Environmental Science & Other Innovations:

1. Environmental Science Innovations in India:

Noise Pollution Legislation Recommended: A significant study by Punjabi University's law department, released on July 21, 2025, has urged the enactment of special legislation to address noise pollution in India. The research identified deficiencies in the current legal framework, calling for more stringent measures, better definition of offenses, and sufficient penalties. Recommendations include using advanced technology for quieter aircraft, enforcing noise limits, insulating infrastructure, relocating industrial units, and launching public awareness campaigns.

CSIR-NEERI's Ongoing Contributions: The Council of Scientific and Industrial Research – National Environmental Engineering Research Institute (CSIR-NEERI) continues to be a central player. While specific new innovations on July 21 are not highlighted, ongoing efforts include:

Emphasis on decarbonization and nature-based solutions for sustainability.

Integration of sustainable practices, resource efficiency, circular economy initiatives, and green innovations.

Active contribution to national priority programs like Swachh Bharat Mission, clean air, river rejuvenation, sustainable waste management, and carbon sequestration.

Research into the accumulation of garbage through solar energy generation.

Technology Transfer under the Jal Jeevan Mission.

Collaboration with government agencies, industries, and international organizations to develop science-driven solutions.

Plastic Waste Management: India's commitment to tackling plastic pollution continues.

TDB-DST & APChemi Pvt. Ltd. (2025): An agreement was signed to produce purified pyrolysis oil for making circular plastics and sustainable chemicals from waste.

CSIR initiatives: CSIR-IICT, Hyderabad, converts plastic waste into fuel oil, monomers, hydrogen, and green plasticizers, with technology shared with private companies. CSIR also has an MoU with DDA & Delhi Municipal Corporations to set up a plant to convert waste plastic into diesel and tiles.

Plastic Parks: India's strategy includes developing Plastic Parks—industrial zones with facilities for manufacturing, processing, and recycling plastic products, promoting eco-friendly practices. 10 such parks have been approved.

Swachh Bharat Mission (Grameen) Phase II: Focuses on rural waste management, including plastics, with provisions for setting up Plastic Waste Management Units (PWMUs).

Local Success in Waste Management: Derabassi, a town in Mohali, has outperformed Mohali city in door-to-door garbage collection (100%) and source segregation (60%), showcasing
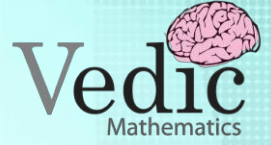
successful local implementation of waste management practices.

2. Renewable Energy and Climate Action (India):

Major Climate Milestone Achieved: India has reached a significant climate milestone, achieving 50% of its installed power generation capacity from non-fossil fuel sources, five years ahead of its 2030 target under the Paris Agreement. This includes 234 GW from clean energy (solar, wind, large hydro) and 8.7 GW from nuclear energy. This achievement positions India as a leader in green energy.

Increased Investment in Green Energy:

NTPC and NLC India Ltd: The Cabinet approved state-run NTPC to invest up to ₹20,000 crore in its green energy subsidiaries, a sharp rise from the earlier cap. NLC India Ltd was also allowed to invest ₹7,000 crore in its renewables subsidiary. This is aimed at accelerating the development of renewable projects to achieve targets of 60GW green energy by 2032 for NTPC.

Adani Green Energy Ltd (AGEL): India's largest renewable energy firm, AGEL, accounts for 8.66% of India's total renewable energy base and added 3.3 GW of solar, wind, and hybrid capacity in FY25. They are targeting 50 GW by 2030, with the massive 30 GW Khavda project in Gujarat central to this vision (5.5 GW operational by mid-2025).

Energy Storage Systems (ESS): Companies like AGEL are prioritizing ESS, including Hydro Pumped Storage Projects (PSPs) and Battery Energy Storage Systems (BESS), recognizing their vital role in grid reliability with increasing variable renewable output.

Future Focus: With the 50% clean energy target met, attention will now shift to expanding energy storage, upgrading grid infrastructure, and adopting AI-driven load management. India's goal of installing 500 GW of non-fossil capacity by 2030 remains well within reach.

3. Water Conservation and Management (India):

MNREGS Focus on Water Conservation: Water conservation has become a primary focus of the Centre's Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) in Uttar Pradesh. Expenditure for water conservation under the Natural Resource Management (NRM) component reached an all-time high of over 85% in 2024-25. The Ministry of Rural Development has mandated at least 65% of NRM expenditure within Mission Water Conservation (MWC) blocks be allocated to water conservation measures.

NGO Initiatives: The Indian Nature Preservation Alliance (INPA) is leading transformative water conservation projects in rural and semi-urban areas. Their 2025 projects include:

Jal Raksha Abhiyan (Maharashtra): Rainwater harvesting, tank desilting.

Neer Sanchay Mission (Rajasthan): Rooftop rainwater units.

Harit Jal Kranti (Madhya Pradesh): Canal revival, contour trenching.

Key impact metrics include 1,200+ rainwater harvesting structures installed and 1.8 million liters of water storage capacity created.
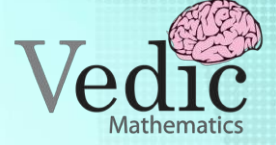
Holistic Approach: INPA's work combines traditional methods with modern science, promoting community participation and long-term goals like digitizing water audit tools and scaling rooftop water harvesting in urban slums.

4. Other Innovations:

Geospatial Intelligence with AI (Mapex AI): Noida, India-based Azure Clouds has rebranded as Mapex AI and launched global operations with a new client servicing office in Toronto, Canada. Mapex AI specializes in integrating cutting-edge technologies (UAVs, LiDAR, photogrammetry, satellite imagery) with AI to deliver intelligent, end-to-end mapping solutions for urban infrastructure, natural resources, and utilities. A major innovation is their Agentic AI model, a GIS-specific AI assistant accessible via text or voice for real-time geospatial insights.

Sustainable Agriculture Technology: The Union Cabinet approved the Prime Minister Dhan-Dhaanya Krishi Yojana (PMDDKY) on July 16, 2025, a ₹24,000 crore annual scheme for six years. It targets 100 low-performing agri-districts to enhance productivity, promote crop diversification, improve irrigation, and ensure credit access through the convergence of 36 Central schemes. The scheme emphasizes sustainable agricultural practices, including soil and water conservation, and expansion of natural and organic farming.

Agri-Tech Trends for 2025: Indian farming is seeing increased adoption of:

Precision Agriculture: Data, drones, satellite-based crop health monitoring.

AI and Machine Learning: AI/ML-powered advisory for weather, pest control, yield prediction.

Autonomous Machinery: Robotic planters, AI-guided harvesters, spraying drones.

IoT Sensors: For precise irrigation and soil management.

Digital Platforms and Mobile Apps: For farmer guidance.

Blockchain-backed supply chain traceability.

## Carbon Capture Technology:

Global Innovation Centre in India: Carbon Clean, a UK-headquartered company founded in India, launched its Global Innovation Centre (GIC) in India. This will be one of the world's largest dedicated carbon capture research facilities, focused on developing next-generation carbon capture technologies like their modular CycloneCC. It aims to accelerate the deployment of CCUS (Carbon Capture, Utilization, and Storage) solutions in hard-to-abate industries, with existing pilot partnerships in India with companies like BHP, JSW, NTPC, and Tata Steel.

NLC India and IIT Madras Collaboration: The Energy Consortium-IIT Madras has partnered with NLC India Limited to advance economical Carbon Capture technologies and the future utilization of captured CO2, suitable for large-scale industrial deployment.

Supercritical CO_2 Technologies: Triveni Turbine Limited and IIT Madras are collaborating to develop capabilities in supercritical carbon dioxide (sCO_2) technologies, a frontier area for the energy sector.
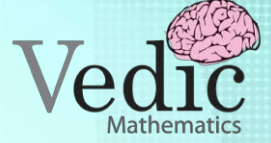
Cybersecurity in Smart Cities: A National Conference on Making Cities Cyber Secure was held on July 18, 2025, emphasizing urban cyber preparedness. Key initiatives discussed included city-level cybersecurity frameworks, mandatory appointment of Chief Information Security Officers (CISOs), and cybersecurity audits, highlighting the growing need for innovation in securing digital urban infrastructure.

MCQS

1. A study by Punjabi University's law department, released on July 21, 2025, has recommended the enactment of special legislation to address which specific environmental issue in India?
a) Air pollution
b) Water scarcity
c) Noise pollution
d) Soil erosion

Answer: c) Noise pollution
The text states: "A significant study by Punjabi University's law department, released on July 21, 2025, has urged the enactment of special legislation to address noise pollution in India."

2. India has achieved a significant climate milestone by reaching what percentage of its installed power generation capacity from non-fossil fuel sources, ahead of its 2030 target?
a) 25%
b) 40%
c) 50%
d) 75%

Answer: c) 50%
The text states: "India has reached a significant climate milestone, achieving 50% of its installed power generation capacity from non-fossil fuel sources, five years ahead of its 2030 target under the Paris Agreement."

3. In Uttar Pradesh, what percentage of the Natural Resource Management (NRM) expenditure under MNREGS reached an all-time high for water conservation in 2024-25?
a) Over 50%
b) Over 65%
c) Over 75%
d) Over 85%

Answer: d) Over 85%
The text states: "Expenditure for water conservation under the Natural Resource Management (NRM) component reached an all-time high of over 85% in 2024-25."

4. What is the new name of Noida, India-based Azure Clouds, which has rebranded and launched global operations with a focus on geospatial intelligence with AI?
a) GeoSense AI
b) TerraMap AI
c) Mapex AI
d) SkyVision AI

Answer: c) Mapex AI
The text states: "Noida, India-based Azure Clouds has rebranded as Mapex AI and launched global operations..."

5. Which UK-headquartered company, founded in India, launched its Global Innovation Centre (GIC) in India, focused on developing next-generation carbon capture technologies like their modular CycloneCC?
a) CO2 Solutions Inc.
b) Carbon Engineering
c) Carbon Clean
d) Climeworks

Answer: c) Carbon Clean

The text states: "Carbon Clean, a UK-headquartered company founded in India, launched its Global Innovation Centre (GIC) in India."