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Daily Current Affairs

To The Point

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GS Paper 3 – Science & Technology

1 NASA Astronauts Return After Unexpected 9-Month Delay

Context: NASA astronauts **Butch Wilmore** and **Suni Williams** have finally returned to Earth after an unexpected **nine-month delay** caused by issues with **Boeing's Starliner spacecraft**. Initially scheduled for a **brief one-week stay**, the astronauts ended up spending **286 days** aboard the **International Space Station (ISS)** due to technical malfunctions that made their return unsafe.

286 Days in Space – A Prolonged Mission:

- Although their **nine-month stay** is one of the longest space missions, it does not break the record for the longest continuous stay in space. That honor belongs to **Soviet cosmonaut Valeri Polyakov**, who spent **438 days** aboard the **Mir Space Station**. Other astronauts, including **Russia's Oleg Kononenko** and **NASA's Peggy Whitson**, have also completed multiple long-duration missions, contributing to space research.

Boeing's Starliner: A Test Mission Turned Crisis:

- Wilmore and Williams were part of a crucial **test mission for Boeing's Starliner CST-100**, a spacecraft designed to transport astronauts to the ISS under **NASA's Commercial Crew Program**. However, the spacecraft faced **multiple technical issues**, including a **helium leak** even before launch. Despite these concerns, the mission proceeded. More problems arose **during the journey**, ultimately preventing the spacecraft from safely returning the crew as planned.

No Immediate Backup for Safe Return:

- With no immediate alternatives, NASA had to carefully **assess return options**. Missions to and from the ISS are meticulously planned months in advance, and the next **scheduled return mission** wasn't set until **February 2025**. Since the astronauts faced **no urgent medical concerns**, NASA made the decision to let them remain aboard the ISS, which can support up to **12 astronauts** at a time.

Thriving Despite Uncertainty:

- Their prolonged stay became a **global talking point**, capturing attention worldwide. While **long space missions** are not new, few astronauts have experienced such an **unexpected extension** with uncertainty surrounding their return.

  Despite the situation, Wilmore and Williams remained **fully engaged in ISS operations**. They assisted in **critical experiments, conducted maintenance and repairs**, and even participated in **spacewalks**.

Record-Breaking Spacewalks by Suni Williams:

- A historic moment emerged during their extended mission as **Suni Williams set a new record for the most time spent spacewalking by a female astronaut**, clocking in an impressive **62 hours over nine spacewalks**.

Leading in Space – Williams' Command Role:

Three months into her extended stay, Williams was **appointed as the ISS station commander**, demonstrating her leadership and expertise. She held this position until just before their return to Earth.

Scientific Insights from Extended Space Travel:

NASA scientists see their extended mission as a **valuable research opportunity**. Long-duration space travel impacts the **human body in multiple ways**, including:

- **Muscle and Bone Loss** – Astronauts in microgravity experience muscle atrophy and bone density reduction.
- **Brain Fluid Changes** – Studies suggest fluid shifts in space may affect cognitive functions.
- **Heart Disease Risks** – Prolonged exposure to space radiation can increase cardiovascular risks.
- **Psychological Effects** – Mental health challenges arise from isolation, confinement, and mission uncertainty.

The findings from this mission will contribute to **future deep-space exploration**, including planned **Moon and Mars missions** under NASA's **Artemis Program**.

Looking Ahead – The Future of Space Missions:

The return of Wilmore and Williams marks another chapter in human space exploration. Despite the **technical setbacks**, this mission has provided **invaluable data** that will shape the future of **commercial space travel** and **long-duration space missions**.

As NASA and Boeing work to resolve **Starliner's challenges**, the mission raises important discussions on the **safety, reliability, and preparedness** needed for future astronaut missions beyond Earth's orbit.

GS Paper 2 – Health & Disease

2 National Wildlife Health Policy Enhances Zoonotic Disease Surveillance

Context: In the wake of the **COVID-19 pandemic**, the Indian government is reviewing a **draft National Wildlife Health Policy (NWHP)** aimed at **strengthening disease surveillance** in wildlife. This policy seeks to establish **advanced monitoring systems**, introduce **new diagnostic laboratories**, and expand **research initiatives** to prevent the spread of **zoonotic diseases**—infections that transfer from animals to humans.

National Referral Centre for Wildlife (NRC-W): A Game-Changer

Understanding the Zoonotic Threat:

Zoonotic diseases contribute to nearly **60% of emerging infectious diseases worldwide**, with **72% of these infections originating from wildlife**. India has already faced several severe outbreaks, including **Kyasanur Forest Disease** and the **Nipah virus**, highlighting the urgent need for **continuous health surveillance of both wild and captive animals**.

Establishing NRC-W: A Critical Step for Wildlife Health

To address these concerns, the government has established the **National Referral Centre for Wildlife (NRC-W)** in **Junagadh, Gujarat**. Under the guidance of the **Central Zoo Authority (CZA)** and the **Union Environment Ministry**, this center will focus on:

- **Early disease detection** and research
- **Outbreak prevention** and management
- **Advanced diagnostics** for wildlife health
- **Training programs** for veterinarians and researchers

Why NRC-W is Crucial:

- Out of the **1,407 pathogens** affecting humans, **816 originate from animals**, posing a severe public health risk. The **NRC-W** will play a vital role in **identifying and containing these threats** before they spread, ultimately preventing **potential pandemics**.

Cutting-Edge Facilities and a One Health Approach:

- The NRC-W will be equipped with **state-of-the-art research labs** to analyze diseases in **both wildlife and humans**. This initiative is part of India's **One Health Approach**, which integrates **human, animal, and environmental health programs** to ensure a comprehensive strategy for disease control.

Global and National Collaborations:

- The NRC-W will collaborate with **leading national and international institutions** to enhance wildlife disease surveillance. The **CZA will act as the nodal agency**, coordinating efforts across India's **zoos, research institutions, and conservation programs**.

National Wildlife Health Policy (NWHP) Under Review:

An Updated Policy for Stronger Wildlife Disease Control:

- The government is in the process of refining the **National Wildlife Health Policy (NWHP)** to bolster **wildlife disease surveillance, research, and outbreak response mechanisms**. The new policy emphasizes:
- **Integrated surveillance networks** for real-time monitoring
- **Cutting-edge diagnostic laboratories** across the country

- **Collaboration between wildlife, veterinary, and public health sectors**
- **Strategies to prevent disease spillover from animals to humans**

Alignment with the One Health Framework:

- With **over 60% of emerging human diseases originating from animals**, the NWHP is aligned with the **National One Health Mission**. This integrated strategy is critical for **early pandemic preparedness**, ensuring that wildlife health monitoring becomes a **priority in India's public health agenda**.

Key Contributors and Policy Development:

The **Central Zoo Authority (CZA)** is spearheading this policy initiative, with support from:

- **The Principal Scientific Adviser's Office**
- **Experts from IIT Bombay**
- **Various governmental and research institutions**

Role of NRC-W in National Wildlife Health Policy:

The **NRC-W**, inaugurated by **Prime Minister Narendra Modi** in **Junagadh, Gujarat**, will serve as the **central authority for wildlife disease investigations**. This institution will be responsible for:

- **Analyzing wildlife deaths and disease outbreaks**
- **Developing rapid response protocols**
- **Enhancing research in wildlife pathology and epidemiology**

Bridging the Gap: Data Integration and Cross-Sector Coordination:

Creating a Unified Wildlife Health Database:

Currently, **wildlife disease surveillance** in India is fragmented across multiple agencies. The NWHP proposes the creation of:

- **A National Wildlife Health Database** for real-time data tracking
- **A Wildlife Health Information System** to predict and prevent outbreaks
- **Integration with the National Animal Disease Referral Expert System** for comprehensive monitoring

Expanding Wildlife Health Infrastructure:

The policy also recommends:

- **Satellite Diagnostic Laboratories** near key forest regions to improve disease detection
- **Vaccination Programs for livestock near national parks** to reduce disease transmission to wildlife
- **Community participation initiatives** for better awareness and prevention

A Step Towards Stronger Wildlife Protection:

The **National Wildlife Health Policy** and the establishment of **NRC-W** represent a **major leap forward in India's approach to wildlife disease management**. By integrating **advanced research, disease surveillance, and global collaborations**, these initiatives will play a crucial role in **safeguarding both wildlife and human health** from emerging zoonotic threats.

As the world grapples with **increasing risks of pandemics**, India's proactive measures will not only protect biodiversity but also **strengthen national and global health security**.

GS Paper 2 – Governance and Polity

3 Ana Sagar Lake: A Timeless Marvel of Ajmer

Context: The **Supreme Court** has recently ordered the **Rajasthan state government** to remove **replica structures** from the **'Seven Wonders' park**, which is situated within the **wetland zone** of **Ana Sagar Lake**. The court has set a **six-month deadline** for the removal, emphasizing the need to **preserve the lake's ecological balance** and **heritage value**.

Ana Sagar Lake: A Historic Jewel of Rajasthan:

A Lake with a Rich Heritage:

Ana Sagar Lake is a **magnificent artificial lake** located in **Ajmer, Rajasthan**. It was constructed between **1135 and 1150 AD** by **Arnoraja Chauhan**, the grandfather of the legendary **Prithviraj Chauhan**. The lake is named after its creator, reflecting the rich **Chauhan dynasty's** legacy in Rajasthan.

Engineering Feat of the 12th Century:

The lake was created by building a **dam across the Luni (Lavanavari) River**, showcasing early **hydraulic engineering techniques**. Spanning over **13 km**, the lake is one of the **largest man-made water bodies** in Rajasthan.

Mughal Influence on Ana Sagar:

The lake later attracted the attention of the **Mughal emperors**, who contributed significantly to its beautification:

- **Shah Jahan** built the elegant **Baradari (pavilions) in 1637 AD**, adding to its architectural grandeur.
- **Jehangir** developed the **Daulat Bagh Gardens** along the banks of the lake, transforming it into a serene retreat.

A Stunning Island in the Middle of the Lake:

- At the center of **Ana Sagar Lake** lies a **picturesque island**, accessible only by **boat rides**, making it a popular attraction for tourists.

Colonial Legacy: The British Residency

- On a hill near the lake stands a **circuit house**, which was once the **British Residency** during colonial rule. Today, it offers breathtaking views of the lake and the surrounding landscapes.

The Lake's Seasonal Transformation:

Despite its grandeur, **Ana Sagar Lake dries up every summer** due to **high temperatures and evaporation**, highlighting the challenges of **water conservation** in Rajasthan's arid climate.

Ana Sagar Lake: A Must-Visit Destination

- Surrounded by lush gardens, historic monuments, and scenic beauty, **Ana Sagar Lake remains one of Ajmer's most iconic landmarks**. Whether you enjoy **boating, exploring Mughal-era pavilions, or simply soaking in the sunset views**, this lake offers a perfect blend of **history, culture, and natural beauty**.

Did You Know?

- **Ajmer Sharif Dargah**, one of India's most revered Sufi shrines, is just a few kilometers from the lake, making it a spiritual and historical hub.
- The **lake was originally much smaller**, but successive rulers, including the **Mughals and British, expanded its surroundings** for aesthetic and functional purposes.
- **Birdwatching enthusiasts** can spot migratory birds visiting the lake during the winter season.

Ana Sagar Lake is not just a water body—it's a **testament to centuries of Rajput, Mughal, and colonial influences**. With the Supreme Court's recent decision to protect its **ecological and historical essence**, the lake continues to be a **symbol of Ajmer's heritage and natural beauty**.

GS Paper 1 – Geography

4 Peru: Land of Ancient Civilizations and Natural Wonders

Context: Peru has declared a **state of emergency** and deployed the **army in Lima**, the nation's **capital**, in response to a **surge in violence**. The move comes as part of government efforts to **restore law and order** in one of **South America's most dynamic cities**.

Peru: A Nation of Diverse Landscapes and Rich History

Strategic Location in South America:

Peru is situated on the **western coast of South America**, acting as a **geographical bridge** between the **Pacific Ocean, the Andes Mountains, and the Amazon Rainforest**.

Borders:

- **North:** Ecuador and Colombia
- **East:** Brazil
- **South:** Bolivia and Chile
- **West:** Pacific Ocean

This **strategic positioning** makes Peru a **biodiversity hotspot** and an important player in **regional trade and environmental conservation**.

Geographical Marvels of Peru:

The Mighty Amazon and the World's Highest Navigable Lake

- **Amazon River** – One of the world's longest and most powerful rivers originates in Peru.
- **Lake Titicaca** – The **highest navigable lake in the world** (shared with Bolivia), revered by the **Inca civilization**.

A Country of Vast and Contrasting Landscapes:

- **Amazon Rainforest** – Covering nearly **60% of Peru**, this dense jungle is home to **rare wildlife, indigenous tribes, and immense biodiversity**.
- **Atacama Desert** – One of the **driest places on Earth**, extending from **Chile into southern Peru**.
- **Humboldt Current** – A **cold ocean current** that regulates Peru's **marine ecosystem**, making it one of the world's **richest fishing zones**.
- **Nazca Lines** – **Mysterious ancient geoglyphs** carved into the desert, believed to be created by the **Nazca civilization** between 500 BCE and 500 CE.

Peru's Natural Wealth and Economic Importance:

A Global Leader in Silver Production:

Peru boasts **one of the world's largest silver reserves**, making it a **key player in the global mining industry**. In addition to **silver**, the country is rich in:

- **Gold** – One of **South America's top gold producers**.
- **Copper and Zinc** – Crucial for **industrial and technological applications**.
- **Agricultural Exports** – Leading producer of **quinoa, coffee, and avocados**, which are exported worldwide.

A Land of Cultural and Historical Significance:

Home to the Legendary Inca Empire:

- **Machu Picchu** – The breathtaking **Lost City of the Incas**, a UNESCO World Heritage site and one of the **New Seven Wonders of the World**.
- **Cusco** – The **former capital of the Inca Empire**, blending **Andean and Spanish colonial heritage**.

Did You Know?

- The **Peruvian Andes** are home to the **Rainbow Mountain (Vinicunca), famous for its multicolored slopes**.
- **Peru has over 3,000 potato varieties**, making it the **birthplace of the potato**!
- The **Andean condor**, one of the world's **largest flying birds**, soars over Peru's rugged landscapes.

With its **rich history, stunning geography, and abundant resources**, **Peru remains one of South America's most fascinating nations**.

GS Paper 3 – Environment and Ecology

5 India's First PPP-Based Green Waste Processing Plant Set to Launch in Indore

Context: India's **first-ever Public-Private Partnership (PPP) model Green Waste Processing Plant** is all set to begin operations in **Indore**, marking a revolutionary step in **sustainable waste management**. This initiative, launched under the **Swachh Bharat Mission-Urban**, aims to transform **green waste** into **valuable eco-friendly resources**, setting a benchmark for cities across India.

Key Highlights of Indore's Green Waste Processing Plant:

- The facility will process **wood, branches, leaves, and flowers** to generate revenue for the **Indore Municipal Corporation (IMC)**.
- IMC will provide **land and transportation** of green waste, ensuring an efficient supply chain.
- A **private entity, Astronomical Industries Private Limited**, will be responsible for the **installation, operation, and maintenance** of the plant.
- The project will contribute to **waste-to-energy** and **waste-to-wealth** initiatives, promoting circular economy principles.

India's Green Waste Management Initiatives:

India has been actively working towards sustainable **waste processing and bioenergy production** through various initiatives:

1. Solid Waste Management Rules, 2016:

- Mandates that **biodegradable waste** must be **composted, treated, or disposed of** within the premises as much as possible.
- Encourages **decentralized waste processing**, reducing the burden on landfills.

2. National Bioenergy Programme:

- Supports the **establishment of bioenergy projects**, promoting **biogas and biomass-based power generation**.
- Aims to enhance **energy security** and **reduce dependency on fossil fuels**.

3. Waste to Wealth Mission:

- An initiative under the **Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC)**.
- Focuses on **scientific and technological innovations** to strengthen **waste management systems**.
- Promotes the conversion of **waste into valuable resources**, contributing to a **circular economy**.

Why This Matters?

With **rapid urbanization** and **increasing waste generation**, India faces significant **waste management challenges**. The **Indore Green Waste Processing Plant** serves as a **model project** for other cities, showcasing the **potential of public-private partnerships** in addressing environmental concerns.

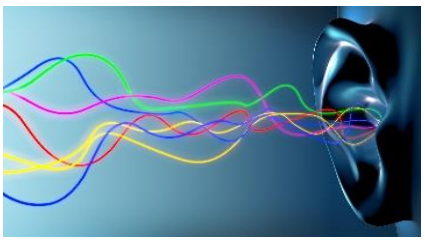
Additionally, Indore has been a **pioneer in cleanliness**, consistently ranking as **India's cleanest city** under the Swachh Survekshan rankings. This new initiative **reinforces its leadership** in **sustainable urban development** and **green innovation**.

A Step Towards a Greener Future:

This **PPP-based Green Waste Processing Plant** is not just a facility—it's a **vision for a cleaner, greener, and more sustainable India**. As the country continues to innovate in **waste management**, such projects will play a **crucial role** in achieving **environmental sustainability** and **urban resilience**.

GS Paper 3 – Science and Technology

6 Audible Enclaves: The Future of Private Sound Technology



Context: Imagine standing in a **crowded room** yet hearing a message only meant for you—without the use of **headphones** or **earpieces**. This futuristic concept is now a reality with **Audible Enclaves**, a breakthrough in **sound wave technology** that allows audio to be transmitted **privately to specific individuals**, even in noisy environments.

What Are Audible Enclaves?

Audible Enclaves are **small, localized pockets of sound** that remain **undisturbed by surrounding noise**. They ensure that only the **intended listener** hears the transmitted audio, making them ideal for **crowded spaces** like **airports, museums, offices, and retail stores**.

Key Features:

- **Private Sound Zones** – Only individuals in the designated area can hear the audio.
- **No Headphones Needed** – Experience **personalized audio** without wearing any device.
- **Noise-Free Communication** – External noise does not interfere with the transmitted message.

Understanding Sound Waves: How Does Sound Work?

Sound travels in the form of **waves**, causing particles in the surrounding medium (such as **air, water, or solid materials**) to **vibrate back and forth**. The **speed of these vibrations** determines the frequency of sound:

- **Higher frequency = Higher-pitched sound**
- **Lower frequency = Deeper sound**

When sound waves are emitted, they undergo **diffraction**, meaning they spread out as they travel. Interestingly, **higher-frequency waves** tend to diverge **more** than lower-frequency waves. This principle plays a crucial role in **targeted audio transmission**.

How Are Audible Enclaves Created?

Audible Enclaves take sound control **a step beyond traditional directional speakers**.

- **Traditional Parametric Speakers:** These use **high-frequency waves** modulated with an **audio signal** to create **focused sound beams**.
- **Audible Enclave Technology:** This advanced method uses **two high-frequency waves of different frequencies** that are:
- **Individually inaudible** to the human ear.
- When they **intersect** at a specific location, they interact **non-linearly**, generating a sound wave **audible only within that precise zone**.

Scientific Validation: This method, documented in the **Proceedings of the National Academy of Sciences (PNAS)**, ensures highly **precise sound targeting**—an innovation that could redefine **communication, entertainment, and security applications**.

Potential Applications of Audible Enclaves:

Audible Enclaves can revolutionize various industries, including:

- **Retail & Marketing** – Stores can deliver **personalized promotions** to individual shoppers without disturbing others.
- **Museums & Exhibits** – Visitors can hear detailed descriptions of exhibits without needing **headphones**.
- **Airports & Public Spaces** – Announcements can be directed to specific groups without overwhelming ambient noise.
- **Healthcare** – Patients can receive **private audio guidance** without disrupting a shared environment.
- **Military & Security** – Confidential audio transmissions can be sent to individuals without risk of **eavesdropping**.

The Future of Sound: What's Next?

Audible Enclaves represent a **giant leap** toward **hyper-personalized audio experiences**. As **AI and smart sound systems** evolve, this technology could merge with **augmented reality (AR) and virtual reality (VR)**, transforming **how we interact with sound in digital spaces**.

A World Where Sound is Personal:

With **Audible Enclaves**, sound is no longer **a shared experience**—it becomes **a tailored, immersive interaction**. This technology is set to **reshape communication, privacy, and entertainment** in ways we've only imagined.