



VEDANTA COACHING ACADEMY & LIBRARY

Editorial Analysis

UPSC Civil Services — GS Paper III : Environment & Ecology

“Why Do Cities Get Polluted in Summer?”

Source: The Hindu (Explainer)

Authors: M. Rafiuddin & S. M. Ignatious (CEEW)

1 Mains + 5 Prelims MCQs + Essay

■ Index / Contents

★ Original Editorial (The Hindu) — full page	2
1 Context — The Story So Far	3
2 Central Argument & Key Data	3
3 Why Cities Pollute in Summer — The Paradox	3
4 The Ozone Story — A Secondary Pollutant	5
5 What Drives PM10 Spikes?	5
6 Way Forward — Solutions Matrix	5
7 Value Addition & Linkages	6
8 Key Terms & Institutions (Prelims Capsule)	6
9 Mains Practice Question (GS-III)	7
10 Prelims MCQs with Detailed Analysis	7
11 Essay Topics	9

Why do cities get polluted in summer?

How is summer air pollution different from that in winter? Why does ozone rise in hot weather? What drives PM10 spikes in Indian cities? How do dust storms affect air quality? How do human activities worsen summer air pollution? What can cities do to combat summer air pollution?

EXPLAINER

Mohammad Rafiuddin
Sneha Maria Ignatious

The story so far:

In March, the Commission for Air Quality Management in the National Capital Region and Adjoining Areas (CAQM) revoked all curbs under the Graded Response Action Plan (GRAP), signalling the end of the winter air pollution in Delhi.

A month later, as temperatures rose, it reimposed Stage 1 of the GRAP to combat summer air pollution. It was briefly revoked and reimposed again in May, while North India was reeling under heatwaves.

Why are cities witnessing pollution episodes during summer?

Delhi and the Indo-Gangetic plain are known for winter smog because low temperatures, low wind speeds, and their basin-like topography trap pollutants close to the ground.

Summer brings stronger winds, occasional thunderstorms that wash out pollutants, and warmer temperatures that allow pollutants to mix higher in the atmosphere. Despite such meteorological favours, Delhi has already witnessed 54 days between 1 April and 31 May 2026 where daily average PM10 levels exceeded the 24-hour National Ambient Air Quality Standard (NAAQS) of 100 ug/m3. At the same time, on 40 days, at least one Continuous Ambient Air Quality Monitoring Station (CAAQMS) in the city recorded a breach in the hourly ozone standard of 180 ug/m3.

Unlike most headlines, this is not the story of Delhi alone. Other large cities like Mumbai, Chennai, Hyderabad, Bengaluru, and Kolkata also recorded pollution spikes in the same period this summer, with PM10 and ozone levels going above the national standards to varying degrees. These spikes were shaped by local sources such as vehicular emissions, road dust, construction activity, industrial emissions, and dust from local storms. Mumbai, for instance, has been recording high PM10 and ozone levels over the last few years due to construction activity, dust, and traffic. While Chennai's PM10 breaches are occasional, its high vehicular density and hot weather also make it an ozone hotspot.

How is summer air pollution different from that in winter?

While winter pollution is dominated by finer PM2.5 particles, summer air pollution is driven by the coarser PM10 and ozone.

Vehicles, industries, waste burning, agricultural residue burning, construction sites, and broken roads remain year-round sources of pollution. Winter adds biomass burning for heating. Summer brings in dust storms that hike PM10 levels, while heat and sunlight catalyse ozone formation.

Why does ozone rise in hot weather?

Ozone is not emitted directly from a tailpipe or chimney. It forms when nitrogen oxides (NOx), largely from vehicles and volatile organic compounds (VOCs) from industrial emissions, vehicle exhaust, paints, and other sources, react under strong sunlight. Hotter, sunnier days therefore create favourable conditions for ozone formation, which, along with particulate matter, could cause respiratory illnesses.



Summer brings in dust storms that hike PM10 levels, while heat and sunlight catalyse ozone formation. PTI

THE GIST

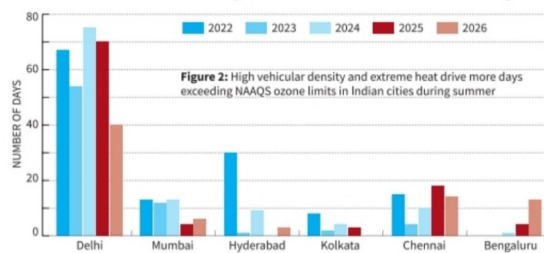
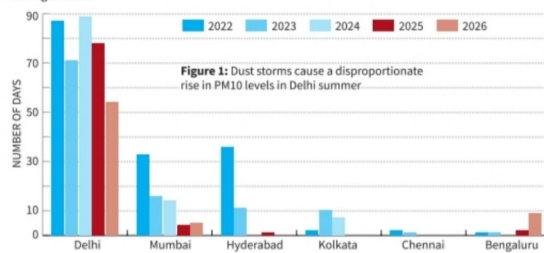
Summer air pollution is driven largely by PM10 and ozone, with several Indian cities recording repeated breaches of national standards.

Dust storms, construction activity, road dust, vehicular emissions and industrial pollution contribute to pollution episodes during the hotter months.

Heat and strong sunlight promote ozone formation, underlining the need for year-round air quality management rather than a focus on winter smog alone.

The summer burden

Dust, heat, and urban emissions continue to drive pollution episodes across Indian cities even during summer



Note: The data for 2026 is from 1 April to 31 May 2026. For other years, the data is from 1 April to 30 June. SOURCE: CEEW ANALYSIS OF CAAQMS DATA

What causes India's PM10 to spike?

Hot conditions over the Indian subcontinent create a low-pressure area that extends towards Iran. Its interaction with surrounding high-pressure areas produces hot, windy conditions. These winds could stir up dust storms, including hot winds called loo, which carry dust from West Asia and the Thar Desert across India towards the Bay of Bengal. Such episodes could elevate PM10 levels for days, as seen during the severe North Indian dust storms of 2018.

The Indian subcontinent also experiences shorter, localised dust storms known as 'andhi' that usually subside within hours. These form when strong downward-moving air associated with thunderstorms hits the ground, lifts loose dust, and carries it at high speed. While loo-type dust storms are common in

North India, cities like Mumbai and Hyderabad generally face dusty episodes due to local thunderstorms.

Human activity worsens this natural dust load. Construction and demolition work often resumes after the more stringent winter GRAP restrictions are lifted. Without adequate site-level dust control, these activities add to PM10 levels. Vehicles moving over broken roads also further resuspend loose, dry dust into the air in the dry summer months.

What can cities do to combat summer air pollution?

While natural sources of dust cannot be controlled, they can be predicted. Delhi's Air Quality Early Warning System (AQEWS) was created in response to severe dust storms in 2018 and smog episodes of the previous years, and now

runs year-round. It has since been extended to other cities such as Jaipur and Mumbai, and provides forecasts of multiple pollutants several days in advance. Its bulletin provides detailed weather information for Delhi and three-day Air Quality Index forecasts for 140 Indian cities.

The India Meteorological Department (IMD) also publishes national weather forecast bulletins several times a day. Authorities should use these systems to issue local alerts on dust storms, ozone, and poor air quality so citizens can reduce exposure.

For controllable non-natural sources, enforcement matters. Construction sites need active dust management even outside winter.

A study by the Council on Energy, Environment and Water (CEEW) found that simply reducing heavy-vehicle movement at construction sites can lower local particulate matter levels. The Brihanmumbai Municipal Corporation (BMC)'s Air Quality Decision Support System (AQDSS), also developed with CEEW, for example, assists in monitoring construction sites. It has already helped authorities take measures against more than 1,000 sites since October 2025 in Mumbai.

Reducing ozone requires cutting NOx and VOC emissions from vehicles and industries through cleaner transport, better compliance, and attention to solvents, paints, and fuel combustion. Even simple behavioural measures, like the 'Red Light On, Gaadi Off' campaign of the Delhi government that urges drivers to switch vehicles off while waiting at junctions to reduce idling emissions, can reduce ozone formation. But Indian cities need more sustained action.

Delhi has had a summer action plan since 2022. Other cities need similar plans that combine forecasting, public health advisories, construction dust control, road dust management, and action on ozone-forming emissions. Summer may disperse some pollutants better than winter, but heat and sunlight create their own pollution chemistry. Indian cities must plan for both seasons, treating them with equal seriousness.

(Mohammad Rafiuddin is Programme Lead and Sneha Maria Ignatious is Programme Associate at the Council on Energy, Environment and Water)

Source: The Hindu (Explainer) — reproduced for academic / classroom study at Vedanta Coaching Academy & Library.

1. Context — The Story So Far

For decades, air pollution in Indian cities — especially Delhi and the Indo-Gangetic plain — has been framed as a **winter problem** of toxic smog. This editorial overturns that assumption with data showing that **summer carries its own distinct pollution chemistry**, demanding year-round management.

- **March 2026:** The **Commission for Air Quality Management (CAQM)** revoked all curbs under the **Graded Response Action Plan (GRAP)**, signalling the end of Delhi's winter pollution season.
- **April 2026:** As temperatures rose, **Stage I of GRAP was re-imposed** to combat summer pollution. It was briefly revoked and re-imposed again in May during severe North-Indian heatwaves.
- This rapid policy back-and-forth is the clearest signal yet that **pollution is no longer a single-season event**.

2. Central Argument

Core Thesis

Winter pollution is dominated by **fine PM2.5** trapped by cold, calm air. Summer pollution is driven by **coarse PM10** (dust) and **ground-level ozone** (heat + sunlight chemistry). Therefore, India must shift from an episodic, winter-only response to a **continuous, airshed-based, two-season air-quality framework**.

Key Data You Must Quote

- **Delhi:** 54 days (1 April–31 May 2026) breached the 24-hour PM10 standard of **100 µg/m³**.
- **40 days:** at least one monitoring station breached the hourly ozone standard of **180 µg/m³**.
- Breaches also recorded in **Mumbai, Chennai, Hyderabad, Bengaluru & Kolkata** — not a Delhi-only story.

3. Why Cities Pollute in Summer — The Paradox

Counter-intuitively, summer weather should *help* clean the air, yet pollution persists. Understanding this paradox is the analytical heart of the editorial.

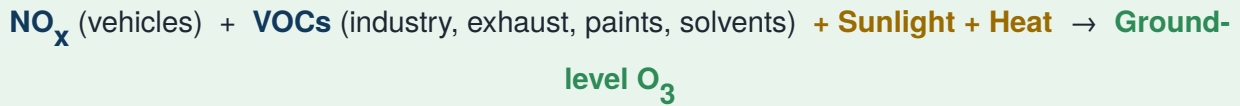
Meteorological Factor	Effect on Air Quality
Stronger summer winds	Disperse pollutants — but also stir up and transport dust , raising PM10.
Thunderstorms	Wash out pollutants — but downdrafts trigger short ' andhi ' dust storms.
Higher temperatures	Greater vertical mixing (higher mixing height) — but heat + sunlight catalyse ozone formation .
Basin topography (winter)	Traps PM2.5 near the ground — this is the classic winter smog mechanism.

Despite these favourable factors, **local sources** (vehicles, road dust, construction, industry) and natural dust override the advantage. **Mumbai** records high PM10/ozone from construction, dust and traffic; **Chennai's** high vehicular density and heat make it an **ozone hotspot**.

■ 4. The Ozone Story — A Secondary Pollutant

Why Ground-Level Ozone Rises in Hot Weather

Ozone (O₃) is **not emitted directly** from any tailpipe or chimney — it is a **secondary pollutant**. It forms when precursors react under strong sunlight:



Hotter, sunnier days create ideal conditions for this photochemical reaction. Combined with particulate matter, ozone aggravates **respiratory illness**.

! Prelims Trap: Good Ozone vs Bad Ozone

Stratospheric ozone (the ozone layer) is *beneficial* — it shields Earth from UV radiation. **Tropospheric / ground-level ozone** is *harmful* — a respiratory irritant and a **short-lived climate pollutant (greenhouse gas)**. Same molecule, opposite roles depending on altitude.

■ 5. What Drives PM10 Spikes?

- **Synoptic (large-scale) dust storms:** Hot conditions create a low-pressure zone extending toward Iran; its clash with high-pressure areas produces hot, windy weather that carries dust from **West Asia and the Thar Desert** across India toward the Bay of Bengal (e.g. the severe North-Indian dust storms of **2018**). These can elevate PM10 for days.
- **Localised 'andhi':** Short dust storms formed when downward-moving air from thunderstorms hits the ground, lifts loose dust and carries it at high speed; they subside within hours. **Loo-type** storms are common in North India.
- **Human amplification:** Construction & demolition resumes once winter GRAP curbs lift; without site-level dust control it adds to PM10. Vehicles on **broken roads resuspend dry dust**.

■ 6. Way Forward — Solutions Matrix

Lever	Action / Example
Predict the un-controllable	Natural dust can't be stopped but can be forecast. Delhi's Air Quality Early Warning System (AQEWS) — created after the 2018 storms, now year-round — gives 3-day AQI forecasts for 140 cities ; extended to Jaipur & Mumbai. IMD bulletins enable local alerts.
Enforce on controllable sources	Active construction-site dust management even outside winter. BMC's Air Quality Decision Support System (AQDSS) (with CEEW) acted on 1,000+ sites since Oct 2025 .

Cut ozone precursors	Reduce NO _x & VOCs via cleaner transport, compliance, and attention to solvents, paints & fuel combustion.
Behavioural nudges	Delhi's ' Red Light On, Gaadi Off ' campaign cuts idling emissions at junctions.
City summer action plans	Delhi has one since 2022; other cities need plans combining forecasting + health advisories + dust control + ozone action. Treat both seasons equally.

■ 7. Value Addition & Linkages

Connect to the Bigger Picture (for higher marks)

- **NCAP (National Clean Air Programme, 2019):** Targets reduction of PM levels in 130+ non-attainment cities — but is winter/PM2.5-centric; needs an ozone & summer dimension.
- **Airshed approach:** Pollution ignores city boundaries; regional/airshed-level governance (like CAQM for NCR) is needed nationwide.
- **Health & SDGs:** Links to SDG 3 (Health), SDG 11 (Sustainable Cities), SDG 13 (Climate). Tropospheric ozone is a **short-lived climate pollutant** — cutting it gives a climate co-benefit.
- **Federalism gap:** CAQM's statutory teeth exist only for NCR; other metros lack a comparable empowered body.

■ 8. Key Terms & Institutions (Prelims Capsule)

Term	What to Remember
CAQM	Commission for Air Quality Management in NCR & Adjoining Areas — statutory body (CAQM Act, 2021).
GRAP	Graded Response Action Plan — stage-wise emergency measures tied to AQI severity.
NAAQS	National Ambient Air Quality Standards — notified by CPCB . PM10 (24-hr) = 100 µg/m ³ ; Ozone (1-hr) = 180 µg/m ³ .
CAAQMS	Continuous Ambient Air Quality Monitoring Station — real-time monitoring.
AQEWS	Air Quality Early Warning System — multi-day forecasts (IITM Pune / IMD ecosystem).
CEEW	Council on Energy, Environment and Water — the think tank authoring this piece.
NCAP	National Clean Air Programme (2019, MoEFCC) — national PM-reduction mission.

■ 9. Mains Practice Question (GS-III)

GS PAPER III 15 MARKS 250 WORDS

Q. Air pollution in Indian cities has long been treated as a winter problem, yet summer brings its own distinct pollution chemistry dominated by PM10 and ground-level ozone. Examine the causes of summer air pollution and suggest measures for a year-round, airshed-based air-quality management framework.

Suggested Answer Structure

Introduction (intro with data): Open with the fact that Delhi breached the PM10 standard on 54 days in April–May 2026, establishing that pollution is no longer seasonal. Define the shift from winter PM2.5 smog to summer PM10 + ozone.

Body — Causes of summer pollution:

- **Particulate (PM10):** synoptic dust storms (Thar & West Asia), localised 'andhi', construction/demolition resuming post-GRAP, road-dust resuspension.
- **Ozone:** photochemical reaction of NO_x + VOCs under intense summer sunlight; ozone hotspots like Chennai.
- **Governance gap:** episodic, winter-focused response; CAQM's empowered model limited to NCR.

Body — Year-round, airshed framework: Forecast-led action (AQEWS, IMD alerts) · construction dust management (AQDSS model) · cutting NO_x /VOC precursors via clean transport & emission compliance · behavioural nudges ('Red Light On, Gaadi Off') · city-specific summer action plans · widening NCAP to include ozone & summer metrics.

Conclusion: Clean air must be treated as a year-round public-health right; both seasons deserve equal policy seriousness within an airshed approach, delivering health and climate co-benefits.

■ 10. Prelims MCQs (with Detailed Analysis)

Q1 With reference to **ground-level (tropospheric) ozone**, consider the following statements:

1. It is a secondary pollutant formed by the reaction of oxides of nitrogen and volatile organic compounds in the presence of sunlight.
2. Its formation is favoured by hot and sunny weather.
3. Unlike stratospheric ozone, it is harmful to human respiratory health.

How many of the above statements are correct?

- (a) Only one (b) Only two (c) All three (d) None

Answer: (c) All three. Ground-level ozone is not emitted directly; it forms photochemically from NO_x + VOCs under sunlight (1 ✓), is favoured by heat and strong sunlight (2 ✓), and unlike the protective stratospheric ozone layer, it is a respiratory irritant and greenhouse gas (3 ✓).

Q2 Consider the following statements regarding the **Graded Response Action Plan (GRAP)** and the **CAQM**:

1. GRAP is a set of emergency measures implemented in a stage-wise manner based on air-quality severity.
2. In the National Capital Region, GRAP is invoked and revoked by the Commission for Air Quality Management (CAQM).
3. CAQM is a non-statutory advisory body.

Which of the statements given above are correct?

- (a) 1 and 2 only (b) 2 and 3 only (c) 1 and 3 only (d) 1, 2 and 3

Answer: (a) 1 and 2 only. GRAP works through escalating stages tied to AQI (1 ✓) and is operated by CAQM in the NCR (2 ✓). Statement 3 is wrong — **CAQM is a statutory body** created under the CAQM Act, 2021, not a mere advisory body.

Q3 Consider the following statements about particulate matter and air-quality standards in India:

1. Summer air pollution is driven mainly by coarser PM₁₀ and ozone, whereas winter is dominated by finer PM_{2.5}.
2. PM_{2.5} particles are coarser and heavier than PM₁₀ particles.
3. Both PM₁₀ and PM_{2.5} are regulated under the National Ambient Air Quality Standards (NAAQS).

Which of the statements given above are correct?

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3

Answer: (b) 1 and 3 only. Summer = PM₁₀ + ozone, winter = PM_{2.5} (1 ✓); both PM sizes are covered by NAAQS (3 ✓). Statement 2 is wrong — **PM_{2.5} is finer** ($\leq 2.5 \mu\text{m}$) than PM₁₀ ($\leq 10 \mu\text{m}$), not coarser.

Q4 With reference to the **Air Quality Early Warning System (AQEWS)**, consider the following statements:

1. It provides air-quality and pollutant forecasts several days in advance.
2. Initially set up for Delhi, it has since been extended to other cities such as Jaipur and Mumbai.
3. It operates only during the winter pollution season.

Which of the statements given above are correct?

- (a) 1 and 2 only (b) 2 and 3 only (c) 1 and 3 only (d) 1, 2 and 3

Answer: (a) 1 and 2 only. AQEWS gives multi-day forecasts (1 ✓) and has been extended beyond Delhi to Jaipur and Mumbai (2 ✓). Statement 3 is wrong — the system **now runs year-round**, providing 3-day AQI forecasts for around 140 cities.

Q5 Consider the following statements about dust storms affecting Indian cities in summer:

1. 'Andhi' are short-lived, localised dust storms that usually subside within hours.
2. Hot winds can transport dust from West Asia and the Thar Desert across India.
3. Construction and demolition activity has no measurable effect on PM10 levels, since dust is purely natural.

Which of the statements given above are correct?

- (a) 1 and 2 only (b) 2 and 3 only (c) 1 and 3 only (d) 1, 2 and 3

Answer: (a) 1 and 2 only. 'Andhi' are brief local storms from thunderstorm downdrafts (1 ✓) and synoptic winds carry Thar/West-Asian dust across India (2 ✓). Statement 3 is wrong — **human activity such as construction and road-dust resuspension significantly worsens PM10**, which is exactly why site-level dust management is recommended.

■ 11. Essay Topics

Practice both philosophical/abstract and direct framings. The editorial best feeds an environment-and-governance essay.

1. "Clean air is not a winter privilege but a year-round right."

2. "The chemistry of neglect: how India breathes its own development."

3. "We cannot stop the dust storm, but we can stop pretending it will pass — prediction without prevention is incomplete governance."

4. "Sustainable cities are built not on what we construct, but on what we are willing to breathe."

5. "Environment and development need not be adversaries; the air we share proves they are partners."

6. "There is no second atmosphere — managing the air is managing the future."

*Prepared by **Vedanta Coaching Academy & Library** — Daily Editorial Analysis for UPSC Aspirants.*

Read the original, build your own examples, and revise the Prelims Capsule before mains.