

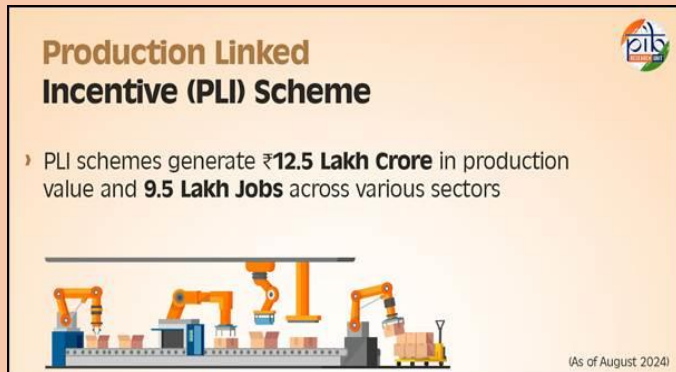
PRAGNYA BHARATHI: Detailed News Analysis (DNA)

Topic : Government Scales Up PLI Budget to Accelerate Manufacturing

Relevance : GS Paper 3 Economy

Source : PIB

Context :



India's manufacturing sector is undergoing a major transformation, driven by policies aimed at boosting domestic production and enhancing global competitiveness. One of the most significant initiatives in this regard is the **Production Linked Incentive (PLI) Scheme**, launched in 2020 to attract investment, encourage innovation, and create employment. The government has now significantly increased budget allocations for key sectors under the scheme for **FY 2025-26**, reinforcing its commitment to making India a global manufacturing powerhouse.

Increased Budget for Key Sectors

The government has allocated substantial funds to accelerate industrial growth in strategic sectors. The budget for **electronics and IT hardware** has increased from ₹5,777 crore in FY 2024-25 to ₹9,000 crore in FY 2025-26. The **automobile and auto components** sector has seen a dramatic rise from ₹346.87 crore to ₹2,818.85 crore. Similarly,

the **textile sector**, which had a mere ₹45 crore allocation in the previous year, has been granted ₹1,148 crore. Other sectors like pharmaceuticals, white goods (ACs and LED lights), specialty steel, and battery storage have also received higher allocations to strengthen domestic manufacturing capabilities.



Strategic Importance of PLI Scheme

The **PLI Scheme** is not just a financial incentive mechanism but a strategic step toward **Atmanirbhar Bharat** (Self-Reliant India). By focusing on sectors such as electronics, textiles, pharmaceuticals, and automobiles, the scheme directly links financial incentives to measurable outcomes like increased production, higher sales, and technological advancement. This **performance-based approach** attracts both domestic and foreign investments, pushing businesses to adopt cutting-edge technologies and achieve economies of scale.

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With an overall outlay of ₹1.97 lakh crore (over US\$26 billion), the **PLI Scheme covers 14 critical sectors** to enhance India's industrial capabilities and strengthen its position in global markets. These sectors have been selected strategically to boost domestic production, reduce import dependency, and expand exports.

Achievements and Economic Impact

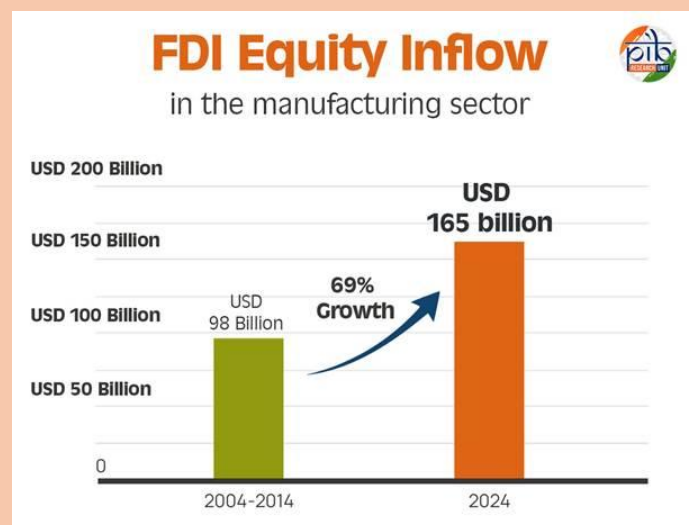
Since its launch, the **PLI Scheme has attracted massive investments**, totaling ₹1.46 lakh crore as of August 2024. This is expected to exceed ₹2 lakh crore in the coming year. These investments have led to significant production and sales growth,

amounting to ₹12.50 lakh crore. Additionally, the scheme has created **9.5 lakh jobs** directly and indirectly, with projections indicating that the number will rise to **12 lakh jobs** soon.

Exports have also surged past ₹4 lakh crore, particularly in **electronics, pharmaceuticals, and food processing**. The scheme has played a crucial role in strengthening India's domestic industries, increasing the global competitiveness of Indian products, and driving employment generation.

Foreign Direct Investment (FDI) Reforms and Their Role

A critical aspect of the PLI scheme is its ability to **attract foreign investment** in high-tech industries, which strengthens India's manufacturing sector. The government has introduced **liberalized FDI policies**, allowing **100% FDI under the automatic route** in most manufacturing sectors.



Over the past decade, several key reforms have been implemented to enhance investment attractiveness.

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In 2019, **100% FDI was allowed in coal mining and contract manufacturing**. In 2021, **FDI in the insurance sector was increased to 74%**, and the **telecom sector was brought under the automatic route**. In 2024, reforms in the **space sector** further boosted India's appeal to global investors.

These policy changes have resulted in a **69% increase in FDI equity inflows** in the manufacturing sector, rising from **USD 98 billion (2004-2014) to USD 165 billion (2014-2024)**. With streamlined approval processes and investor-friendly regulations, India continues to position itself as a **leading global manufacturing destination**.

Sector-Specific Achievements Under PLI

PLI Schemes with the Highest Budget Allocation (2025-26)		
Name of the Scheme	Revised Estimates 2024-25 (₹ Crores)	Budget Estimates 2025-26 (₹ Crores)
Production Linked Incentive (PLI) Scheme in electronics manufacturing and IT hardware.	5777.00	9000.00
PLI for Automobiles and Auto Components	346.87	2818.85
PLI for Pharmaceuticals	2150.50	2444.93
PLI for Textile	45.00	1148.00
PLI for White Goods (ACs and LED Lights)	213.57	444.54
PLI for Specialty Steel	55.00	305.00
PLI for National Programme on Advanced Chemistry Cell (ACC) Battery Storage	15.42	155.76

1. Electronics and IT Hardware

The large-scale electronics manufacturing

sector has grown rapidly, transforming India from a **net importer** to a **net exporter** of mobile phones. Domestic production has surged from **5.8 crore units in 2014-15 to 33 crore units in 2023-24**. Foreign Direct Investment in this sector has increased by **254%**, and mobile phone exports have crossed **5 crore units**, indicating a shift in India's global market position.

2. Pharmaceuticals and Medical Devices

The PLI scheme has **strengthened India's pharmaceutical sector**, making it the **third-largest producer of medicines by volume** globally. Exports now account for **50% of total production**, and India has significantly reduced its reliance on imported bulk drugs by **producing key raw materials like Penicillin G**. The medical devices industry has also benefited, with companies **developing advanced equipment like CT scanners and MRI machines domestically**.

3. Automobile and Auto Components

The **PLI scheme for automobiles** has led to substantial investment inflows, exceeding **₹67,690 crore**, far surpassing initial expectations. Over **115 companies** applied for incentives, with **85 firms receiving approvals**. This has enhanced the production of high-tech auto components, strengthening India's position as a global automotive hub.

4. Renewable Energy and Solar PV Modules

The **solar manufacturing sector** has witnessed rapid expansion under the PLI scheme. The first phase, with an outlay of **₹4,500 crore**, successfully built **solar PV module manufacturing capacity**. The

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second phase, with **₹19,500 crore**, is expected to establish **65 GW of domestic production capacity**, significantly reducing import dependence and boosting India's renewable energy ambitions.

5. **Telecom and Networking Equipment**
India has achieved **60% import substitution in telecom equipment**, with global companies now setting up manufacturing units domestically. The country has become a **major exporter of 4G and 5G telecom equipment**, strengthening its **telecom infrastructure and global market presence**.
6. **Drones and Drone Components**
The PLI scheme has provided a significant boost to India's **drone industry**, with sector revenues increasing **seven-fold**. The **growth of MSMEs and start-ups in this sector** has attracted investments and created jobs, positioning India as a **global leader in drone technology**.

The **Production Linked Incentive (PLI) Scheme** is a cornerstone of India's **Atmanirbhar Bharat and Make in India** vision. With **increased budget allocations**, rising investments, and growing exports, the scheme is **transforming India's industrial landscape**. By **reducing import dependency, fostering innovation, and strengthening domestic manufacturing**, the scheme is expected to drive **long-term economic growth** and establish India as a **global manufacturing leader**.

As the PLI scheme continues to scale up, its impact on employment, exports, and industrial self-reliance

will be crucial in shaping India's **economic trajectory in the coming decade**.

Prelims Practice Question

Q. Consider the following statements regarding the Production Linked Incentive (PLI) Scheme:

1. The PLI scheme was launched in 2014 as part of the Make in India initiative.
2. The scheme provides financial incentives based on incremental production and sales.
3. The PLI scheme covers only five key sectors, including electronics and pharmaceuticals.
4. One of the objectives of the scheme is to reduce import dependence and enhance India's global competitiveness.

Which of the statements given above are correct?

- (a) 1 and 3 only
- (b) 2 and 4 only
- (c) 1, 2, and 3 only
- (d) 2, 3, and 4 only

Answer:

Correct Option: (b) 2 and 4 only

Explanation:

- **Statement 1 is incorrect:** The PLI scheme was launched in **2020**, not 2014.
- **Statement 2 is correct:** The scheme provides **financial incentives linked to incremental production and sales** to boost manufacturing.

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- **Statement 3 is incorrect:** The PLI scheme covers **14 sectors**, not just five.
- **Statement 4 is correct:** One of the key objectives of the scheme is to **reduce import dependence and enhance India's global competitiveness**.

Mains Model Question

Q. The Production Linked Incentive (PLI) Scheme is a key pillar of India's manufacturing strategy aimed at enhancing self-reliance and global competitiveness. Discuss the significance of the scheme, its impact on key sectors, and the challenges associated with its implementation.

The **Production Linked Incentive (PLI) Scheme**, launched in 2020, aims to boost India's **manufacturing capacity, attract investment, enhance exports, and reduce import dependency**. With an outlay of ₹1.97 lakh crore, the scheme covers **14 strategic sectors**, including electronics, pharmaceuticals, textiles, and automobiles.

Significance of the PLI Scheme

- **Boosts Domestic Manufacturing:** Encourages firms to expand production within India.
- **Enhances Global Competitiveness:** Supports India's transition into a global manufacturing hub.
- **Attracts Foreign Direct Investment (FDI):** Investor-friendly policies have resulted in increased FDI inflows.
- **Generates Employment:** Direct and indirect job creation across multiple sectors.

- **Supports Technological Advancements:** Promotes R&D and adoption of cutting-edge technologies.

Impact on Key Sectors

- **Electronics & IT Hardware:** India has become a net exporter of mobile phones, with production increasing significantly.
- **Automobile & Auto Components:** Incentives have led to increased production of electric vehicles and high-tech components.
- **Pharmaceuticals & Medical Devices:** Strengthened India's position as a global pharmaceutical supplier.
- **Renewable Energy:** Expansion of **solar PV module** manufacturing to reduce reliance on imports.

Challenges in Implementation

- **Delays in Disbursement:** Slow rollout of incentives affects investor confidence.
- **Infrastructure Bottlenecks:** High logistics and energy costs hinder manufacturing growth.
- **Global Supply Chain Disruptions:** Dependence on imported raw materials affects production.
- **Compliance and Regulatory Hurdles:** Lengthy approval processes deter small businesses.

Conclusion

The **PLI scheme is a transformative step** toward an **Atmanirbhar Bharat**, fostering economic

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growth, job creation, and technological progress. However, addressing implementation challenges is crucial to maximizing its impact.

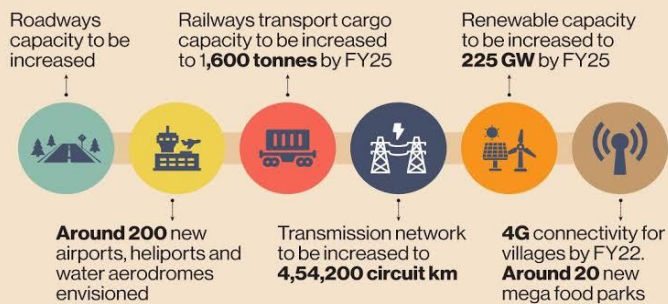
Topic : PM Gati Shakti: For India's Infrastructure Growth

Relevance : GS Paper 3 Infrastructure

Source : India Express

Context :

GATI SHAKTI MASTER PLAN



PM Gati Shakti – National Master Plan for Multimodal Connectivity was launched on October 13, 2021, with the objective of **revamping India's infrastructure, enhancing logistics efficiency, and improving multimodal transportation**. The initiative integrates multiple ministries and sectors under a **unified digital platform** to ensure seamless coordination, reduce project delays, and boost India's competitiveness in global markets. By focusing on **sustainability and efficiency**, PM Gati Shakti is a significant step toward achieving India's vision of becoming a **self-reliant and globally competitive economy**.

It is a **game-changer for India's infrastructure development**, addressing **long-standing**

inefficiencies in project execution, logistics, and multimodal connectivity. By **integrating digital technology, sustainability, and coordinated planning**, the initiative aims to **position India as a global economic and manufacturing hub**. When combined with complementary initiatives like **ODOP and Make in India**, PM Gati Shakti is set to **drive India's economic growth, attract global investments, and create a robust, future-ready infrastructure ecosystem**.

Global Recognition and Significance

The **PM Gati Shakti Experiential Centre at Bharat Mandapam, New Delhi**, has received international appreciation for showcasing India's **technological and infrastructural advancements**.

- **Retired Justice Michael Wilson (Hawaii, USA)** highlighted the initiative's potential to **address global transportation challenges** while maintaining a balance between **sustainability and economic growth**.
- **Professor Vesselin Popovski (Soka University, Japan)** recognized **India's infrastructure modernization** and emphasized that initiatives like **PM Gati Shakti and One District One Product (ODOP)** will **position India as a global economic leader** in the coming decades.

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Key Features of PM Gati Shakti

Key Achievements of PM GatiShakti

- 

On boarding Whole of the Government on the Single platform: PMGS has integrated 44 Central Ministries and 36 States/UTs with more than 1600 data layers.
- 

Social Sector Impact: PMGS social sector expansion has enabled data-driven planning for schools, hospitals, and anganwadis. E.g., PMGS portal was used to link PM Shri Schools with local industries for district-specific skill training.
- 

PM GatiShakti State Master Plans (SMPs): All 36 States/UTs have developed the PMGS portals, aligned with the PM GatiShakti National Master Plan platform.
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Trade Facilitation: PMGS has been instrumental in addressing critical infrastructure gaps, reducing logistics costs, etc. E.g., Planning over 8,891 km of roads using NMP.
- 

Driving Sustainable, Data-Driven Development: PMGS employs GIS tools to ensure efficient infrastructure development. E.g., A 13 GW renewable energy project from Leh (Ladakh) to Kaithal (Haryana) achieved optimal alignment of the 'Green Energy Corridor' for inter-state transmission.
- 

PMGS Delivers Results: Breakthrough assessment of 208 key infrastructure projects totalling \$180 Billion.

PM Gati Shakti integrates multiple **infrastructure projects under one centralized framework** to streamline logistics, optimize supply chains, and reduce inefficiencies.

- It brings together various **ministries, including Railways, Road Transport, Shipping, Civil Aviation, and Urban Affairs**, ensuring **coordinated execution of infrastructure projects**.
- The initiative covers key infrastructure programs such as **Bharatmala, Sagarmala, inland waterways, UDAN, industrial corridors, and economic zones**.
- A **real-time digital platform** facilitates **data sharing, project monitoring, and predictive analytics**, helping authorities **prevent duplication of efforts and accelerate implementation**.
- It aims to **reduce logistics costs, improve last-mile connectivity, and support India's growing manufacturing sector** by ensuring

faster transportation of goods and raw materials.

Role of One District One Product (ODOP) Initiative

The **ODOP initiative**, showcased at the **Experiential Centre**, promotes **local industries and region-specific products** by providing them **better market access and support for export-oriented growth**.

- Professor Popovski emphasized that **ODOP will benefit producers, suppliers, and consumers while boosting international investments** in India's local industries.
- It connects various sectors such as **agriculture, textiles, handicrafts, and manufacturing**, making it a **catalyst for rural and small-scale economic development**.
- The initiative aligns with **India's vision of promoting self-reliance (Atmanirbhar Bharat)** and enhancing employment opportunities, especially for the **youth and small entrepreneurs**.

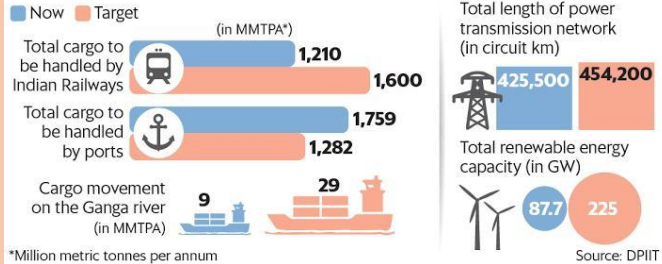
Impact on India's Infrastructure and Economy

PM Gati Shakti is expected to bring about a **major transformation in India's logistics and infrastructure landscape**.

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The master plan

The PM Gati Shakti aims to break inter-ministerial silos in infrastructure development. It will be achieved through integrated planning and coordinated implementation between different government departments.

Key targets by FY25

- By reducing transportation bottlenecks and improving supply chain efficiency, it will lower costs for industries and consumers alike.
- Improved connectivity between ports, highways, rail networks, and industrial hubs will enhance India's exports and foreign direct investment (FDI) inflows.
- The project will create millions of direct and indirect employment opportunities by expanding industrial corridors, logistics parks, and smart urban infrastructure.

Prelims Practice Question

Q. Consider the following statements regarding PM Gati Shakti – National Master Plan:

1. It is a **digital platform** aimed at ensuring **integrated planning and coordinated execution** of infrastructure projects across multiple ministries.
2. The initiative primarily focuses on **urban infrastructure development** and does not include projects related to transportation and logistics.

3. PM Gati Shakti integrates key infrastructure programs such as **Bharatmala, Sagarmala, inland waterways, and UDAN**.
4. The initiative is designed to **reduce logistics costs, enhance supply chain efficiency, and boost India's manufacturing sector**.

Which of the statements given above are correct?

- (a) 1, 3, and 4 only
(b) 1 and 2 only
(c) 2 and 4 only
(d) 1, 2, 3, and 4

Answer:

Correct Option: (a) 1, 3, and 4 only

Explanation:

- **Statement 1 is correct:** PM Gati Shakti is a **digital platform** that enables **integrated planning and coordinated execution** of infrastructure projects across multiple ministries.
- **Statement 2 is incorrect:** The initiative does not focus **only on urban infrastructure**; it includes **transportation, logistics, industrial corridors, and multimodal connectivity projects**.
- **Statement 3 is correct:** It integrates major infrastructure programs like **Bharatmala (highways), Sagarmala (ports), inland waterways, UDAN (regional air connectivity), and other industrial corridors**.
- **Statement 4 is correct:** One of its key objectives is to **reduce logistics costs, enhance supply chain efficiency, and**

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support India's manufacturing sector by improving connectivity.

Mains Model Question

Q. PM Gati Shakti – National Master Plan is a transformative initiative aimed at revolutionizing India's infrastructure development. Discuss its key objectives, components, and impact on logistics, economy, and governance.

PM Gati Shakti, launched in **October 2021**, is a **comprehensive digital master plan** aimed at streamlining infrastructure development in India. It integrates multiple sectors, such as **railways, roads, ports, and aviation**, under a **unified digital platform** to ensure coordinated execution of projects. This initiative seeks to enhance **logistics efficiency**, boost economic growth, and improve **governance through inter-ministerial collaboration**.

PM GATI SHAKTI: SIX PILLARS OF TRANSFORMATION					
Comprehensiveness	Prioritization	Optimization	Synchronization	Analytical	Dynamic
It will include all the existing and planned initiatives of various Ministries and Departments with one centralized portal. Each and every Department will now have visibility of each other's activities providing critical data while planning & executing projects in a comprehensive manner.	Through this, different Departments will be able to prioritize their projects through cross-sectoral interactions.	The National Master Plan will assist different ministries in planning for projects after the identification of critical gaps. For the transportation of goods from one place to another, the plan will help in selecting the most optimum route in terms of time and cost.	Individual Ministries and Departments often work in silos. PM Gati Shakti will help in synchronizing the activities of each department, as well as of different layers of governance, in a holistic manner by ensuring coordination of work between them.	The plan will provide the entire data in one place with GIS-based spatial planning and analytical tools having 200+ layers, enabling better visibility to the executing agency.	All Ministries and Departments will now be able to visualize, review, and monitor the progress of cross-sectoral projects through the GIS platform, as satellite imagery will give on-ground progress periodically and the progress of the projects will be updated on a regular basis on the portal. It will help in identifying the vital interventions for enhancing and updating the master plan.

The primary objective of PM Gati Shakti is to **reduce logistics costs**, which currently stand at **13-14% of GDP**, much higher than global standards. By integrating **Bharatmala (highways)**, **Sagarmala (ports)**, **inland waterways**, **UDAN (aviation)**, and **industrial corridors**, it promotes

multi-modal connectivity for faster and cost-effective transportation. The project leverages **GIS-based mapping, real-time data, and AI-driven analytics** to identify bottlenecks and improve decision-making.

One of its major impacts is the **enhancement of India's supply chain efficiency**. Faster transportation and reduced transit times will strengthen the **manufacturing sector**, making India a competitive player in **global trade and exports**. Additionally, the initiative supports **sustainable infrastructure** by promoting eco-friendly transport systems and **reducing carbon emissions**. It also acts as a catalyst for **employment generation**, particularly in construction, logistics, and industrial clusters.

From a governance perspective, PM Gati Shakti adopts a **whole-of-government approach**, fostering **seamless coordination among multiple ministries and departments**. It eliminates bureaucratic delays, ensures transparency, and accelerates project approvals through a **centralized digital framework**. By **integrating infrastructure planning with technology-driven governance**, PM Gati Shakti is poised to transform **India's economic landscape**, positioning the country as a **global manufacturing and logistics hub**.

Topic : India-Nepal MoU on Water, Sanitation, and Hygiene (WASH)

Relevance : GS Paper 2 International Relations and Governance

Source : PIB

Context :

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The **India-Nepal MoU on WASH** is a **strategic step toward ensuring water security, sanitation, and sustainable environmental management** in both nations. With growing urbanization and climate change challenges, joint efforts in **capacity building, technology sharing, and policy alignment** will lead to **improved public health, economic progress, and environmental sustainability**. This initiative not only deepens **bilateral ties** but also reinforces the commitment of both nations toward a **cleaner, healthier, and more resilient future**.

The signing of the **Memorandum of Understanding (MoU) between India and Nepal on Water, Sanitation, and Hygiene (WASH)** marks a significant milestone in the collaboration between the two neighboring countries. With water security and sanitation being essential components of **public health and sustainable development**, this agreement strengthens bilateral ties and

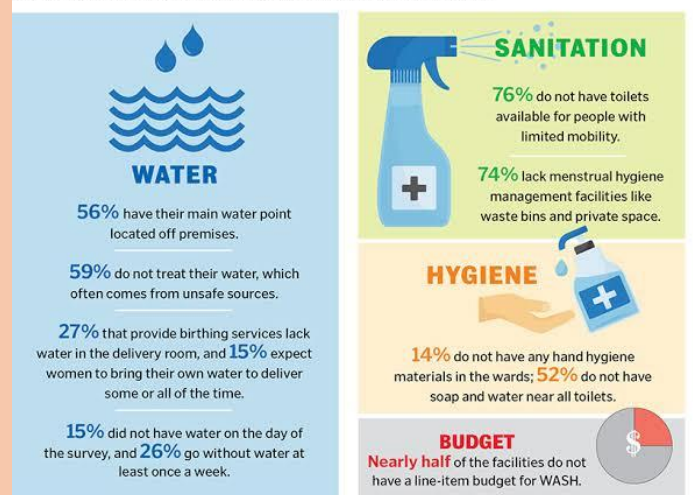
reinforces their commitment to improving the quality of life for their citizens.

The MoU focuses on **capacity building, technology transfer, and groundwater management**, reflecting a shared vision for a **sustainable and resilient water sector**. With the growing global emphasis on **clean water accessibility and sanitation**, this partnership is expected to yield long-term benefits for both nations.

The WASH Sector:

The **WASH sector** refers to the combined areas of **Water, Sanitation, and Hygiene**, which are fundamental to **public health, economic growth, and environmental sustainability**. It includes ensuring **safe drinking water, proper sanitation facilities, and hygiene awareness** to prevent waterborne diseases and improve overall well-being.

Catholic facilities do not escape the poor WASH conditions endemic in low-resource settings around the world. Assessments in 151 facilities in 23 countries found:



Information from WASH assessments, see also: <https://www.humandevelopment.va/content/dam/sviluppoumano/progetti/wash-2021/Summary-Handout.pdf>

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Importance of WASH:

1. **Public Health Protection** – Lack of clean water and sanitation is a major cause of diseases such as **cholera, diarrhea, and typhoid**. By improving WASH infrastructure, both India and Nepal can **prevent outbreaks** and reduce the burden on their healthcare systems.
2. **Child Mortality Reduction** – Poor sanitation is linked to high infant and child mortality rates due to **malnutrition and infections**. Ensuring access to clean water and hygiene facilities can **save millions of lives**.
3. **Gender and Social Equity** – Access to proper sanitation is crucial for **women's health, safety, and dignity**, particularly in rural areas. Safe sanitation facilities in schools and workplaces encourage **higher female participation in education and employment**.
4. **Economic Development** – Inadequate WASH facilities **reduce productivity** by increasing disease prevalence. Improved sanitation and water access contribute to **better workforce efficiency and economic growth**.
5. **Environmental Sustainability** – Proper **waste and wastewater management** prevents **water pollution, soil contamination, and ecosystem degradation**, ensuring the responsible use of natural resources.

Key Features of the India-Nepal MoU on WASH

1. **Capacity Building** – India will **train Nepali professionals** in water resource management, sanitation, and waste treatment, helping Nepal build its technical expertise.
2. **Technology & Knowledge Transfer** – India will share its **best practices and technological solutions**, including **water purification techniques, sanitation models, and waste management systems**.
3. **Groundwater Management** – Both nations will work together to **monitor and assess groundwater resources**, implement **rainwater harvesting**, and explore **artificial recharge methods** for water conservation.
4. **Regular Bilateral Meetings** – Continuous engagement and exchange visits between officials will **ensure progress tracking and effective implementation** of WASH projects.

Lessons learned: Successful practices for impactful programmes

- Raising awareness about the importance of inclusive WASH and advocating for the rights and inclusion of persons with disabilities and women is crucial to garner support and drive positive change.
- Collaboration and partnerships: Working with local organizations including organizations of disabled persons, government agencies and community leaders facilitates implementation and improves buy-in.
- Capacity building: Providing training and capacity building for community members, teachers and WASH practitioners on inclusive practices and accessibility contributed to successful implementation.
- Community engagement: Engaging with the community and involving persons with disabilities and women in decision-making processes alongside the community from the outset, fosters ownership and empowerment, and leads to more sustainable and inclusive outcomes. This should be supported by appropriate budgeting to cover the costs of inclusive decision making.
- NTD disability perspectives and services should be integrated into overall government approach to Universal Health Coverage, as well as within primary healthcare services to identify needs and provide advice on self-care and infection prevention.
- To sustain inclusive WASH, it is important to train and build the capacity of healthcare staff at all levels, as well as patients, their family and friends.

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India's Achievements in WASH and Their Relevance to Nepal

India has made **remarkable progress in sanitation and clean water access** under the leadership of **Prime Minister Narendra Modi**. Initiatives such as the **Jal Jeevan Mission (JJM)** and **Swachh Bharat Abhiyan (SBA)** have transformed rural sanitation and drinking water accessibility.

- **Jal Jeevan Mission (JJM):** Aims to provide **tap water connections** to every rural household by **2024**, ensuring universal access to safe drinking water.
- **Swachh Bharat Abhiyan (SBA):** India's **flagship sanitation program** led to the construction of **over 100 million toilets**, making India **open defecation-free (ODF)**.
- **Namami Gange Program:** Aims at **revitalizing the Ganga River ecosystem**, focusing on **wastewater treatment and solid waste management**.

These initiatives serve as a **model for Nepal**, which seeks to enhance its **sanitation infrastructure and water security**. Through this MoU, Nepal can **learn from India's experience** and adapt similar **community-driven, technology-supported approaches**.

Significance of India-Nepal Collaboration in WASH

The **India-Nepal MoU on WASH** strengthens **regional cooperation** and aligns with global efforts to achieve **Sustainable Development Goal 6 (Clean Water and Sanitation for All)**. Given their **geographical proximity and shared water**

resources, collaboration is essential to **tackle water pollution, climate-related water scarcity, and sanitation challenges**.

Moreover, improving WASH infrastructure in both countries will enhance **tourism, cross-border trade, and public health**, reinforcing their longstanding **cultural and economic ties**. By working together, India and Nepal can set a **benchmark for regional cooperation in water and sanitation**, benefiting millions of people in South Asia.

Prelims Practice Question

Consider the following statements regarding the India-Nepal Memorandum of Understanding (MoU) on the WASH sector:

1. The MoU focuses on collaboration in areas such as capacity building, technology transfer, and groundwater management.
2. Under the agreement, India will provide financial assistance to Nepal for the construction of sanitation infrastructure.
3. The agreement aligns with Sustainable Development Goal (SDG) 6, which aims to ensure clean water and sanitation for all.

Which of the above statements is/are correct?

- a) 1 and 2 only
- b) 2 and 3 only
- c) 1 and 3 only
- d) 1, 2, and 3

Answer:

- c) 1 and 3 only

PRAGNYA BHARATHI: Detailed News Analysis (DNA)**Explanation:**

- **Statement 1 is correct:** The MoU between India and Nepal focuses on **capacity building, technology transfer, and groundwater management**, among other areas in the WASH sector.
- **Statement 2 is incorrect:** The MoU primarily focuses on **knowledge sharing and cooperation**, but it does not explicitly mention **financial assistance for sanitation infrastructure**.
- **Statement 3 is correct:** The agreement supports **SDG 6 (Clean Water and Sanitation for All)**, which aims to ensure universal access to **safe drinking water and proper sanitation facilities**.

Mains Model Question

India and Nepal recently signed an MoU to enhance cooperation in the Water, Sanitation, and Hygiene (WASH) sector. Discuss the significance of this agreement in the context of regional cooperation, sustainable development, and public health.

The Memorandum of Understanding (MoU) between India and Nepal in the WASH sector marks a significant step towards regional cooperation, ensuring sustainable water resource management and improved sanitation facilities. Water security and sanitation are critical components of public health and environmental sustainability, making this agreement particularly relevant for both nations.

The collaboration focuses on capacity building, knowledge transfer, and groundwater management.

Nepal can benefit from India's experience in implementing large-scale water and sanitation programs, such as the Jal Jeevan Mission and Swachh Bharat Abhiyan, which have significantly improved access to clean drinking water and hygiene in India. By adopting best practices and modern technology, Nepal can enhance its infrastructure and policy frameworks to provide safe water and sanitation to its citizens.

Regional cooperation in the WASH sector strengthens diplomatic ties and fosters mutual development. India and Nepal share numerous transboundary rivers, and effective water management strategies require joint efforts. This MoU facilitates knowledge sharing on water conservation techniques, artificial recharge, and sustainable groundwater use, which are crucial for both countries in the face of climate change and increasing water scarcity.

The agreement also aligns with Sustainable Development Goal (SDG) 6, which aims to provide clean water and sanitation for all. Improved WASH infrastructure directly impacts public health by reducing waterborne diseases, enhancing hygiene, and ensuring sustainable urban and rural development.

India-Nepal MoU in the WASH sector is a step towards greater regional collaboration, addressing shared challenges in water management, sanitation, and hygiene. It reflects a commitment to sustainable development and strengthens bilateral relations while working towards a healthier and more resilient future for both nations.

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Topic : National Green Hydrogen Mission

Relevance : GS Paper 3 Environmental Science

Source : Indian Express

Context :

NATIONAL GREEN HYDROGEN MISSION

NODAL MINISTRY
 ▶ Ministry of New and Renewable Energy

OBJECTIVE
 ▶ Decarbonise energy/industrial/mobility sector
 ▶ Develop indigenous manufacturing capacities
 ▶ Create export opportunities for GH₂ and its derivative

COMPONENTS OF NGHM
 ▶ Strategic Interventions for Green Hydrogen Transition Programme (SIGHT)
 ▶ Strategic Hydrogen Innovation Partnership (SHIP) (PPP for R&D)

GH₂ is not commercially viable at present; current cost in India is around ₹350-400/kg. The National Hydrogen Energy Mission aims to bring it down under ₹100/kg.

Expected Outcomes by 2030
 • At least 5MMT GH₂ annual production
 • Rs 1 lakh crore fossil fuel import savings
 • 6 lakh jobs
 • 50MMT CO₂ annual emissions averted
 • ₹ 8 lakh crore investment

HYDROGEN AND GREEN HYDROGEN
 Hydrogen is the most common element in nature but exists only in combination with other elements. It has to be extracted from naturally occurring compounds (like water).
 Green Hydrogen (GH₂) is made by splitting water through an electrical process called electrolysis, using an electrolyser powered by renewable energy (RE).

Grey hydrogen: Natural gas → Hydrogen → CO₂

Blue hydrogen: Natural gas → Hydrogen → CO₂ (Underground storage)

Green hydrogen: Green electricity + Water → Hydrogen

The **National Green Hydrogen Mission** is an initiative by the Government of India aimed at promoting the production and utilization of green hydrogen to achieve energy self-reliance and meet climate goals. Approved by the Union Cabinet in January 2023, the mission has an initial outlay of

₹19,744 crore, which includes allocations for the Strategic Interventions for Green Hydrogen Transition (SIGHT) program, pilot projects, research and development, and other mission components.

Mission Objectives:

- **Green Hydrogen Hubs:** Establishing at least two green hydrogen hubs with the necessary infrastructure to serve as centers for production and utilization.
- **Policy Support:** Implementing measures such as waivers of interstate transmission charges for renewable energy used in green hydrogen production, facilitating renewable energy banking, and ensuring timely grant of open access and connectivity for green hydrogen projects.

State-Level Implementations:

Several Indian states have taken proactive steps to implement and support the National Green Hydrogen Mission:

- **Gujarat:** The state has been at the forefront of renewable energy initiatives and is actively exploring green hydrogen production. Notably, in January 2023, the National Thermal Power Corporation Ltd (NTPC) commissioned India's first green hydrogen blending project with Gujarat Gas Limited in Surat.
- **Assam:** In April 2022, the state established India's first 99.99% pure green hydrogen pilot plant, aligning with national objectives

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to promote hydrogen production and its applications across various sectors.

- **Odisha:** The state has shown interest in leveraging its industrial base to develop green hydrogen projects, aiming to decarbonize its steel and chemical industries.
- **Karnataka:** With its robust renewable energy infrastructure, Karnataka is exploring green hydrogen production to complement its existing energy mix.
- **Maharashtra:** The state is engaging with industry stakeholders to develop green hydrogen projects, particularly in the transportation and industrial sectors.

These state-level initiatives, in conjunction with the National Green Hydrogen Mission, are pivotal in positioning India as a global leader in green hydrogen production and utilization, contributing to energy security, environmental sustainability, and economic growth.

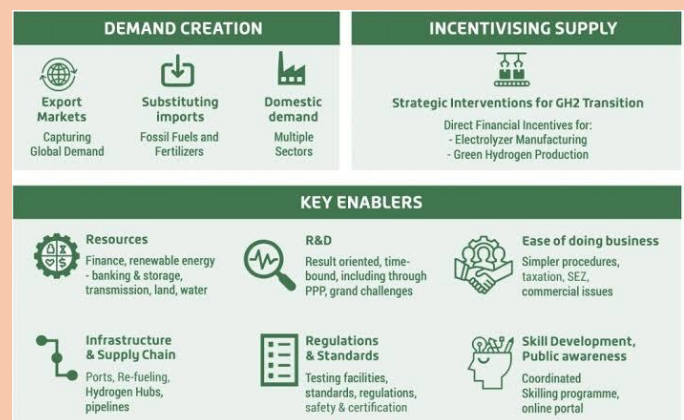
Hydrogen as a Clean Energy Source:

Hydrogen, particularly **green hydrogen** (produced using renewable energy), is emerging as a key solution for global decarbonization efforts. The **National Green Hydrogen Mission** is India's major step toward utilizing hydrogen for reducing carbon emissions, enhancing energy security, and fostering industrial innovation. However, despite its potential, there are several challenges to widespread hydrogen adoption.



Environmental Benefits

Hydrogen is a clean fuel that, when used in **fuel cells**, produces only **water vapor and heat** as byproducts. Unlike fossil fuels, it **does not release carbon dioxide (CO₂), sulfur oxides (SO_x), or nitrogen oxides (NO_x)**, making it an excellent solution for tackling climate change.



Green hydrogen, produced using electrolysis

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powered by renewable energy, is completely emission-free.

Energy Security and Independence

India imports **85% of its crude oil** and **over 50% of its natural gas** requirements, making it vulnerable to global price fluctuations. Hydrogen, especially **green hydrogen**, can reduce dependency on fossil fuel imports by **providing an alternative clean energy source** for transportation, industry, and power generation.

Industrial Decarbonization

Industries like **steel, cement, fertilizers, and petrochemicals** rely on carbon-intensive processes. Hydrogen can replace **coke (coal-based fuel) in steel production**, serve as a feedstock in **ammonia production for fertilizers**, and be used in **refineries for cleaner fuel processing**. By adopting **green hydrogen**, these industries can significantly lower emissions.


Versatile Applications

Hydrogen can be used in **multiple sectors**, including:

- **Transportation:** Hydrogen fuel cells can power buses, trucks, trains, ships, and even aircraft, reducing reliance on petrol and diesel.
- **Power Generation:** Hydrogen can be stored and used for electricity generation, complementing solar and wind energy.
- **Residential and Commercial Heating:** Hydrogen can be blended with natural gas to

provide **cleaner fuel for cooking and heating**.

Long-term Energy Storage Solution

EXPECTED OUTCOMES OF THE MISSION BY 2030		
India's Green Hydrogen Production Capacity will Reach at Least 5 MMT Per Annum		Renewable Energy Capacity Addition of ~125 GW
Over ₹8 lakh crore in Total Investments	Create Over 6 lakh Full Time Jobs	50 MMT per annum of CO2 Emissions are Expected to be Averted

Unlike batteries that lose charge over time, **hydrogen can be stored for months or even years** without degradation. It can act as a **backup power source** for intermittent renewable energy sources like solar and wind, ensuring energy availability during demand fluctuations.

Economic and Job Creation Potential

Hydrogen can drive economic growth by:

- **Attracting investments** in new technologies and infrastructure (e.g., hydrogen production plants, refueling stations).
- **Creating jobs** in manufacturing, transportation, and research & development (R&D).
- **Boosting exports**, as India aims to become a **global hub** for green hydrogen production and supply.

High Production Costs

Producing **green hydrogen** via electrolysis is currently **expensive** due to high energy

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consumption. Electrolyzers, the equipment used to split water into hydrogen and oxygen, are costly and not yet widely manufactured in India. The cost of renewable energy also impacts hydrogen production expenses.

Infrastructure Limitations

India lacks a **widespread hydrogen transportation and storage network**. Hydrogen refueling stations, dedicated pipelines, and specialized storage facilities are still in the early stages of development. **Without proper infrastructure**, large-scale hydrogen adoption remains difficult.

Energy Intensive Production Process

Even though **green hydrogen** is clean, its production requires a **large amount of electricity**. If renewable energy is not used efficiently, the overall process may still contribute to emissions. Scaling up **solar and wind power generation** is essential for truly sustainable hydrogen production.



Storage and Transportation Challenges

Hydrogen is the **lightest element**, making it difficult to store and transport efficiently. It needs to be stored either at **very high pressures (compressed hydrogen)** or at **extremely low temperatures (-253°C for liquid hydrogen)**, both of which require advanced and expensive technologies.

Safety Concerns

Hydrogen is **highly flammable** and requires special safety measures for production, storage, and transport. Although it is less dense than natural gas and disperses quickly, **strict handling protocols** are necessary to prevent leaks and explosions.

PRAGNYA BHARATHI: Detailed News Analysis (DNA)**Competition with Other Green Technologies**

While hydrogen is promising, other renewable solutions like **battery storage, biofuels, and carbon capture technologies** are also being developed. Some industries may prefer these alternatives if hydrogen remains expensive or difficult to implement.

Policy and Regulatory Challenges

Clear regulations on **hydrogen production, distribution, and usage** are still evolving in India. The **government needs to provide more incentives, subsidies, and policy support** to encourage private-sector investments and large-scale adoption.

Prelims Practice Question:

Q. Consider the following statements regarding the National Green Hydrogen Mission:

1. The mission was launched with an outlay of ₹19,744 crore up to FY 2029-30.
2. Green hydrogen is produced using renewable energy and does not emit carbon dioxide during combustion.
3. Hydrogen storage and transportation are simple and cost-effective compared to fossil fuels.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2, and 3

Answer:

Correct option: (a) 1 and 2 only

Explanation:

- **Statement 1 is correct:** The **National Green Hydrogen Mission** was launched in January 2023 with a financial allocation of **₹19,744 crore** until **FY 2029-30** to support hydrogen production, infrastructure, and R&D.
- **Statement 2 is correct:** **Green hydrogen** is produced using **electrolysis powered by renewable energy** (like solar or wind) and does not emit carbon dioxide when burned, making it an environmentally friendly fuel.
- **Statement 3 is incorrect:** **Hydrogen storage and transportation** are **complex and expensive** due to its low density, high flammability, and the need for high-pressure tanks or cryogenic storage (-253°C for liquid hydrogen). This makes it more challenging compared to conventional fossil fuels.

Thus, the correct answer is **(a) 1 and 2 only**.

Mains Model Question

Q. Discuss the significance of the National Green Hydrogen Mission in India's transition towards clean energy. What are the major challenges in its implementation, and how can they be addressed?

The **National Green Hydrogen Mission (NGHM)** is a crucial step in India's clean energy transition, launched in January 2023 with an outlay of ₹19,744

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crore. It aims to make India a global leader in green hydrogen production, reduce fossil fuel dependence, and decarbonize key industries like steel, chemicals, and transportation. By promoting green hydrogen, India seeks to cut carbon emissions, enhance energy security, and foster economic growth through investments in hydrogen technology.

Significance of the Mission:

1. **Decarbonization of Industries:** Hydrogen can replace fossil fuels in high-emission sectors such as steel, cement, and fertilizers.
2. **Energy Independence:** Reduces India's reliance on imported oil and gas.
3. **Renewable Energy Utilization:** Enhances the role of solar and wind power by storing excess energy as hydrogen.
4. **Job Creation & Economic Growth:** Encourages investments in hydrogen infrastructure and technology development.
5. **Global Leadership:** Positions India as a key player in the hydrogen economy, aligning with its **net-zero target by 2070**.

Challenges in Implementation:

- **High Production Costs:** Electrolyzers and renewable energy infrastructure are expensive.
- **Storage & Transportation Issues:** Hydrogen requires high-pressure tanks or cryogenic storage, making logistics complex.
- **Infrastructure Deficit:** India lacks hydrogen refueling stations and dedicated pipelines.
- **Safety Concerns:** Hydrogen is highly flammable and requires strict safety measures.

About NCHM

Features

- Establishment of Green Hydrogen (GH2) ecosystem.
- Robust Standards and Regulations.
- PPP for R&D (Strategic Hydrogen Innovation Partnership – SHIP incentive) etc.
- Coordinated skill development programme under Mission.

Expected outcomes by 2030

- At least 5 MMT GH2 production capacity per annum.
- Addition of 125 GW RE capacity.
- Over ₹ 8 Lac crore in investments; 6 Lac jobs creation.
- Reduction in fossil fuel imports of over ₹ 1 Lac crore.
- Abatement of 50 MMT annual Greenhouse gas emissions.

Green Hydrogen

- Hydrogen emits only water when burned thus a clean energy source but its creation could be 'carbon' intensive.
- Based on production methods, hydrogen can be grey, blue, green and a few other types.
- Green Hydrogen is hydrogen produced by splitting water into hydrogen and oxygen using renewable electricity.

Color	GREY HYDROGEN	BLUE HYDROGEN	TURQUOISE HYDROGEN	GREEN HYDROGEN
Process	SMR or gasification	SMR or gasification with carbon capture (90-95%)	Pyrolysis	Electrolysis
Source	Methane or Coal	Methane or Coal	Methane	Renewable Electricity

Note: SMR = steam methane reforming
* Turquoise hydrogen is an emerging decarbonisation option.

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- **Policy & Regulatory Gaps:** A clear framework for hydrogen production, pricing, and distribution is still evolving.

Way Forward:

- **Government Incentives & R&D Investments** to lower production costs.
- **Development of Hydrogen Corridors** for seamless transportation and storage.
- **Private Sector Collaboration** to accelerate infrastructure growth.
- **Skill Development & Workforce Training** to support the hydrogen economy.

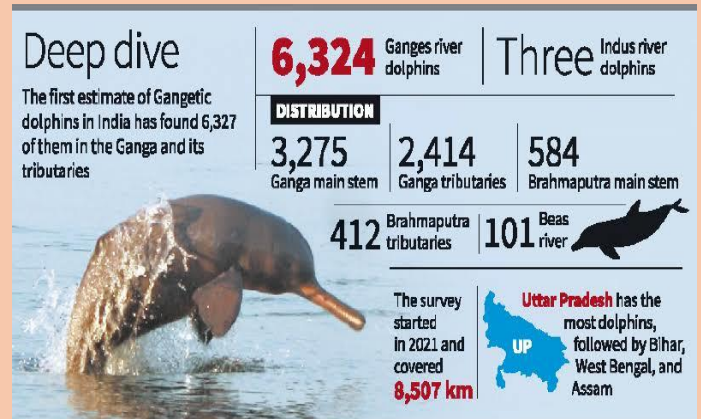
With strategic policy support and investment, NGHM can drive India's clean energy revolution while ensuring sustainable economic growth.

Topic : Gangetic Dolphin Population Study (2024 Report)

Relevance : GS Paper 3 Environmental Science

Source : The Hindu

Context :



A recent study has estimated **6,327 Gangetic river dolphins** in the Ganga and its tributaries across four states—**Uttar Pradesh, Bihar, West Bengal, and Assam**. This is the first large-scale survey using **acoustic hydrophones**, though the number cannot be compared with previous estimates due to different methodologies. The study, spanning **8,507 km**, also recorded **three Indus river dolphins** in the Beas river.

Gangetic dolphin survey provides a crucial baseline for monitoring conservation efforts. However, with increasing **pollution, habitat destruction, and fishing-related threats**, urgent measures are needed to **protect both freshwater and marine dolphins**. The success of initiatives like **Project Dolphin and local conservation programs** will determine the future of these iconic species in India's rivers and seas.

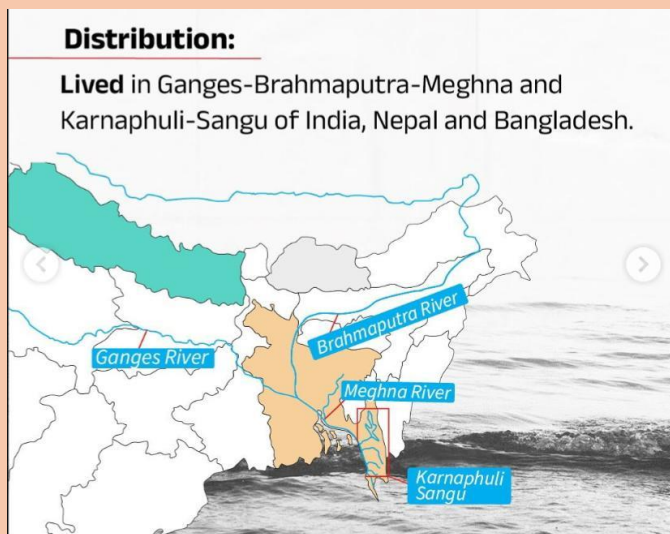
Key Findings of the Study

- **Main Ganga stem:** 3,275 dolphins
- **Ganga tributaries:** 2,414 dolphins
- **Brahmaputra main stem:** 584 dolphins
- **Brahmaputra tributaries:** 412 dolphins

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- **Beas River (Indus dolphin):** 101 dolphins

Counting river dolphins is more challenging than counting land animals like tigers and elephants due to their **underwater habitat, sporadic surfacing behavior, and lack of unique identification features** (like tiger stripes or elephant ears). The survey relied on hydrophones, which detect echolocation sounds emitted by the dolphins.



The **next survey is expected after four years**, and conservationists are now studying the effects of **pollution and fishing net entanglements** on their population.

About Gangetic Dolphins

The **Gangetic river dolphin (*Platanista gangetica gangetica*)** is the **only freshwater dolphin species found in India**. It is **endemic to the Ganga-Brahmaputra-Meghna and Karnaphuli-Sangu river systems in India, Nepal, and Bangladesh**.

Key Characteristics

- **Blind:** Uses echolocation to navigate and hunt.
- **Solitary nature:** Mostly found alone or in small groups.
- **Slow reproductive rate:** Females give birth to a single calf once in 2-3 years.
- **Indicator species:** Their presence indicates a healthy river ecosystem.

Conservation Status

- **IUCN Status: Endangered**
- **Indian Wildlife Protection Act, 1972: Schedule I species** (highest protection)
- **Threats:** Habitat degradation, pollution, accidental entanglement in fishing nets, and waterway development projects.
- **Conservation Efforts:** The "**Project Dolphin**" initiative, launched in 2020, focuses on protecting both **river and marine dolphins** in India.

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Dolphins in Coastal Waters



- Marine pollution (plastics, oil spills, heavy metals)
- Climate change and rising sea temperatures
- Underwater noise pollution from ships and sonar

Conservation Measures for Marine Dolphins

- Marine Protected Areas (MPAs) such as Gulf of Mannar, Malvan, and Gahirmatha.
- India's Project Dolphin, which aims to include both riverine and marine dolphins under conservation efforts.

Apart from river dolphins, India is home to several **marine dolphin species** found in coastal and deep-sea environments. Some common ones include:

1. **Indo-Pacific Humpback Dolphin (*Sousa chinensis*)** – Found along India's west and east coasts, prefers shallow waters.
2. **Bottlenose Dolphin (*Tursiops spp.*)** – The most commonly known dolphin species, seen along Indian coastal waters.
3. **Spinner Dolphin (*Stenella longirostris*)** – Known for its acrobatic spins, found in deeper offshore waters.
4. **Risso's Dolphin (*Grampus griseus*)** – Recognized by its large size and distinctive scars, found in deep waters.
5. **Common Dolphin (*Delphinus delphis*)** – Found in both warm coastal and deep waters.

Threats to Marine Dolphins

- Bycatch in fishing nets

Prelims Practice Question

Q. Consider the following statements regarding Gangetic River Dolphins:

1. They are completely blind and rely on echolocation for navigation.
2. The latest population estimate of Gangetic dolphins in India is over 6,000, with the highest number found in Bihar.
3. They are listed as **Critically Endangered** under the IUCN Red List.
4. Project Dolphin aims to conserve only freshwater dolphins in India.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 1, 2, and 4 only
- (d) 1, 3, and 4 only

PRAGNYA BHARATHI: Detailed News Analysis (DNA)**Answer:****Correct Option: (a) 1 and 2 only****Explanation:**

- **Statement 1 is correct:** Gangetic dolphins are functionally blind and use echolocation to navigate and hunt.
- **Statement 2 is correct:** The latest survey estimated **6,327** Gangetic dolphins in India, with the highest population recorded in **Uttar Pradesh**, not Bihar.
- **Statement 3 is incorrect:** Gangetic dolphins are listed as **Endangered** (not Critically Endangered) under the **IUCN Red List**.
- **Statement 4 is incorrect:** **Project Dolphin** aims to conserve **both freshwater and marine dolphins** in India.

consumption and damaging aquatic ecosystems. Additionally, untreated sewage from urban areas, estimated to be in billions of liters per day, worsens water quality due to insufficient sewage treatment infrastructure. Agricultural runoff carrying pesticides and fertilizers further contaminates the river, leading to excessive nutrient accumulation and oxygen depletion, which harms aquatic life. Religious and ritual practices, including idol immersion and floral offerings, add organic and non-biodegradable waste, exacerbating pollution levels. Moreover, unregulated sand mining and dredging disrupt the riverbed and aquatic habitats, affecting the food chain and reproductive cycles of species like the Gangetic Dolphin.

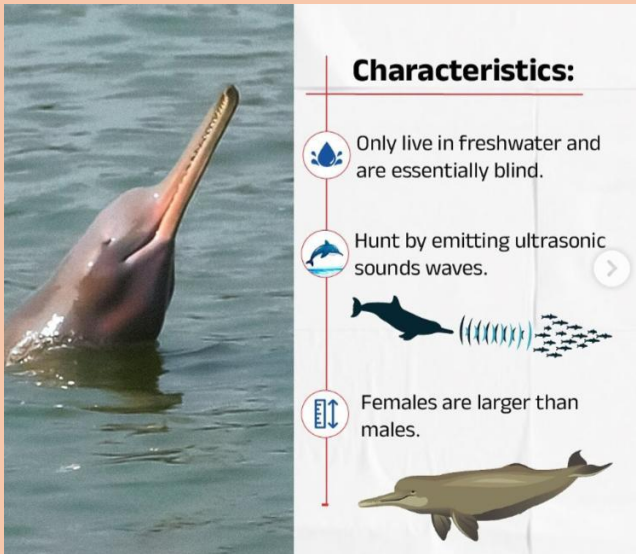
Thus, the correct answer is **(a) 1 and 2 only**.

Mains Model Question:

The conservation of Gangetic River Dolphins is closely linked to the health of the Ganga River ecosystem. Discuss the major challenges in ensuring clean Ganga water and suggest measures to improve its water quality.

The Ganga River is not only a lifeline for millions but also home to the endangered Gangetic River Dolphin, an indicator of river health. However, increasing pollution threatens both aquatic biodiversity and human communities dependent on the river. Industrial effluents from tanneries, textile units, and chemical plants release toxic waste directly into the river, making water unfit for

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ensure long-term conservation efforts. Eco-sensitive policies must regulate developmental activities near riverbanks to maintain ecological balance. Ensuring a clean Ganga is not just about water purification but also about sustaining biodiversity and protecting the livelihoods of millions who depend on it. Integrating policy action, technological advancements, and public participation is crucial for restoring the river's health.



To address these challenges, strict enforcement of the **Namami Gange Mission** is necessary, focusing on expanding sewage treatment plants and ensuring zero-liquid discharge from industries. Strengthening regulations on industrial pollution and monitoring effluent treatment can prevent harmful waste from entering the river. Sustainable agricultural practices, such as organic farming and controlled fertilizer use, can reduce chemical runoff. Community participation, through awareness campaigns and local engagement in river clean-up initiatives, can