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23 SEPTEMBER 2025

EN-BUZZER

Daily News Analysis

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1. Smog Eating Photocatalytic Coatings

- **Prelims** - Smog Eating Photocatalytic Coatings
- **Mains** - GS 3 - Science and Technology

Why in the news?

- Delhi government has decided to conduct a study on the use of Smog Eating Photocatalytic Coatings on roads, pavements and public spaces to reduce pollutants such as nitrogen dioxide (NO₂) and harmful hydrocarbons.

Smog Eating Photocatalytic Coatings

- **What is it?:**
 - These are surface coatings (often applied to building facades, roads, pavements, and tiles) that use photocatalysis to break down harmful air pollutants like NO_x (nitrogen oxides), SO_x, VOCs, and particulate matter.
 - Typically based on **titanium dioxide (TiO₂)** nanoparticles, which, when exposed to sunlight (UV), generate reactive oxygen species that oxidize pollutants into harmless substances (like nitrates, CO₂, and water).
- **How does it Work:**
 - **Sunlight Activation:** UV rays excite TiO₂, releasing electrons and creating electron-hole pairs.
 - **Reactive Oxygen Species (ROS):** These react with oxygen and water vapor to produce hydroxyl radicals and superoxide ions.
 - **Pollutant Breakdown:** NO_x, SO_x, benzene, and other smog-forming compounds are oxidized into non-toxic byproducts.
 - **Self-Cleaning Effect:** The coatings also decompose organic dirt, keeping surfaces cleaner.
- **Applications:**
 - **Urban Infrastructure:** Coated concrete, pavements, and tiles (e.g., “smog-eating” pavements in Mexico City, Milan, and Tokyo).
 - **Building Facades:** High-rise buildings in polluted cities (e.g., Torre de Especialidades Hospital, Mexico).
 - **Transport Sector:** Roadways and tunnels coated with TiO₂ to reduce vehicular NO_x.



- **Consumer Products:** Paints, tiles, glass, and textiles marketed as “air-purifying” or “self-cleaning.”
- **Significance for India:**
 - Aligned with **National Clean Air Programme (NCAP)** goals.
 - Potential integration into **Smart Cities Mission, Green Building Codes, and urban planning.**
 - IITs and CSIR labs exploring **TiO₂ and ZnO-based nanocoatings** for smog mitigation.
 - Pilot projects could target Delhi, Kanpur, Lucknow, and other NCAP priority cities.
- **Advantages:**
 - **Air Quality Improvement:** Reduces NO_x concentrations locally by up to 30–80% in pilot projects.
 - **Climate & Health Gains:** Lowers smog formation, respiratory illnesses, and urban heat-island effects.
 - **Durability:** Long-lasting with minimal maintenance.
 - **Co-benefits:** Energy savings via cooler buildings (reflective surfaces).
- **Limitations:**
 - **Dependence on Sunlight:** Less effective in shaded/indoor or low-UV areas.
 - **By-products:** Converts NO_x to nitrates, which may accumulate and require surface washing.
 - **Cost:** Higher than conventional coatings.
 - **Scale Challenge:** City-wide coverage is expensive and logistically complex.
 - **Efficacy Debate:** Real-world reductions often smaller than lab claims.



2. Pradhan Mantri Ujjwala Yojana (PMUY)

- **Prelims** - Pradhan Mantri Ujjwala Yojana (PMUY)
- **Mains** - GS 3 - Economy

Why in the news?

- The Centre on Monday sanctioned 25 lakh additional LPG connections under the Pradhan Mantri Ujjwala Yojana (PMUY) during the current financial year.

Pradhan Mantri Ujjwala Yojana (PMUY)

- **Launched**: May 1, 2016 at Ballia (Uttar Pradesh).
- **Nodal Ministry**: Ministry of Petroleum and Natural Gas.
- **Objective**: Provide clean cooking fuel (LPG) to rural and deprived households, replacing unclean fuels like firewood, coal, dung cakes.
- **Features**
 - **Beneficiaries**: Women from Below Poverty Line (BPL) households.
 - **Identification**: Based on Socio-Economic and Caste Census (SECC-2011) data, Antyodaya Anna Yojana (AAY), Forest dwellers, SC/ST households, PMAY-Gramin, Tea/Chai workers, etc.
 - **Financial Assistance**: ₹1,600 per LPG connection (including deposit of cylinder, pressure regulator, safety hose, etc.).
 - **Target**: Initially 5 crore connections (achieved in 2018); later enhanced to 8 crore by 2021.
 - **PMUY 2.0 (August 2021)**:
 - ★ Additional 1 crore connections (now extended further).
 - ★ Provision for free first refill and stove.
 - ★ Focus on migrants (self-declaration accepted without address proof).
- **Significance**
 - **Health Benefits**: Reduced indoor air pollution, respiratory diseases, eye problems.
 - **Women's Empowerment**: Time saved from collecting firewood; reduced drudgery; enhanced dignity.
 - **Environment**: Reduces deforestation, carbon emissions, and black carbon soot.



→ **Social Impact:** Women as direct beneficiaries; contributes to SDG-3 (Good Health), SDG-5 (Gender Equality), SDG-7 (Clean Energy).

- **Challenges**

- **Refill Affordability:** High refill cost → low refill rates, many reverting to biomass.
- **Awareness Gap:** Some households continue traditional fuels alongside LPG.
- **Supply Chain:** Accessibility issues in remote/rural areas.
- **Safety Concerns:** Need for better awareness on safe LPG usage.



3. Project Vijayak

- **Prelims** - Project Vijayak
- **Mains** - GS 3 - Internal Security

Why in the news?

- The Project Vijayak of the Border Roads Organisation (BRO) celebrated its 15th Raising Day at Kargil, Ladakh.

Project Vijayak

- **Launched by:** Border Roads Organisation (BRO) in 2010.
- **Name Origin:** Derived from Operation Vijay (Kargil War, 1999) – signifying the overlap between the theatre of battle and the project's area of responsibility.
- **Objectives:**
 - Entrusted with road connectivity in Kargil and Zaskar (earlier under Project Himank).
 - Focus on two strategically vital lines of communication in the Western Indus Corridor:
 - ★ Zojila – Kargil – Leh axis
 - ★ Nimmu – Padam – Darcha axis
 - Ensure defence preparedness and all-weather access in Ladakh's frontier regions.
- **Strategic & Socio-Economic Significance:**
 - Strengthened security infrastructure along the Line of Control (LC).
 - Enhanced troop mobilisation and logistics in sensitive areas.
 - Contributed to socio-economic development by connecting remote areas with healthcare, markets, education, and tourism opportunities.



4. Biodiversity Beyond National Jurisdictions (BBNJ)

- Prelims - Biodiversity Beyond National Jurisdictions (BBNJ)
- Mains - GS 3 - Environment

Why in the news?

- The BBNJ Treaty crossed the threshold of 60 ratifications, with Morocco and Sierra Leone becoming the 60th and 61st signatories respectively, paving the way to enter into force in January 2026.

Biodiversity Beyond National Jurisdictions (BBNJ)

- What is it?
 - Also called the High Seas Treaty.
 - A legally binding instrument under UNCLOS (United Nations Convention on the Law of the Sea).
 - Deals with conservation and sustainable use of biodiversity in international waters (beyond territorial waters & EEZs).
 - Covers ~64% of the oceans, considered global commons.
- Came into Force: June 2023 after 20 years of negotiations
- Headquarters: New York
- Objectives:
 - Establish Marine Protected Areas (MPAs) in the high seas (like national parks/wildlife reserves).
 - Ensure sustainable use of marine biodiversity & resources.
 - Regulate extractive activities (e.g., sea-bed mining).
 - Introduce mandatory Environmental Impact Assessments (EIAs) before major projects.
 - Provide for equitable benefit-sharing from marine genetic resources.
 - Strengthen global governance of oceans.
- India's Position:
 - Signed, but not yet ratified.
 - 55 countries ratified; treaty comes into force 120 days after 60th ratification.
 - India is drafting a domestic legislation to:
 - ★ Build institutional capacity for marine EIAs.



- ★ Equip itself to utilize economic benefit-sharing provisions.
- ★ Align national interests with treaty obligations.

- **Significance:**

- Balances freedom of navigation, overflight, fishing, infrastructure (undersea cables), and mineral extraction with conservation duties.
- Protects marine ecosystems against pollution, overfishing, and excessive exploitation.
- Builds a framework for blue economy opportunities while safeguarding biodiversity.

- **Challenges:**

- Ratification delay: Global target not yet reached.
- Capacity gaps: Need scientific, legal, and institutional frameworks for EIAs and benefit-sharing.
- Geopolitical rivalries: Conflicts in high seas (e.g., deep-sea mining, navigation rights).
- Overlap with other conventions: CBD, regional fisheries treaties, etc.

5. Morocco and Sierra Leone

- Prelims - Location of Morocco and Sierra Leone
- Mains - GS 1 - Geography

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Morocco

Why in the news?

- The BBNJ Treaty crossed the threshold of 60 ratifications, with Morocco and Sierra Leone becoming the 60th and 61st signatories respectively, paving the way to enter into force in January 2026.

Morocco

- Location:** Morocco is a country in the Maghreb region of North Africa.
- Capital:** Rabat
- Border Countries:** Algeria
- Bordering Waterbodies:** Atlantic Ocean, Mediterranean Sea
- Associated Geographical Feature:** Border western Sahara to south.
- Climate:** Mediterranean climate
- Membership in International Organisation:** African Union (AU), Arab League, Organisation of Islamic Cooperation (OIC), the Non-Aligned Movement.





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Sierra Leone



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Sierra Leone

- **Location:** It is a country on the southwest coast of West Africa.
- **Capital:** Freetown
- **Border Countries:** Liberia, Guinea.
- **Bordering Waterbodies:** North Atlantic Ocean
- **Climate:** Tropical climate.
- **Vegetation:** Savanna to rainforests.
- **International Grouping:** Member of ECOWAS, the African Union, the African Development Bank (AFDB), the Organisation of Islamic Cooperation (OIC), and the Non-Aligned Movement (NAM).



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