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## Current Affairs - 07 October 2025

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### NOBEL PRIZE FOR MEDICINE AWARDED TO IMMUNE SYSTEM RESEARCHERS

The **2025 Nobel Prize in Physiology or Medicine**, the first of this year's awards, has been jointly given to **Mary E. Brunkow and Fred Ramsdell of the USA**, and **Shimon Sakaguchi of Japan**, for their groundbreaking discoveries on the human immune system.

Their work represents two interconnected phases — Sakaguchi's earlier research laid the foundation, while Brunkow and Ramsdell's later findings complemented and completed it, together advancing understanding of immune regulation and tolerance.

The Medicine Prize traditionally opens the Nobel season, followed by those for Physics, Chemistry, Literature, Peace, and Economics.

#### **The Discovery: Key Cells That Prevent the Body from Attacking Itself**

- The 2025 Nobel Prize in Medicine laureates — Mary Brunkow, Fred Ramsdell, and Shimon Sakaguchi — were honoured for discovering the **mechanism of peripheral immune tolerance**.
- Their research revealed regulatory **T cells**, the body's "**immune security guards**," which prevent immune cells from attacking healthy tissues.
- This breakthrough has been crucial to understanding autoimmune diseases and developing targeted therapies for immune-related disorders and cancers.
  - For years, scientists were puzzled by how the **immune system fights infections** without harming the body's own cells.
  - By the 1980s, they understood **central tolerance**, where self-reactive **T cells** are eliminated. But this couldn't explain all immune regulation.
  - In **1995**, **Shimon Sakaguchi** provided groundbreaking evidence for a **special class of T cells**, later called **regulatory T cells**, which act as "police" preventing other T cells from attacking healthy tissues.



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### The Immune System and the Discovery of Regulatory T Cells

- The **immune system** protects the body from thousands of microbes daily, distinguishing between harmful invaders and the body's own healthy cells.
- When this identification fails, it leads to **autoimmune diseases** or **organ transplant rejection**.
- **T cells** are central to this defence: **helper T cells** detect threats, while **killer T cells** destroy them.
- Traditionally, scientists believed the **thymus gland** ensured immune tolerance by filtering out self-attacking T cells — a process called **central tolerance**.
- However, the 2025 Nobel laureates — Mary Brunkow, Fred Ramsdell, and Shimon Sakaguchi — discovered an additional layer of control.
- This control involved **regulatory T cells**, which act as **immune system “security guards”**, preventing other T cells from attacking the body's own tissues.
- This breakthrough transformed the understanding of immune regulation and opened new paths for treating autoimmune and transplant-related disorders.

### How the Nobel-Winning Discoveries Are Transforming Medicine?

- The discoveries of regulatory T cells and the FOXP3 gene have revolutionised immune-regulation research, opening new therapeutic pathways for several major diseases.
  - **In cancer**, scientists are exploring ways to **block regulatory T cells that shield tumours from immune attacks**, helping the body's defences target cancer cells more effectively.
  - In contrast, **for autoimmune diseases**, treatments aim to **enhance regulatory T cell** activity to suppress harmful immune responses that damage healthy tissues.
  - These insights are also improving organ transplant success, helping prevent rejection by fine-tuning the immune system's response.
  - Overall, the discoveries have laid the groundwork for precision immunotherapy and targeted treatment innovations.
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### JAL JEEVAN MISSION



- It was **launched on August 15, 2019**.
- JJM is envisioned to **provide safe and adequate drinking water** through individual Functional Household Tap Connections (FHTCs) by 2024 to all households in rural India.
- It is based on a **community approach to water** and will include extensive Information, Education and communication as key components of the mission.
- **Nodal Ministry:** Ministry of Jal Shakti.
- **Components of Jal Jeevan Mission**
  - Development of **in-village piped water supply** infrastructure to provide tap water connections to every rural household.
  - **Bottom-up planning:** Community engagement in planning, implementation and Operation and Maintenance (O&M)
  - Women empowerment: Involvement of women in planning, decision-making, implementation, monitoring, and O&M
  - **Focus on future generations:** Provision of tap water supply to schools, tribal hostels, and anganwadi (daycare) centers
  - **Skill development and employment generation:** Local people are skilled for building and maintaining water supply structures
  - **Greywater management:** Reuse and recycle waste water for source sustenance
  - **Source sustainability:** Promote groundwater recharge and water conservation
  - **Water Quality:** Ensure safe drinking water to reduce water-borne ailments
- **Funding Pattern:**
  - 50:50 between Centre and States
  - 90:10 for Himalayan and North-Eastern States.
  - In case of UTs, 100% of the funding is provided by the Central government.



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### MGNREGA - CENTRE MANDATES MINIMUM SPENDING ON WATER CONSERVATION WORKS

- The Ministry of Rural Development (MoRD) has **amended Schedule-I** of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), 2005.
- This is to ensure a **minimum proportion of funds is allocated for water conservation and harvesting** works across rural India.
- The amendment aims to address **India's deepening groundwater crisis** and **promote sustainable rural livelihoods**.

#### **Background - Understanding Schedule-I of MGNREGA:**

- **MGNREGA provision:** Every state government shall introduce a scheme to provide at least 100 days of guaranteed employment in a financial year to every rural household, based on demand.
- **Schedule-I:** Lists permissible public works and defines the scheme's minimum features.
- **Amendment power:** While changes to the Act need **Parliament's approval**, the Centre can amend the Schedule **via notification** (issued by the Ministry of Rural Development [MoRD]) — done nearly 24 times since 2005.

#### **The Latest Amendment:**

- The amendment inserts a new proviso **mandating minimum expenditure** on water-related works at the **block level, depending on groundwater status**.
- **Earlier**, 60% of district-level works (in terms of cost) had to create productive assets directly linked to agriculture and allied activities through development of land, water and trees.
- Now, the **focus has shifted** from district-level to block-level implementation.

#### **Likely Benefits of the Decision:**

- Out of the Rs 86,000 crore allocated for MGNREGS in FY 2025–26, about **Rs 35,000 crore** is expected to be directed toward water-related works.



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- The **states** with the highest number of over-exploited and critical blocks will gain the most funds - **Rajasthan** (214), Punjab (115), Tamil Nadu (106), Haryana (88), Uttar Pradesh (59).

### Significance for Rural India:

- Encourages **climate-resilient rural infrastructure**.
- Aligns MGNREGA with the **Jal Shakti Abhiyan** and **Atal Bhujal Yojana**.
- Reduces groundwater stress through **community-based interventions**.
- Promotes **employment generation** in water management sectors.

### Way Forward:

- **Integrated planning:** Convergence with schemes like **PM Krishi Sinchayi Yojana** (PMKSY) and **watershed programmes**.
- **Capacity building:** Training for **Gram Sabhas** and local engineers for scientific water management.
- **Monitoring and transparency:** Use of **GIS mapping** and **real-time dashboards** for implementation tracking.
- **Sustainability focus:** Promote recharge structures, afforestation, and soil-water conservation.

### Conclusion:

- The amendment marks a **strategic shift** in India's rural employment and water management framework.
  - By linking MGNREGA works to groundwater sustainability, the government seeks to **tackle one of India's most pressing environmental challenges while strengthening rural livelihoods and climate resilience**.
  - **Effective execution** at the block and Gram Panchayat levels will be crucial for realising these objectives.
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### MY BHARAT-NATIONAL SERVICE SCHEME (NSS) AWARDS



- It was instituted by the **Ministry of Youth Affairs and Sports** in 1993-94.
- **Objective:** To honour and celebrate the outstanding contributions of youth in the fields of **social service, community development and nation-building**.
- It is **given every year** to recognise and reward outstanding contributions towards voluntary community service made by the Programme Officers/NSS Units and NSS Volunteers.

#### **Key Facts about National Service Scheme:**

- NSS is a **Central Sector Scheme** which was launched in **the year 1969** during the birth centenary celebrations of Mahatma Gandhi.
- **Objective:** The primary objective of **developing the personality and character** of the student youth through voluntary community service.
- The ideological orientation of the NSS is inspired by the ideals of **Mahatma Gandhi**.
- It provides an opportunity to the student youth of **the 11th & 12th Class** of schools at +2 Board level and student youth of Technical Institution, Graduate & Post Graduate at colleges and University level of India to **take part in various Government led community service activities & programmes**.

### MIG LA PASS



- Mig La Pass is located on the **Changthang Plateau in Ladakh**.
- **World Record Altitude:** At 19,400 ft, Mig La Pass is the highest motorable road in the world.
- **Strategic Axis:** It connects **Likaru–Mig La–Fukche**, creating the third vital corridor from Hanle to Fukche **near the Indo-China border**.



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- **All-Weather Road:** Built with advanced features to withstand harsh winters, shifting glaciers, and oxygen-thin air, making it the highest all-season road globally.

### What is Project Himank?

- The Project was **raised on 04 Dec 1985 at Leh** for the development of road communication in Ladakh region.
  - It has the distinction of **supporting the Army during various operations** undertaken in the region.
  - The Project ensures the **maintenance of communication** and access to strategic areas close to the **Line of Actual Control** with China and had been instrumental in keeping both the Leh - Manali and the Zojila axis open during Op VIJAY.
  - It has done yeoman service in **restoration of road communication**, clearing landslides and avalanches, constructions of bridges, **snow clearance and opening of air fields**.
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### DECODING DELHI'S AIR POLLUTION: THE DSS EXPLAINED

As Delhi braces for its annual winter air pollution spike, the **Decision Support System (DSS) for Air Quality Management** has been reactivated. Developed by the **Indian Institute of Tropical Meteorology (IITM), Pune**, the DSS uses numerical models to identify and estimate daily contributions of different pollution sources — including vehicles, industries, dust, and farm fires — to particulate matter levels (PM2.5 and PM10).

It also projects how various **emission-control measures** could impact air quality. While recent rain and winds have temporarily kept pollution levels low, officials warn that cooler temperatures, shifting wind patterns, and increasing stubble burning in Punjab and Haryana are likely to worsen air quality in the coming weeks.

### What's Choking Delhi's Air: Farm Fires or Traffic?

- According to Decision Support System (DSS) data, **farm fires have so far contributed minimally to Delhi's pollution**.



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- On October 5, stubble burning accounted for only 0.22% of PM2.5 levels, and on October 6, it contributed nothing at all, based on VIIRS satellite data that track active fire counts.
  - VIIRS, or Visible Infrared Imaging Radiometer Suite, is a set of instruments aboard polar-orbiting weather satellites that produce data streams that monitor changes in surface vegetation, including fires.
- Though paddy harvesting has started in Punjab, the Indian Agricultural Research Institute (IARI) reported no residue burning events across six states on October 6, and only 210 fires since September 15 — far below previous years.
- At present, **transport emissions are the biggest source of Delhi's pollution.**
- Other contributors include **residential sources** (4–5%) and **industries** (3–5%), underscoring that urban emissions, not farm fires, currently dominate Delhi's air pollution.

### How the DSS Tracks and Forecasts Delhi's Pollution?

- The Decision Support System (DSS), developed by IITM Pune, operates on a 10-km horizontal grid to generate five-day forecasts and insights on Delhi's air quality.
  - It quantifies:
    - how emissions from Delhi and 19 neighbouring districts affect the city's air;
    - the share of eight key emission sectors (like transport, industries, and households) in Delhi's pollution;
    - the impact of biomass burning in nearby states; and
    - how emission-control measures could influence severe pollution events.
  - The DSS also uses climatological fire and emission data to predict short-term pollution levels.
  - However, it currently runs only during winter, limiting year-round tracking.
  - The Council on Energy, Environment and Water (CEEW) has recommended continuous operation and advanced modelling to make it more effective.
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### KARNAK TEMPLE



- The Karnak Temple, or rather the **complex of temples of Karnak in Luxor, Egypt**, is one of the most impressive of **Ancient Egyptian sites** and **once formed part of the city of Thebes**.
  - It is located in **Karnak, Luxor Governorate, south of Egypt on the east side of the Nile River bank**.
  - It was **built between 2055 BC and around 100 AD**.
  - It was built as a cult temple and was **dedicated to the gods Amun, Mut, and Khonsu**.
  - Being the **largest building for religious purposes ever to be constructed**, the Karnak Temple was **known as “most select of places” by ancient Egyptians**.
  - While the **height of its importance was during the New Kingdom**, and during the reigns of famous pharaohs such as **Hatshepsut, Tuthmose III, Seti I, and Ramesses II**, all contributed significant additions to the complex, **construction continued into the Greco-Roman Period**, with the Ptolemies, Romans, and early Christians all leaving their mark there.
  - **Together with the Luxor Temple and the Valley of the Kings, the Karnak Temple is a UNESCO World Heritage site**.
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