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EDITORIAL ANALYSIS

Smog-Eating Surfaces — Can Technology Save Delhi From Its Air Crisis?

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SUBJECTS COVERED**ENVIRONMENT****SCIENCE & TECH****GS PAPERS****GS3****CURATED & WRITTEN BY****Bharat Choudhary**

UPSC Educator & Content Creator •

[linkedin.com/in/epicbharat](https://www.linkedin.com/in/epicbharat)

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Smog-Eating Surfaces — Can Technology Save Delhi From Its Air Crisis?

Hindustan Times 23 March 2026 **GS3**

HT Hindustan Times | MAINS RELEVANCE: **GS Paper 3**



INTERVIEW ANGLE

"Technological solutions like photocatalytic coatings are being tested for Delhi's air pollution. Do you believe technology alone can solve the air quality crisis, or are governance and behavioural reforms more critical?"

WHY IN NEWS

The Delhi government's MoU with IIT Madras to test photocatalytic TiO₂ coatings on roads has sparked debate about whether technological innovation can meaningfully address Delhi's air pollution crisis, or whether it risks becoming a distraction from the governance failures that perpetuate the problem.

The Technology Promise

Photocatalytic coatings represent an elegant science-based approach: Titanium Dioxide (TiO₂) surfaces activated by sunlight break down NO₂ and VOCs into harmless compounds. Cities like Milan, Tokyo, and Mexico City have piloted this technology with promising localised results — Milan reported up to 60% NO₂ reduction in treated areas.

The Sceptic's Case

However, the editorial argues that technology alone cannot solve Delhi's air crisis for several reasons:

1. Scale vs Impact Mismatch

Delhi's pollution is a city-wide atmospheric problem driven by millions of sources. Photocatalytic coatings work at the **surface level** — a few metres from the treated surface. The impact on city-wide AQI may be negligible compared to the scale of the problem.

2. Seasonal Mismatch

Delhi's worst pollution occurs during **October-February** when:

- Sunlight hours are shortest (photocatalysis needs UV light)

- Temperature inversions trap pollutants near ground level
- Stubble burning peaks in October-November
- Cold weather reduces photocatalytic efficiency

The technology works best in summer — precisely when Delhi’s air quality is already better.

3. Source vs Symptom

Photocatalytic coatings treat the **symptom** (airborne pollutants) rather than the **sources**:

SOURCE	CONTRIBUTION	STATUS OF SOURCE CONTROL
Vehicular emissions	~28%	EV transition slow; BS-VI compliance patchy
Construction dust	~22%	GRAP compliance enforcement weak
Industrial pollution	~21%	Relocation to NCR periphery ongoing
Stubble burning	Seasonal (~30% during peaks)	CRM distribution improving but adoption slow
Power plants	~5%	Some relocated; coal usage declining slowly

4. Governance Deficit

The editorial’s core argument: Delhi has **enough policy frameworks** — NCAP, GRAP, CAQM Act, EV Policy — but suffers from chronic **implementation failure**:

- GRAP stages are triggered reactively (after pollution spikes) rather than preventively
- Inter-state coordination on stubble burning remains weak
- Construction site compliance monitoring is understaffed
- Public transport modal share remains low despite Metro expansion

The Technology Governance Framework Needed

The editorial recommends that technological solutions like photocatalytic coatings should be part of a **layered strategy**, not a standalone fix:

LAYER	ACTION	TIMELINE
Immediate	Enforce GRAP strictly; penalise violators	Now
Short-term	Scale electric bus fleet; congestion pricing	1-2 years
Medium-term	Photocatalytic coatings on high-traffic corridors	2-3 years
Long-term	Complete stubble burning elimination; clean energy transition	5-10 years

Air Quality Governance in India

BODY/Framework	ROLE
CAQM	Statutory body for Delhi-NCR air quality (CAQM Act 2021)
GRAP	4-stage graded response (Green → Yellow → Orange → Red)
NCAP	National Clean Air Programme (131 cities, 40% PM reduction target)
CPCB	Monitors National AQI; sets NAAQS standards
SAFAR	System of Air Quality Forecasting and Research (IMD)

UPSC RELEVANCE

CAQM Act 2021, GRAP stages, NCAP targets, SAFAR system, AQI categories.

MAINS GS-3:

Technology vs governance in environmental management; Delhi air pollution — multi-stakeholder challenge; role of institutions (CAQM, CPCB) in pollution control.

★ FACTS CORNER — KNOWLEDGEPEDIA

DELHI AIR QUALITY FRAMEWORK:

CAQM: Commission for Air Quality Management (statutory, CAQM Act 2021)

Replaced: EPCA (Environment Pollution Prevention and Control Authority)

GRAP: 4 stages based on AQI levels

NCAP: 131 cities, 40% PM10 reduction target by 2025-26

DELHI POLLUTION SOURCES:

Vehicles: ~28%; Construction dust: ~22%; Industry: ~21%

Stubble burning: ~30% during Oct-Nov peaks

Delhi annual PM2.5: ~100-120 ug/m³ (WHO: 5 ug/m³)

PHOTOCATALYTIC TECHNOLOGY:

Catalyst: TiO₂ (Titanium Dioxide)

Targets: NO₂, VOCs

Limitation: Needs UV sunlight; less effective in winter

Global precedent: Milan reported 60% NO₂ reduction locally

AQI CATEGORIES IN INDIA:

Good (0-50), Satisfactory (51-100), Moderate (101-200)

Poor (201-300), Very Poor (301-400), Severe (401-500)

OTHER RELEVANT FACTS:

CRM: Crop Residue Management machinery (subsidised by Centre)

BS-VI: Bharat Stage VI emission norms (implemented April 2020)

Delhi EV Policy: launched 2020; target 25% new vehicle registrations as EVs

Delhi Metro: ~392 km network (among world's largest)

Sources: [Hindustan Times](#), [ANI](#)

CURATED & WRITTEN BY

Bharat Choudhary

UPSC Educator & Content Creator

 [linkedin.com/in/epicbharat](https://www.linkedin.com/in/epicbharat)

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