Release

The complete Monthly Current Affairs Module will be released soon, optimized to a compact 100–150 pages — comprehensive yet concise, exam-ready, and revision-efficient.

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