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To The Point

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Table Of Content

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GS Paper 3 – Bio-diversity, Environment, Security

1 Reviving River Ecosystems: Understanding the Importance of Environmental Flow (E-Flow)

Context: In a recent high-level meeting led by the **Union Jal Shakti Minister**, discussions centered around enhancing the **environmental flow (e-flow)** of the **Ganga River** and its **tributaries**. The move underscores India's growing commitment to restore and preserve the **natural health of river systems**, particularly those under increasing pressure from human interventions.

What is Environmental Flow (E-Flow)?

Environmental Flow refers to the **quantity**, **timing**, and **quality** of water that must be allowed to flow in a river to **support aquatic ecosystems**, maintain **natural processes**, and sustain **human communities** that rely on these water bodies. It goes beyond just water levels — it's about preserving the **rhythm and pulse** of rivers.

Challenges Facing Indian Rivers:

India's rivers are facing mounting stress due to decades of unchecked development and poor water management. Key challenges include:

- **Dams and Barrages**: Excessive construction has **disrupted natural flow regimes**, fragmenting aquatic habitats and affecting migratory species.
- **Pollution**: Industrial waste, sewage discharge, and agricultural runoff have severely **degraded water quality**, choking river life.
- **Encroachments**: Urban expansion and sand mining have **altered river courses** and restricted natural floodplains.
- **Over-Extraction**: Excessive withdrawal for irrigation, industry, and domestic use has reduced **base flows**, especially during lean seasons.

These disruptions have not only undermined **ecological balance** but also affected **groundwater recharge**, **sediment transport**, and **biodiversity**.

Why E-Flow Matters: Ecological and Social Significance

1. **Preserving Biodiversity:** Environmental flow ensures adequate **habitats for aquatic species**, particularly fish and invertebrates, which are critical to maintaining **food webs** and **nutrient cycles**.

For instance, species like the **Gangetic dolphin** rely on minimum flow levels for survival and breeding.

2. **Sustaining Livelihoods:** Millions of people, especially **riparian communities**, depend on rivers for **fishing**, **agriculture**, and **domestic needs**. E-flow supports **sustainable use** without compromising ecosystem integrity.
3. **Improving Water Quality:** A consistent flow helps dilute pollutants and **flush out toxins**, improving **oxygen levels** and overall **water health**.
4. **Climate Resilience:** Healthy river systems with regulated flows help **mitigate floods**, reduce **drought severity**, and support **climate adaptation** strategies.

Scientific Approach to E-Flow Implementation:

Modern **e-flow assessments** incorporate **hydrological modeling**, **ecological data**, and **community inputs**. These studies evaluate:

- **Flow thresholds** for key species like **Mahseer**, **Hilsa**, and **Rohu**

- **Seasonal variability** needed for spawning, feeding, and migration
- **Sediment and nutrient transport** essential for downstream ecosystems

This data-driven approach helps design **flow regimes** that mimic natural conditions as closely as possible.

Global Context and India's Efforts:

Countries like **Australia**, **South Africa**, and parts of **Europe** have pioneered environmental flow strategies as part of **integrated river basin management**. India has also begun taking strong steps:

- The **National Mission for Clean Ganga (NMCG)** mandates specific **minimum flow levels** in the river.
- **E-flow norms** have been notified for the Ganga stretch under the **Environment (Protection) Act, 1986**.
- The **Ganga Basin Management Plan (GBMP)** by IIT consortium provides a comprehensive roadmap for balancing development with ecological sustainability.

The Way Forward: A Call for River Rejuvenation

- **Strengthen Legal Enforcement** of e-flow regulations across all rivers, not just the Ganga.
- Promote **catchment area treatment**, **afforestation**, and **wetland conservation** to support base flow.
- Foster **community participation** in flow monitoring and river protection efforts.
- Integrate e-flow into broader **climate and water policies**, linking it with **groundwater recharge**, **agriculture planning**, and **urban development**.

Conclusion: Flowing Towards a Sustainable Future

Restoring and maintaining **environmental flow** is **not just a scientific obligation**, but a **moral and ecological necessity**. Healthy rivers are the **lifelines of civilizations**, and e-flow is the heartbeat that keeps them alive. As India aspires for **sustainable development**, respecting the **natural flow of rivers** will be key to securing **ecological balance**, **water security**, and **climate resilience** for generations to come.

GS Paper 3 – Science and Technology

2 India's NavIC System Expands: ISRO to Launch 3 New Navigation Satellites by 2026

Context: In a major development for satellite navigation, the **Indian Space Research Organisation (ISRO)** has announced plans to **launch three additional satellites** for the **Indian Regional Navigation Satellite System (IRNSS)** by **2026**. This move is aimed at **enhancing accuracy**, coverage, and performance of the indigenous navigation system, popularly known as **NavIC**.

What is IRNSS-NavIC?

The **Indian Regional Navigation Satellite System (IRNSS)**, also known as **NavIC** (**Navigation with Indian Constellation**), is **India's independent satellite-based navigation system**. Designed and developed by **ISRO**, it offers **accurate real-time positioning and timing services** to users in India and surrounding regions.

Coverage and Design:

- The **NavIC system** covers the **entire Indian mainland** and extends up to **1,500 kilometers beyond the national borders**.
- The constellation consists of **seven satellites**:
  - **Three** in **Geostationary Orbit (GEO)**
  - **Four** in **Geosynchronous Orbit (GSO)** with an inclined angle
- Supported by a network of **ground stations** operating 24/7 across the country for tracking, control, and data transmission.

Services Offered by NavIC:

NavIC provides **two distinct navigation services**:

1. **Standard Positioning Service (SPS)** –
   - Available **freely to all civilian users**
   - Offers **precise position, velocity, and timing information**
2. **Restricted Service (RS)** –
   - An **encrypted service** exclusively for **authorized government and military users**
   - Ensures **secure and high-precision operations**, especially in defense and strategic missions

Interoperability with Global Systems:

NavIC is designed to be **interoperable** with other major **Global Navigation Satellite Systems (GNSS)** such as:

- **GPS** (United States)
- **GLONASS** (Russia)
- **Galileo** (European Union)
- **BeiDou** (China)

This ensures that devices using NavIC signals can work seamlessly with **international navigation networks**, improving **accuracy and global usability**.

Applications and Significance of NavIC

1. **Civilian Applications:**
   - **Navigation for road transport**, railways, aviation, and marine sectors
   - **Disaster warning systems**, particularly in remote and coastal regions
   - **Asset tracking** for logistics and public services
   - Time synchronization for **telecom and power grids**
2. **Strategic Importance:**
   - Reduces **dependency on foreign GNSS systems** for critical national functions
   - Ensures availability of **navigation services during emergencies** or conflict situations
   - Vital for **missile guidance**, **troop movement coordination**, and **defense communications**
3. **Commercial and Technological Advancements:**
   - Boosts **Make in India** and **Atmanirbhar Bharat** by promoting domestic chipsets and navigation devices
   - Enhances accuracy for **Indian smartphone manufacturers** and **IoT developers**
   - Supports India's **smart cities**, **agriculture precision tools**, and **drones ecosystem**

Looking Ahead: NavIC's Future Roadmap

With the upcoming satellite launches, ISRO aims to:

- **Upgrade the existing constellation** with improved **atomic clocks**, enhanced **signal strength**, and **dual-frequency bands**
- Extend NavIC's footprint into the **Indian Ocean Region (IOR)** and **South Asia**
- Encourage global adoption of NavIC signals in **commercial smartphones and wearables**
- Develop **next-generation NavIC satellites** with **expanded reach and dual-use technology**

As of 2025, several Indian smartphone models are already **NavIC-compatible**, and global tech firms like **Qualcomm** have begun integrating NavIC support into their chipsets.

Conclusion: A Proud Leap in Space-Based Navigation

The **IRNSS–NavIC** system represents a significant step in India's journey towards **technological sovereignty**, **strategic autonomy**, and **regional leadership** in satellite navigation. With new satellite launches on the horizon, **India is well on track to establish itself as a key player in global positioning systems**, offering **reliable, accurate, and secure navigation solutions** tailored for Indian needs and beyond.

GS Paper 3 – Biodiversity and Conservation

3 New Spider Species Discovered in Sundarbans: *Piratula acuminata* Marks First Record for India

Context: In an exciting breakthrough, scientists from the **Zoological Survey of India (ZSI)** have announced the discovery of a **new spider species**, *Piratula acuminata*, from **Sagar Island** in the **Sundarbans Delta**. This finding adds a new chapter to India's rich and diverse **arachnid fauna**.

Meet *Piratula acuminata*: India's First of Its Kind

The newly described species, ***Piratula acuminata***, belongs to the **Lycosidae family**, commonly known as **wolf spiders**. These spiders are **active hunters**, known for their **speed and ground-based predatory behavior**, unlike web-weaving spiders.

This marks the **first time the genus *Piratula* has been recorded in India**. Until now, species from this genus were primarily known from **Asia**, with scattered occurrences in **Europe** and **North America**.

Physical Features and Behavior:

- **Size**: Medium-sized, measuring about **8 to 10 millimetres** in length
- **Appearance**: Exhibits a **creamy-white body** with **chalk-white and brown spots** on the abdomen
- **Distinctive Markings**: Features a pair of **light brown stripes** running toward the rear of the body
- **Habitat**: Found in **coastal, muddy, and saline ecosystems**, specifically within the **intertidal zones** of the Sundarbans
- **Hunting Style**: These **ground-dwelling predators** use **ambush techniques** instead of webs, capturing prey through **stealth and speed**

Ecological Significance:

The presence of *Piratula acuminata* in the **Sundarbans Biosphere Reserve**—a **UNESCO World Heritage Site** and one of the **largest mangrove ecosystems in the world**—highlights the **underexplored biodiversity** of the region.

This discovery reinforces the Sundarbans' role as a **critical hotspot for unique and endemic species**, not only for **tigers and crocodiles**, but also for lesser-known organisms like **spiders, insects, and amphibians**.

Why It Matters: Scientific and Conservation Value

- **Taxonomic Importance**: Enhances knowledge about the **distribution and diversity** of the **Lycosidae** family
- **Conservation Relevance**: Underlines the need for **habitat protection** in fragile ecosystems like the Sundarbans
- **Scientific Curiosity**: The unique adaptations of ground-hunting spiders in **saline, muddy environments** open doors for further research into **behavioral ecology** and **evolutionary biology**

Looking Ahead: Untapped Diversity in Indian Ecosystems

The discovery of *Piratula acuminata* is a **reminder of the vast, yet undiscovered species** that may still be lurking in India's remote landscapes. As habitat loss and climate change threaten these fragile ecosystems, such scientific revelations stress the **urgent need for sustained biodiversity research and conservation action**.

Conclusion: A Small Spider, A Giant Leap in Biodiversity Research

Piratula acuminata may be just a few millimetres long, but its discovery represents a **significant stride in India's natural history documentation**. With the Sundarbans continuing to surprise scientists, it's clear that **nature still holds many secrets**, waiting to be unveiled by those who look closely enough.

GS Paper 2 – International Relations

4 PM Modi's Visit to Maldives Signals Diplomatic Reset and Strategic Deepening

Context: Prime Minister Narendra Modi recently undertook a **high-profile visit to the Maldives** at the invitation of **President Dr. Mohamed Muizzu**, becoming the **first Head of State** to visit the island nation during Muizzu's presidency. This marked Modi's **third visit** to the Maldives and coincided with the country's **60th Independence Day celebrations**, where he was honoured as the **Guest of Honour**.

Celebrating 60 Years of Independence and Friendship:

PM Modi extended heartfelt congratulations on the **60th Independence Day of the Maldives** and participated in the grand national celebrations. To mark **six decades of diplomatic relations**, both leaders released a **commemorative stamp**, symbolizing the enduring bond between the two nations.

- The stamp features the **Indian Uru boat**—a traditional wooden dhow from **Beypore, Kerala**—and the **Maldivian Vadhu Dhoni**, a classic fishing vessel, highlighting the **shared maritime heritage** of the Indian Ocean region.
- **India was among the first nations** to establish diplomatic ties with the Maldives post-independence in **1965**, underlining a relationship rooted in geography, trade, and cultural proximity.

Strengthening Health and Disaster Preparedness:

As part of India's **Neighbourhood First Policy** and its broader maritime vision **'MAHASAGAR'**, PM Modi handed over two **BHISHM Health Cube sets** to the Maldivian government.

- These state-of-the-art **Aarogya Maitri BHISHM Cubes** are portable emergency health kits that can **treat up to 200 casualties** and sustain a medical team of six for **72 hours** in disaster-hit zones.
- Designed for **rapid deployment**, these cubes showcase India's growing role in **humanitarian assistance and disaster relief (HADR)** in the Indo-Pacific.

Key Inaugurations and Handovers:

PM Modi and President Muizzu jointly **inaugurated the new building of the Maldivian Ministry of Defence** in Malé, **funded by India**, reflecting deepening cooperation in **security and infrastructure**.

Other key handovers and inaugurations included:

- **3,300 social housing units** in Hulhumalé under India's Buyer's Credit facility
- **Roads and drainage infrastructure** in Addu City
- **Six High Impact Community Development Projects (HICDPs)** across the Maldives
- **72 vehicles and essential equipment** for civic and security needs

Economic Cooperation: New Credit Lines and Debt Relief

A major highlight of the visit was the announcement of a ₹**4,850 crore Line of Credit (LoC)** to Maldives, marking the **first time such credit is being extended in Indian Rupees**. This is a crucial step to ease Maldives' **twin deficits** and **boost liquidity**.

- India also granted **significant debt relief** by reducing Maldives' annual loan repayment from **$51 million to $29 million**, offering much-needed fiscal breathing space.

- The two nations also **initiated talks for the India-Maldives Free Trade Agreement (IMFTA)**, paving the way for stronger trade and economic integration.

Climate Action and Green Diplomacy:

In a symbolic gesture of shared commitment to climate resilience, both leaders participated in a **joint tree-planting ceremony**, combining India's **"Ek Pedh Maa Ke Naam"** initiative with the Maldives' **"Pledge to Plant 5 Million Trees"** campaign.

This underscores both countries' resolve to address **climate change**, especially in the vulnerable **island ecosystems** of the Indian Ocean.

From 'India Out' to Strategic Embrace: A Diplomatic Turnaround

The visit is being hailed as a **watershed moment in India-Maldives relations**, especially considering the **anti-India rhetoric** that marked President Muizzu's early tenure.

- Elected in **September 2023**, President Muizzu had initially taken a **pro-China stance**, voicing opposition to India's military presence and visiting **Turkey and China** ahead of New Delhi.
- Despite provocations, India chose **strategic patience**. In a pragmatic shift, India replaced its 76 military personnel with **HAL technicians** in May 2024, respecting Maldivian concerns without harming core strategic interests.

This reset came amid **Maldives' economic challenges**, **limited Chinese assistance**, and a **supermajority win** for Muizzu's party, prompting renewed interest in India as a **trusted partner**.

India's Continued Support: The Foundation of Trust

India's **economic and developmental assistance** played a key role in restoring ties. Highlights include:

- **120 crore in additional budgetary support**
- **Rolling over Treasury Bills worth $150 million**
- **Currency swap arrangements worth $750 million**
- **Largest-ever quota allocations** for essential exports to Maldives
- Bilateral trade reached **$548 million in 2023**, supported by **visa-free access** for Indian business travellers

Conclusion: A Relationship Recalibrated

President Muizzu's public statement that **"Maldives will not do anything that harms India's security interests"** marked a **dramatic shift in tone and trust**. The invitation to PM Modi as **Guest of Honour** for the nation's milestone celebration reflects a **mature, realistic, and mutually beneficial partnership**.

This visit stands as a **case study in effective diplomacy**, where **India's calm strategy, regional generosity, and long-term vision** transformed a tense phase into a promising new era of **cooperation, security, and shared prosperity** in the **Indian Ocean region**.

GS Paper 3 – Economy

5 India's Green Steel Push: Paving the Way for Low-Carbon Industrial Transformation

Context: The **Government of India** is on the verge of finalising a landmark policy that will mandate at least **25% of public sector steel procurement to come from "green steel"** sources. The move is aimed at **boosting demand** for low-emission steel and **shielding it from being undercut by cheaper, high-emission alternatives**.

This initiative represents a significant step in aligning **India's infrastructure and industrial growth with its climate commitments** under the **Paris Agreement** and **net-zero vision for 2070**.

What is Green Steel?

Green steel refers to **steel produced through low-carbon technologies**, mainly by:

- **Replacing coal-based blast furnaces** with **hydrogen-based Direct Reduced Iron (DRI)** processes
- Using **Electric Arc Furnaces (EAFs)** powered by **renewable energy sources**

These methods significantly reduce the **carbon footprint** associated with conventional steel production, which is traditionally one of the **most emissions-intensive industries globally**.

Why Green Steel Matters:

- The **steel sector contributes around 10–12% of India's total carbon emissions**, making it a key focus for decarbonisation.
- India, the **second-largest steel producer in the world since 2018**, relies heavily on steel for **infrastructure, automotive, and manufacturing development**.
- A transition to green steel will position India as a **climate-conscious manufacturing hub** and a **responsible global supplier**.

Key Challenges in Green Steel Adoption:

Despite its potential, green steel faces several barriers:

- **High production costs** compared to conventional steel
- **Technologies** like **hydrogen-based DRI** and **carbon capture** are still in **early stages of commercial viability**
- **Green hydrogen production** demands a large-scale **renewable energy infrastructure**, still under development
- **Lack of procurement mandates and market incentives** hinders widespread adoption

India's Efforts So Far: Building the Foundation:

India has already taken **significant policy and institutional steps** to support the green steel transition:

1. **Greening the Steel Sector Report:** The **Ministry of Steel** released a comprehensive **"Greening the Steel Sector in India: Roadmap and Action Plan"**, based on inputs from **14 expert task forces**. It outlines a multi-pronged strategy to decarbonise the sector through **technology, policy, and finance**.
2. **Steel Scrap Recycling Policy (2019):** Encourages the use of **scrap steel**, which can **cut emissions by up to 58%**. The **Vehicle Scrappage Policy** (September 2021) supports this by increasing the domestic availability of scrap.
3. **Renewable Energy Integration:**The **National Solar Mission**, launched in 2010, supports the development of **solar-powered industrial processes**, including steel manufacturing.
4. **Energy Efficiency Incentives:** The **Perform, Achieve and Trade (PAT) scheme**, under the **National Mission for Enhanced Energy Efficiency**, rewards steel plants for **reducing energy consumption**, indirectly lowering emissions.

Strategic Importance for India:

- **Green steel** is crucial to achieving India's **net-zero emissions goal by 2070**
- It enables **sustainable economic growth** while supporting **climate justice** and **environmental integrity**
- By developing indigenous low-carbon technologies and standards, India can become a **global exporter** of green steel and related technologies
- It aligns with global climate action efforts such as the **Carbon Border Adjustment Mechanism (CBAM)** being rolled out in the **European Union**, which could impact India's steel exports

The Way Forward: Accelerating the Transition

To ensure success, India must focus on:

- **Finalising the green steel procurement policy** and implementing **binding targets for public purchases**
- **Scaling up domestic green hydrogen production** through incentives and infrastructure investments
- **Promoting R&D** in low-emission steelmaking technologies
- **Encouraging private sector participation** and creating **demand-side incentives** through green certification and tax breaks
- Establishing **carbon accounting frameworks and emissions labelling** for steel products

Conclusion: Forging a Greener Future

The adoption of **green steel** is not just a climate imperative—it is a **strategic industrial opportunity**. With coordinated policies, innovation, and long-term investment, **India has the potential to lead the world in sustainable steel production** while building a **resilient, low-carbon economy** for future generations.

GS Paper 1 – Geography

6 Democratic Republic of the Congo: Steps Toward Peace and Strategic Importance

Context: In a significant move towards ending long-standing conflict, the **Government of the Democratic Republic of the Congo (DRC)** and the rebel faction **M23 (March 23 Movement)** have signed a **Declaration of Principles** in Doha. This historic agreement, facilitated by the **Congo River Alliance** and mediated by **Qatar**, aims to establish lasting peace and stability in the conflict-ridden eastern regions of the country.

Political and Geographic Overview:

- **Location:** The DRC is a vast nation located in **Central Africa**, rich in natural resources and cultural diversity.
- **Capital City:** Kinshasa, one of the largest cities on the African continent.
- **Neighbouring Countries:** The DRC shares borders with **Angola, Republic of the Congo, Central African Republic, South Sudan, Uganda, Rwanda, Burundi, Tanzania, and Zambia**.
- **Coastline:** It has a narrow coastline along the **Atlantic Ocean**.
- **Conflict Zones:** The volatile provinces of **North Kivu, South Kivu, and Ituri** have been epicenters of violence due to rebel activities and ethnic tensions.

Geographic Highlights and Natural Wealth:

- The **Congo River**, the **second longest river in Africa**, uniquely crosses the Equator twice and serves as a vital lifeline for transportation, hydroelectric power, and agriculture.
- The country features prominent geographical formations like the **Katanga Plateau** and the fertile **Congo Basin**, home to one of the world's largest tropical rainforests.
- Significant lakes including **Lake Tanganyika, Lake Albert, Lake Edward, and Lake Kivu** provide freshwater resources and support biodiversity.
- The **Virunga Mountains** house **Mount Nyiragongo**, an active volcano known for its spectacular lava lake and frequent eruptions.
- The landscape varies from dense **rainforests** in the central lowlands to expansive **savanna** regions.

Economic Significance: Global Cobalt Hub

The DRC holds a critical position in the global economy as the source of approximately **75% of the world's cobalt production**—a mineral essential for manufacturing **batteries in electric vehicles, smartphones, and renewable energy technologies**. This mineral wealth positions the DRC as a key player in the global **green energy transition**, but it also attracts complex challenges related to resource governance and conflict financing.

Additional Insights:

- Despite its abundant natural wealth, the DRC faces ongoing challenges including political instability, humanitarian crises, and infrastructural deficits.
- The peace agreement in Doha could pave the way for international investments and improved governance, potentially unlocking the country's vast economic potential.
- Environmental conservation efforts are crucial as the Congo Basin rainforest plays a vital role in **global carbon sequestration and biodiversity protection**.

Conclusion: A Nation at the Crossroads

The Democratic Republic of the Congo stands at a pivotal moment—where strides toward peace, sustainable management of its natural riches, and regional cooperation could transform its future. The recent peace agreement represents hope not only for stability but also for unlocking the DRC's potential as a cornerstone in Africa's economic and environmental landscape.