



**23-24 December 2024**

### Dark Matter

**Context:** A recent study showed that dark matter particles might need to be heavier than previously thought, especially in the dense inner regions of dwarf galaxies like Leo II. For years, scientists believed the minimum mass of a dark matter particle was  $10^{-31}$  times the mass of a proton. However, in May 2024, physicists revised this estimate, increasing it to  $2.3 \times 10^{-30}$  proton masses, marking a significant advancement in the understanding of dark matter.

#### What is dark matter?

- Dark matter is an invisible, mysterious substance that makes up about 85% of the matter in the universe. It does not emit, absorb, or reflect light, making it undetectable through traditional telescopes.

#### The Mystery of Dark Matter:

- Dark matter doesn't emit or reflect light, making it invisible. Its existence was first suggested in the 1970s when astronomers observed unusual patterns in the way stars moved in galaxies. Stars at the outer edges were moving faster than expected, indicating an unseen mass—dark matter—that was influencing their motion.
- Dark matter is the primary substance in dwarf galaxies, making up about 99% of their mass. If dark matter particles were too light, their size would exceed that of a dwarf galaxy, preventing the formation of small macroscopic objects.

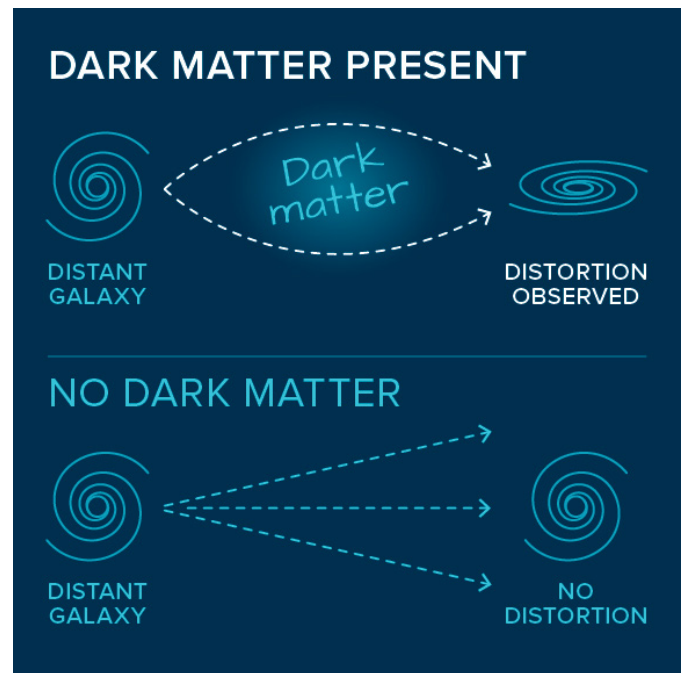
#### The Distribution of Dark Matter:

- Dark matter is not uniformly spread across the universe but tends to clump around galaxies and clusters. These clumps help explain the structure of the universe and the formation of galaxies.
- The mass of dark matter particles directly affects how it is distributed—lighter particles would form a "fluid" while heavier ones could form denser clumps called dark matter halos.

#### The Role of Dark Matter Particles' Mass:

- The mass of dark matter particles influences their distribution and behavior. For example, if dark matter particles were as light as  $10^{-31}$  times a proton's mass, they would be widely dispersed, forming a cosmic fluid.
- On the other hand, heavier particles would form denser structures around galaxies. Research suggests that dark

matter particles are likely to be heavier, with estimates ranging from  $10^{-30}$  to  $10^{-19}$  times the mass of a proton.



#### Why is this discovery significant?

- The revision of dark matter's mass requirement by an order of magnitude is a major update in physics. It highlights the evolving nature of our understanding, facilitated by advanced computer simulations rather than traditional methods.

### South Korea's Political Crisis and Its Implications for Democracy

**Context:** In December 2024, South Korea faced a political crisis when President Yoon Suk Yeol declared martial law on December 3, citing threats from "North Korean communist forces" and "antistate forces."

- This unprecedented move, the first since 1980, was swiftly rejected by the National Assembly, which voted overwhelmingly against it. On December 14, President Yoon was impeached, leading to his suspension and the initiation of impeachment proceedings in the Constitutional Court.

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### Political Developments Following the Impeachment:

- The impeachment exposed fractures within the ruling People Power Party (PPP), which struggled to decide how to respond. This internal conflict highlighted broader political instability.
- The opposition gained confidence after the impeachment motion passed, allowing them to challenge Yoon's policies more aggressively and demand accountability for alleged corruption within his administration.
- Yoon's popularity plummeted due to his handling of domestic and foreign policies and the corruption allegations involving his wife. This decline further strengthened the opposition's position and deepened political divisions.

### Implications for South Korea's Democratic Institutions:

- The martial law declaration raised concerns about the erosion of democratic norms, as such extreme measures could set a dangerous precedent for future administrations to bypass democratic processes in times of crisis.
- The impeachment proceedings, under review by the Constitutional Court, will influence perceptions of judicial independence in South Korea. The outcome could affect public confidence in the country's legal system.
- The political crisis highlighted the dangers of prioritizing partisan interests over national unity, potentially undermining public trust in democratic institutions and hindering effective governance.

### Martial Law in India:

- Martial law refers to the suspension of ordinary law and the governance of a region by military tribunals. While martial law itself is not explicitly defined in the Indian Constitution, it is implicitly covered under Article 34 of the Constitution of India (COI).
- **Essential Characteristics of Martial Law:**
  - Affects only fundamental rights.
  - Suspends ordinary law courts and government functioning.
  - Imposed to restore order during war, external aggression, or armed rebellion.
  - Restricted to specific areas within the country.
  - Military authorities are granted wide powers to restore

order.

- **Case Law:** In A.D.M Jabalpur v. S. Shukla (1976), the Supreme Court clarified that martial law is not synonymous with the suspension of habeas corpus and that it applies within a limited scope to situations of military control.

### Comparative Analysis with India:

- **India's Robust Democratic Framework:** India's federal system, regular elections, and multiple centers of power reduce the likelihood of a South Korea-like crisis.
- **Checks and Balances:** India's judiciary, free press, and active civil society provide important safeguards against abuses of power.
- **Cultural and Political Pluralism:** India's diversity discourages national consensus on undermining democratic processes, providing a check against centralization of power.

## The Phewa Dialogue

**Context:** Nepal and China recently launched the "Phewa Dialogue," a diplomatic initiative aimed at promoting regional prosperity, peace, and economic integration in South Asia. Named after Phewa Lake in Pokhara Valley, the dialogue symbolizes enduring cooperation, drawing inspiration from the lake's ecological and cultural significance.

- The initiative seeks to enhance collaboration between the two countries and the broader South Asian region.

### Significance of the Phewa Dialogue:

- **Regional Cooperation:** The primary goal of the Phewa Dialogue is to foster regional cooperation among South Asian nations. South Asia faces numerous shared challenges, including poverty, environmental issues, and security concerns. The dialogue offers a platform for collaborative solutions to these challenges, aiming to strengthen regional ties and promote peace and prosperity.
- **Economic Integration:** The dialogue also focuses on economic integration, addressing the trade barriers, infrastructure gaps, and political tensions that hinder growth. By improving economic cooperation, the Phewa Dialogue could unlock opportunities for increased trade,

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investment, and development in the region, benefiting all participating countries.

- **Addressing Key Issues:** The Phewa Dialogue serves as a forum for discussing critical regional issues, such as industrial changes, emerging technologies, and sustainable development. These discussions are vital as South Asia adapts to global changes and seeks solutions for long-term stability and modernization.
- **Track II Diplomacy:** A key feature of the dialogue is its use of Track II diplomacy, which involves non-governmental actors like academic institutions. Sichuan University (China) and Tribhuvan University (Nepal) are expected to play pivotal roles in facilitating discussions that will help shape policy and enhance bilateral cooperation.



### Recent Diplomatic Developments between China and Nepal

- **Economic Ties:** China has become Nepal's largest foreign direct investment (FDI) partner since 2014. Investments span various sectors, including hydropower, where China is involved in projects like the Budhi Gandaki Hydroelectric Project. Additionally, China has provided substantial financial aid for Nepal's infrastructure development.
- **Strategic Partnership:** In 2019, Nepal and China formalized their relationship as a "strategic partnership," marked by a visit from Chinese President Xi Jinping. This partnership has led to increased cooperation in defense, security, and trade, with China supplying military aid to Nepal.

### Impacts of the Phewa Dialogue on India:

- The dialogue may shift regional dynamics by strengthening China's influence in South Asia,

potentially reducing India's traditional sway in Nepal. Nepal's increasing reliance on China for economic and strategic support may raise concerns for India.

- As China increases its investments in Nepal's infrastructure and energy sectors, India could face growing competition in trade and investment. Nepal's deepening economic ties with China may affect India's interests in the region.
- Strengthened defense and security ties between Nepal and China could raise security concerns for India, especially along their shared border, requiring India to reassess its strategic approach in the region.

### India's internet connectivity

**Context:** India's internet connectivity has witnessed remarkable growth over the past few decades, but challenges remain that hinder its full potential. According to Debashish Bhattacharya, Senior Deputy Director General of the Broadband India Forum (BIF), India still faces a significant broadband penetration shortfall of 48%, despite over 25 years of terrestrial mobile services. This shortfall highlights key issues that need addressing to ensure equitable access to the internet across the country.

### Key Challenges:

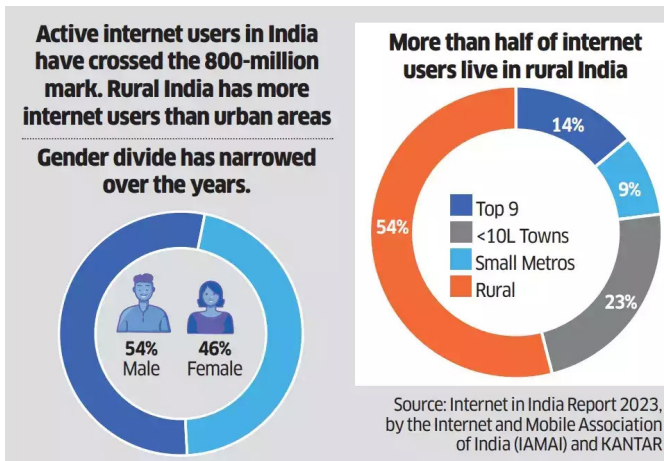
- **Digital Divide:** Although internet penetration is growing, there is a marked disparity between urban and rural areas, with rural regions and lower-income households lagging behind in internet adoption. The digital divide exacerbates socio-economic inequalities, limiting access to essential services such as education, healthcare, and employment.
- **Slow Internet Speeds:** India's average internet speed remains below the global average, with many users, especially in rural areas, experiencing slower speeds. This affects the quality of online services and hampers user experience, particularly in areas that need digital infrastructure the most.
- **Infrastructure Issues:** India faces several infrastructural bottlenecks, including insufficient fiber-optic connectivity, limited cellular coverage in remote regions, and frequent power outages, which disrupt internet access. The lack of a comprehensive and efficient infrastructure framework affects consistent connectivity.

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- **Cost and Regulation:** Providing affordable broadband services, especially in underserved rural areas, remains a key challenge. Additionally, navigating complex regulatory frameworks can delay deployment and complicate compliance.
- **Cybersecurity Concerns:** With an increasing reliance on digital platforms, India's growing internet user base is vulnerable to cyber threats, including data breaches and cyberattacks. Ensuring data protection and building trust in digital services is crucial for sustaining internet growth.



### Opportunities and Solutions:

- **Growing Demand for Digital Services:** India's expanding middle class and growing demand for e-commerce, online education, and digital healthcare offer significant opportunities for service providers to expand their reach.
- **Emerging Technologies:** The adoption of emerging technologies like 5G, Artificial Intelligence (AI), and the Internet of Things (IoT) can drive innovation and fuel India's digital economy.
- **Government Initiatives:** The BharatNet project, which aims to connect all gram panchayats with high-speed internet, can bridge the connectivity gap in rural India. Additionally, implementing public Wi-Fi hotspots, optimizing spectrum allocation, and simplifying the Right of Way (RoW) policy are steps in the right direction.
- **Private Sector Investment:** Encouraging telecom operators to invest in network infrastructure, particularly in rural areas, and promoting the deployment of fiber-optic cables will help provide high-speed connectivity. Public-private partnerships can also play a critical role

in overcoming infrastructure challenges.

- **Technological Innovations:** Leveraging technologies like 5G, satellite internet, and Li-Fi can provide high-speed connectivity in underserved and remote areas. Additionally, community radio networks and community-led initiatives can help extend internet access in rural regions.

## India-Kuwait Relations

**Context:** Prime Minister Narendra Modi's recent visit to Kuwait marked a transformative moment in India-Kuwait relations, as both countries elevated their ties to a "strategic" level. This visit, the first by an Indian Prime Minister in 43 years, reflects India's growing influence in the Gulf region amid shifting geopolitical dynamics. The visit underscores strengthened cooperation in trade, defence, and cultural exchange, laying a foundation for more extensive future collaboration.

### Historical Background of India-Kuwait Relations:

- India and Kuwait share deep-rooted relations that date back to the early years following Kuwait's independence in 1961. India was one of the first countries to establish diplomatic ties with Kuwait.
- Historically, India has been a natural trading partner, with the Indian Rupee even serving as a legal tender in Kuwait until 1961. Today, Kuwait remains one of India's most important allies in the region.

### Current Dynamics of the Relationship:

- Kuwait is India's sixth-largest crude oil supplier, meeting about 3% of India's energy needs. The bilateral trade between the two countries surpassed \$10 billion, with India's exports to Kuwait crossing \$2 billion for the first time.
- The Indian community in Kuwait, comprising more than a million people, is the largest expatriate group and plays a crucial role in Kuwait's economy. The Kuwait Investment Authority's investments in India have exceeded \$10 billion, reinforcing the economic ties between the two nations.

### Significance of Modi's Visit:

- Prime Minister Modi's visit to Kuwait in 2024 was historic for several reasons. It was the first visit by an Indian Prime Minister since Indira Gandhi's visit in 1981.

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- During the visit, Kuwait honored Modi with its highest civilian award, 'The Order of Mubarak Al-Kabeer,' recognizing his efforts in bolstering India-Kuwait relations.
- Modi's engagements included meetings with key Kuwaiti leadership, including Amir Sheikh Meshal Al-Ahmad Al-Jaber Al-Sabah and Crown Prince Sheikh Sabah Al-Khaled Al-Hamad Al-Mubarak Al-Sabah, marking a new chapter in diplomatic relations.

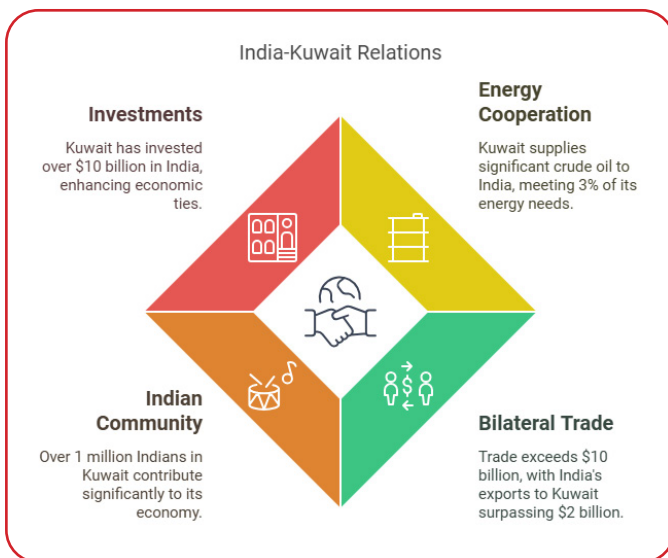
West Asia region. Both countries condemned terrorism and pledged to dismantle terror networks, ensuring a more secure and prosperous future.

### Image of Active Hydrothermal Vent

**Context:** In a groundbreaking achievement, Indian oceanographers have captured the first-ever image of an active hydrothermal vent located 4,500 meters below the surface of the Indian Ocean. This discovery is not only a significant scientific breakthrough but also has great potential for future mineral exploration, playing a key role in India's ambitious Rs 4,000-crore Deep Ocean Mission under the Ministry of Earth Sciences.

### What is a hydrothermal vent and why is it important?

- A hydrothermal vent is an underwater spring where cold seawater meets hot magma beneath the ocean floor. This interaction results in superheated water that releases rich minerals and gases, forming plumes.
- These vents are important because they host unique ecosystems and are potential sources of economically valuable minerals. Their study could provide insights into sustainable mining practices and unique microbial life.

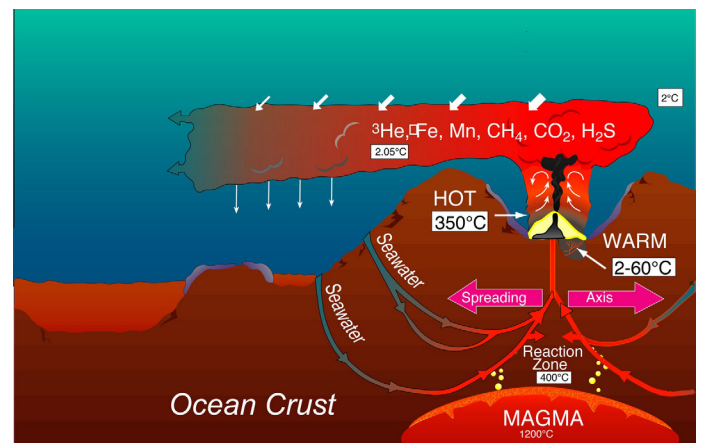


### Strengthening Strategic Cooperation:

- A landmark outcome of the visit was the signing of a comprehensive defence agreement, which includes the exchange of personnel, joint military exercises, and collaboration in defence technology.
- The visit also saw the signing of MoUs in key sectors like sports, culture, and solar energy. Modi invited the Kuwaiti Investment Authority to explore opportunities in India's energy, pharma, infrastructure, and food sectors, further expanding the economic footprint of both nations.

### Regional and Global Implications:

- Modi's visit also set the stage for stronger India-GCC relations, as India expressed interest in intensifying cooperation with the Gulf Cooperation Council (GCC), of which Kuwait is a prominent member.
- India and Kuwait also discussed shared goals for regional peace and stability, particularly in the volatile



### What is the significance?

- Imaging underwater hot springs, or hydrothermal vents, is crucial for India's Deep Ocean Mission as it enhances the understanding of mineral-rich deposits that can aid in economic development.
- These vents, which are rich in valuable minerals such



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as copper, zinc, and gold, could become a source of minerals for future exploration.

- The discovery of active hydrothermal vents also supports scientific research into unique ecosystems that depend on these vents, helping both economic and biological exploration.

### Role of hydrothermal vents in India's mineral exploration:

- Hydrothermal vents are believed to contain rich deposits of minerals and metals such as gold, silver, iron, cobalt, and nickel. These materials are crucial for industrial and technological advancements.
- The discovery and imaging of active hydrothermal vents enhance India's capacity to explore and potentially harness these resources, contributing to the success of the Deep Ocean Mission, which aims to focus on oceanic mineral exploration.

### National Centre for Polar and Ocean Research (NCPOR) role:

- NCPOR, in collaboration with the National Institute of Ocean Technology (NIOT), led the high-resolution imaging campaign to identify and study active hydrothermal vents.
- Their research, conducted using an Automatic Underwater Vehicle (AUV), captured the first-ever image of an active hydrothermal vent, marking a milestone in India's ocean exploration efforts.

### Potential biological implications:

- Hydrothermal vents host unique microbial life that relies on chemical processes, rather than sunlight, to survive. These organisms are essential for understanding life in extreme environments and could have broader implications for the study of biochemistry and potential life forms on other planets. The discovery of these ecosystems enhances India's research into the biology of deep-sea organisms.

## Power Packed News

### PM Modi Honored with Kuwait's Prestigious 'Order of Mubarak Al-Kabeer'

- Prime Minister Narendra Modi was awarded Kuwait's highest honour 'Order of Mubarak Al-Kabeer', which is a symbol of his influential leadership and global recognition. This is his 20th international award, conferred on him by any country.
- The 'Order of Mubarak Al-Kabir' or 'Order of Mubarak the Great' is a prestigious knighthood honour of Kuwait, established in 1974. This honour is given in memory of Mubarak Al-Sabah, also known as Mubarak Al-Kabir. Mubarak Al-Kabir was the ruler of Kuwait from 1896 to 1915 and during his reign Kuwait gained more autonomy from the Ottoman Empire.
- This award is given to heads of state, foreign rulers and members of the royal family as a symbol of friendship. Earlier, this award has been given to leaders like Bill Clinton, Prince Charles and George Bush. PM Modi was given this honor for his role in strengthening India-Kuwait relations.



### Arun Kapoor gets Royal Honour of Bhutan

- Renowned Indian educationist Arun Kapoor was honoured with 'Bura Marp' (red scarf) and 'Patang' (sword) by Bhutan's King Jigme Khesar Namgyal at the National Day celebrations on 17 December 2023.
- This honour is rarely given to non-Bhutanese citizens. Mr Kapoor was also conferred the title of 'Dasho', which is reserved for high officials.
- Mr Kapoor has established several educational institutions in India, Bhutan and Oman. He played an important role in establishing the Royal Academy School in Bhutan and developing



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the Bhutan Baccalaureate system. He was also awarded the 'Druk Thuksey' in 2019.

- Apart from his contributions to education and skill development in Bhutan, Mr Kapoor has founded the NGOs 'Ritinjali' and 'Pallavan School Network' in India. His honour underlines his important role in global education and India-Bhutan relations.

### Masali: India's first solar border village

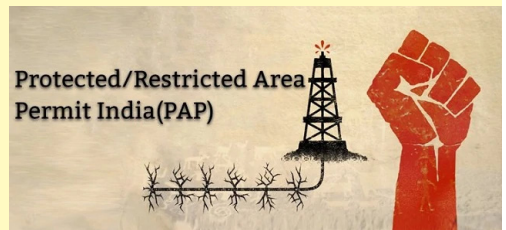
- Masali village in Banaskantha district of Gujarat has become India's first 100% solar powered border village. The village is located 40 km from the Pakistan border.
- Under the PM Surya Ghar Yojana, solar rooftops have been installed on 119 houses in the village, which generate more than 225 kW of electricity.
- This initiative is part of the Border Development Project, under which 11 border villages are planned to be solar energy dependent.
- Masali village has emerged as an example of energy independence. This initiative has set an excellent example of environmental conservation along with rural development.
- This move not only promotes clean energy but also strengthens self-reliance and security in the border areas. The project also aims to inspire other villages towards energy transition.

### Delhi Government's Sanjivani Yojana

- The Delhi government has launched the 'Sanjeevani Yojana' to provide free healthcare to residents aged 60 years and above.
- Under the scheme, elderly patients will be given free medical services in government and private hospitals. If there is a delay in government facilities, patients will be referred to private hospitals at no cost.
- The scheme covers all medical expenses of the elderly, without any limit on their income. Along with this, the government has expanded the old age pension scheme to include 80,000 additional beneficiaries.
- The Sanjivani Yojana aims to provide affordable and accessible healthcare services to the elderly. The move not only ensures their well-being but also sets a benchmark in the field of social security and healthcare.

### Protected Area Regime implemented in Manipur, Mizoram and Nagaland

- The central government has re-implemented the Protected Area Regime (PAR) in Manipur, Mizoram and Nagaland.
- This step was taken to control security concerns and increasing illegal activities from neighboring countries. Now it will be mandatory for foreign nationals to take special permits to enter these states.
- Under the Protected Area Regime (PAR), foreign nationals will be allowed to travel to these areas only after taking permission in advance. This decision has been taken after 14 years, as it was suspended for a year in 2010. After this, this exemption was extended several times and kept valid till 2027.
- This arrangement becomes even more important in view of the ongoing ethnic conflict in Manipur. There is increased tension between the Kuki and Meitei communities in Manipur from May 2023. The move is aimed at controlling illegal infiltration, smuggling and security threats in the region.
- Under the PAR, the movement of foreign nationals will now be strictly monitored, thereby strengthening the internal security of these states.



### First tagging of Ganges River Dolphin

- The Ganges River Dolphin has been tagged for the first time in Assam, which is a historic step towards the conservation of this species. The initiative was taken by the Wildlife Institute of India (WII), Assam Forest Department and Aranyak Sangathan

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# DAILY **pre** PARE

Current affairs summary for prelims

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with the assistance of the National CAMPA Authority.

- The Ganges River Dolphin (*Platanista gangetica*) is the national aquatic animal of India. It is almost blind and hunts through echolocation. It is mainly found in the Ganges, Brahmaputra and Meghna river systems.
- The aim of this tagging process is to understand the migration, range and habitat use of dolphins. This information will help in their conservation and make Project Dolphin a success.
- The Ganges river dolphin is a symbol of the health of India's rivers. But, their numbers are constantly declining due to water pollution and poaching.
- This tagging initiative is a huge success in conserving dolphins and improving the ecosystem of the rivers.



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