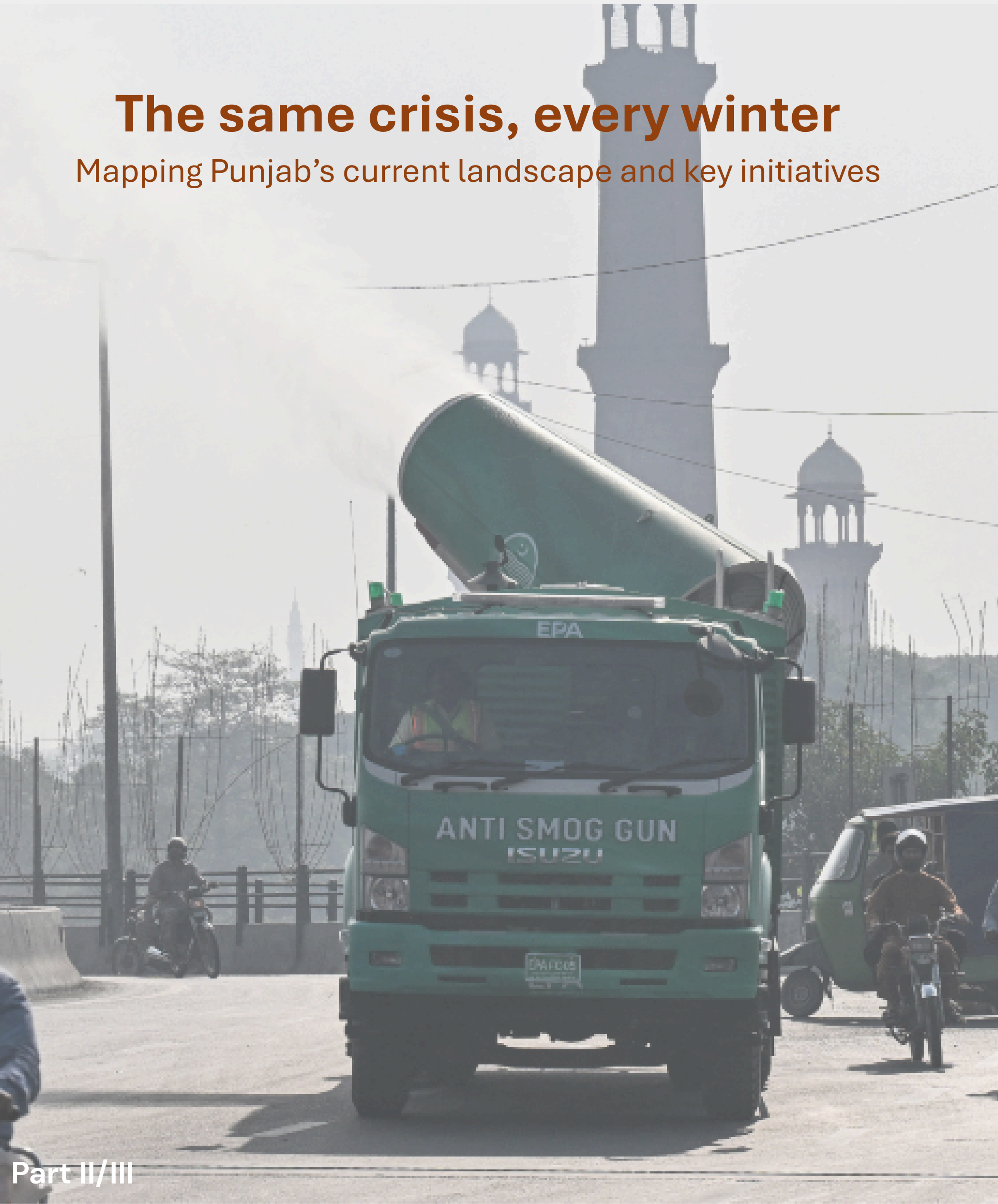
SPHERE
Driving development through data

October 2026

The same crisis, every winter

Mapping Punjab’s current landscape and key initiatives



Part II/III

Acronyms

Abbreviation	Full Form
AQI	Air Quality Index
BS-VI	Bharat Stage VI (vehicle emissions standard)
EPA	Environmental Protection Agency
EP&CCD	Environment Protection & Climate Change Department
EVs	Electric Vehicles
FIR(s)	First Information Report(s)
GRAP	Graded Response Action Plan
LPG	Liquefied Petroleum Gas
MW	Megawatts
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
P&D	Planning & Development Board
PAQI	Pakistan Air Quality Initiative
PCAA	Atmospheric Environmental Contingency Program
PDMA	Provincial Disaster Management Authority
PPP	Public-Private Partnership
PM2.5 / PM10	Particulate Matter 2.5 / 10
PSCA	Punjab Safe Cities Authority
PVICS	Private Vehicle Inspection and Certification System
QR	Quick Response
Rs	Rupees
SO_2	Sulfur Dioxide
VICS	Vehicle Inspection and Certification System
WMCs	Waste Management Companies





Part II/III at a glance

The first installment in this series established what smog is and traced its principal causes within Punjab, Pakistan, from vehicular and industrial emissions to brick kilns and crop residue burning. It went on to examine the toll smog takes on public health, community well-being, and the surrounding environment, drawing on both local data and international research. Building on that foundation, this second installment turns to the response: it examines how relevant authorities in Pakistan have moved to address the smog crisis, from regulatory enforcement and legal interventions to on-the-ground mitigation efforts, and asks how these measures hold up against strategies that have been tried, and in some cases abandoned, in other smog-affected cities around the world.

The brief follows the following structure:

Institutional Responsibility



Core Measures



Zig Zag Kilns



Anti Smog Guns

Global Best Practices



Beijing, China



New Delhi, India



Mexico City, Mexico

Institutional responsibilities

Mapping the response to the crisis: political leadership, lead agencies, and supporting agencies along with key policies and action plans.

Political leadership

Government of Punjab

↓

Lead agencies

Environmental Protection & Climate Change Department (EP&CCD):
Owns the Punjab Smog Control Policy (2017) and Clean Air Action Plan (2023), runs the control rooms, and coordinates enforcement across all other departments

Environmental Protection Agency (EPA) Punjab:
The operational enforcement arm which oversees field inspections, sealing orders, anti-smog squads, and the Smog Control Room

Planning & Development Board (P&D):
Runs the Smog Monitoring Unit and the public AQI dashboard, and coordinates data across sectors

Provincial Disaster Management Authority (PDMA):
Steps in as a coordinating body once smog is treated as an emergency

↓

Enforcement & supporting agencies

Punjab Safe Cities Authority (PSCA):
Camera-based detection of smoke-emitting vehicles and industries

Traffic Police and Punjab Highway Patrol:
Vehicle and kiln enforcement on the ground

Home Department/Police:
Registers FIRs against violators

District Administration/Deputy Commissioners:
Co-chair district anti-smog committees and run Quick Response Centers (currently active in 16 districts)

Waste Management Company (WMCs):
Dry sweeping and dust suppression on city roads

Key Polices and Actions

1 The Punjab Smog Control Policy 2017:

The first formal framework created by the Government of Punjab to manage severe winter air pollution

2 Punjab National Calamities Act 2020:

Smog was formally declared a provincial "Calamity" under the Punjab National Calamities Act, 1958, in 2020

3 Smog Monitoring Unit:

It is a specialized government entity established under the P&D in Punjab, Pakistan, to oversee, coordinate, and implement the province's response.

4 Punjab Smog Mitigation Strategy 2024-25:

It is a comprehensive action plan targeting transport, industry, agriculture, and urban dust to combat severe air pollution.

5 Clean Air Action Plan 2023:

The provincial framework and strategy launched in April 2023 to tackle severe air pollution and winter smog across Punjab

Current Landscape

What is Punjab Doing?

Core measures

1.

Crop burning bans



Punjab bans crop residue burning each autumn, backed by Section 144 and the 2023 Punjab Smog Rules, with fines now reported at Rs 200,000 per acre. Enforcement focuses on post-rice-harvest weeks through police and anti-smog squads.

In 2025, 1,284 cases were registered by 11 November, but field reports found gaps in monitoring and enforcement. The government reported a 70% decline in burning, but no baseline, method, or satellite data was published to independently verify it.

2.

Smog alert and emergency system



Punjab's smog response has evolved into a standing system, with AQI triggers, a Smog Monitoring Unit, a Cabinet Committee, and PDMA. At severe pollution levels, measures include school closures, traffic cuts, industry restrictions, and construction bans. Implementation has often been reactive. The system mainly protects people during peak pollution rather than reducing emissions beforehand, while AQI monitoring may miss night-time peaks.

3.

Plastic bag bans



The Lahore High Court directed EPA to enforce a complete ban on plastic bags under the Pakistan Environmental Protection Act, 1997. It was phased ito begin with large departmental stores and extending to retailers and vendors, with over 25,000 "Plastic-Free Shop" pledges secured as the policy took hold.

**Source: Lahore High Court judgment, W.P. No.227807/2018*

4.

Vehicle emission control



Punjab runs vehicle emissions testing through two tracks: VICS for public and commercial vehicles, a PPP with a Swedish firm rolling out to 39 stations provincewide, and PVICS for private cars, newly mandatory under the anti-smog campaign with enforcement starting October 15, 2026. Private car testing kicks in by engine size, five to seven years after registration, then annually after that. The test itself is quick, focused mainly on tailpipe emissions, with QR-based certification. A failed test means repair and re-inspection, not an outright road ban.

5.

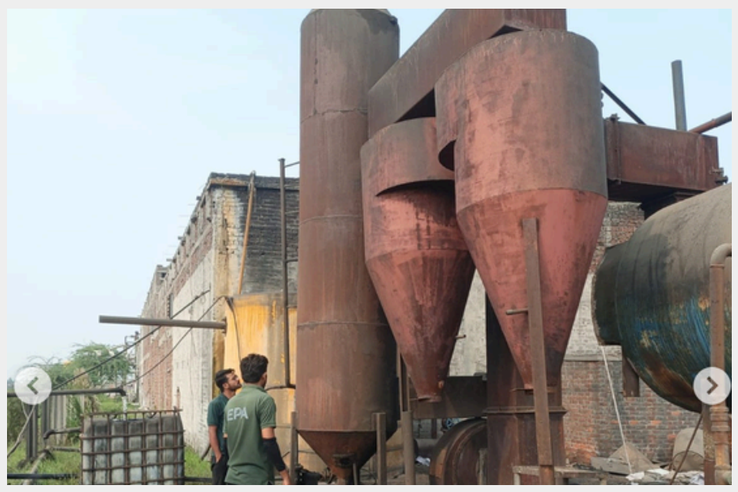
Demolition of illegal pyrolysis plants



Pyrolysis plants are illegal units converting old tyres into fuel for industrial use and were identified as a major smog source. The Court ordered coordinated demolition campaigns, including 19 plants demolished in Sheikhupura and another 19 in Gujranwala, alongside 104 police raids, 4 sealed warehouses, and 102 criminal cases registered against factories using tyre-fuel illegally. Power utilities were also directed to disconnect electricity to illegally operating units during smog season.

6.

Industrial dry scrubbers



Industries, particularly steel re-rolling mills, were ordered to install dry scrubbers capable of removing 90-99% of particulate matter and 90-95% of sulphur dioxide from emissions. At least 223 industries were sealed in 2021 for emitting hazardous pollutants. A final compliance inspection covering 659 industrial units found 499 had installed and operationalized the required pollution control devices, with 20 units found non-compliant.

7.

Zig-zag brick kiln conversion



Punjab has directed the conversion of brick kilns to zig-zag technology, which can reduce PM2.5 and black carbon emissions when properly built and operated.

High conversion costs and limited verification remain key barriers, with promised financial support reportedly unpaid in some areas.

The technology has strong evidence behind it, but Punjab mainly tracks conversion, not whether kilns are correctly built and operated.

**Source: Lahore High Court judgment, W.P. No.227807/2018*

What is a zigzag brick kiln: How it is achieved in practice

Converting a traditional kiln involves reshaping the outer structure from circular to rectangular, thickening the walls from 9 inches to as much as 36 inches to withstand blower pressure, and installing blowers that control smoke flow and extend flue gas retention inside the kiln for more complete combustion. Some kilns require nearly six times the original brick count to rebuild, and the process typically takes two to three months, during which the kiln often has to stop operating entirely.

Properly converted kilns reportedly see about a **25%** production increase alongside a **30%** reduction in overall carbon emissions

**Accroding to an analysis conducted by tThe Friday Times*

The most widely known initiative

The Anti-smog gun: most visible among others

The community recognises this initiative most widely due to its conspicuous nature and its operations in the city centre. The Punjab Government introduced anti-smog guns in October 2025 under the direction of Chief Minister Maryam Nawaz Sharif as part of its broader smog mitigation strategy. Initially, 15 locally manufactured anti-smog guns were deployed in Lahore, with additional units under production. Each unit is mounted on a vehicle carrying a 16,000-litre water tank and is equipped with a water purification system.



Mechanism: How it works

The guns spray a high-pressure fine water mist (microscopic droplets) up to approximately 100 metres into the air.

These droplets capture suspended dust and particulate matter, namely PM10, causing them to settle on the ground and temporarily improving local air quality.

The technology is primarily effective for suppressing road dust and construction-related particulate pollution, providing short-term localized relief rather than eliminating the underlying sources of smog.

Following the introduction of the technology, the Punjab EPA conducted its first field trial in Kahna, Lahore, where officials reported:

According to the Government of Punjab, the Air Quality Index (AQI) decreased from 667 to 170 representing an approximately 70% reduction during the localized spraying operation.

Based on these results, the provincial government announced plans to deploy anti-smog guns in other high-risk urban areas as part of Punjab's seasonal smog control measures.

Limitations

However, environmental experts note that while anti-smog guns can temporarily reduce airborne dust in specific locations, they are not a long-term solution for PM2.5 pollution. This was also noted that these measures cut particulate levels by about half within 20 metres but had little effect beyond about 200 metres.

Secondly, the use of anti-smog guns has raised concerns about water sustainability.

Operating 15 units could consume

Over 5.4 million litres of water per day

placing additional pressure on Lahore's already declining groundwater reserves, as estimated by the founder of Pakistan Air Quality Initiative (PAQI)

$PM_{2.5}$ originates from

- Vehicle emissions
- Industrial activities
- Crop residue burning
- Other continuous emission sources

"The question then becomes: why invest in a solution that does not address the root causes of smog?" - Founder PAQI

Enforcement and monitoring

Enforcement actions

The Punjab EP&CCD has enforced strict fines on violators burning garbage, crop residue, and industrial waste. To control the violations FIRs have been registered against violators and fines have been imposed. These enforcement actions ensure that burning violations are avoided and kept under a strict check. More recently, these enforcement have been extended to brick kilns as well through targeted field interventions by district environmental protection forces.



The key enforcement actions include:

Rs 711 million
total fines imposed on environmental violators

4,000 FIRs
officially registered against individuals and industries

2,575
illegal units completely demolished for severe compliance failures

45,736
inspections specifically targeted at the brick kiln sector

2,500
facilities sealed, including factories, kilns, and commercial units

10
hotspots mapped and interventions applied to control SMOG

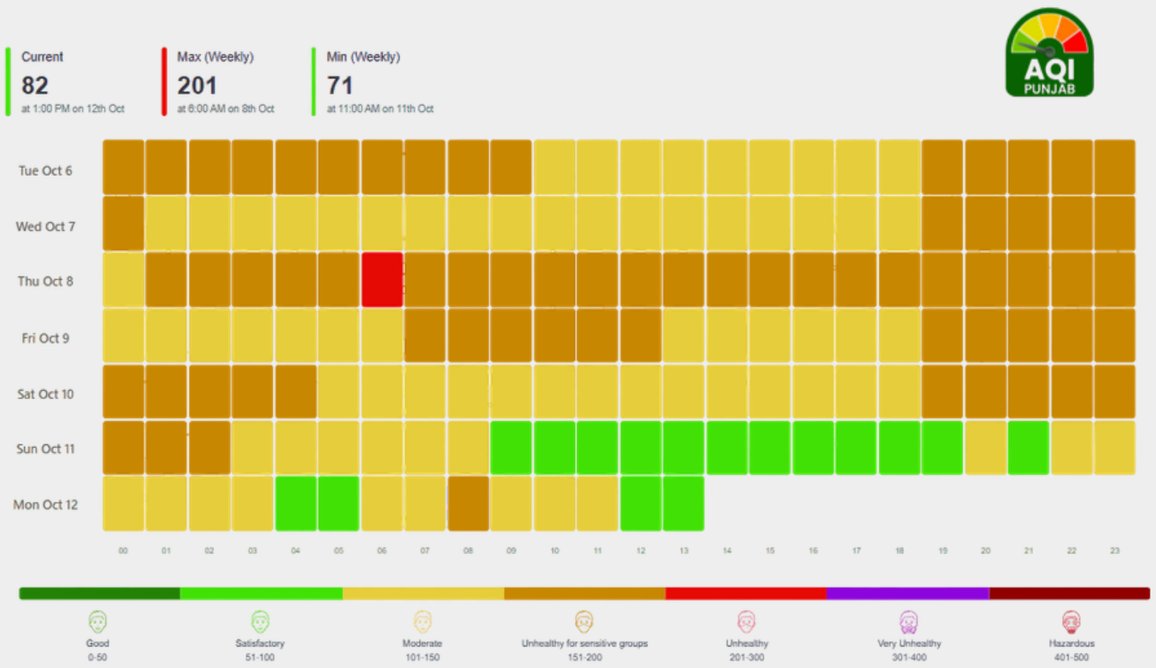
Regular monitoring

Regular monitoring of AQI has been expanded across all district of Punjab through live data systems. The data on AQI has also been made publicly accessible through WhatsApp and the AQI Dashboard.

A designated helpline has been establised to help report burning violations, and visible black smoke from factories and car.

Helpline 1373





Global smog control & prevention strategies

How are comparable regions tackling smog; are strategies working?

BEIJING

Beijing’s severe smog problem intensified significantly following rapid economic growth and industrialization in the late 1990s and early 2000s, peaking during an “airpocalypse” crisis in January 2013 when PM2.5 readings soared to over 20 times World Health Organization safety limits.

Before



After



Primary air pollution sources:

Coal combustion (power & heating), motor vehicle emissions, and heavy regional industrial transport across Beijing-Tianjin- Hebei.

Strategic paradigm

Long-term 5-year plans with legally binding targets tied directly to official promotion evaluations ("One Microgram" Campaign).

Key policy interventions

Coal elimination:
Shut 4 power plants; upgraded 27.3k MW boilers; switched 900k homes from coal to gas/electricity.

Industrial shutdowns:
Closed 1,992 large factories & 11,000 small polluting units permanently.

Vehicle restrictions:
Phase-out of 2.16M old vehicles; deployed 400,000+ EVs; enforced National VI standards.

Outcome

Beijing successfully transformed its air quality by cutting fine particle pollution (PM2.5) by **35%**, proving that severe urban smog can be systematically solved through aggressive intervention, according to a research study conducted by the Beijing Municipal Environmental Protection Bureau and the National Natural Science Foundation of China.

Anti-smog gun drew criticism and scrutiny

China's anti-smog guns drew significant criticism and scrutiny rather than acceptance as an effective solution, most visibly in Zhengzhou. Scientists argued the mist spraying did little to reduce PM2.5, the fine particulate matter actually responsible for respiratory illness and lung cancer, since it mainly settled larger dust particles rather than the microscopic pollutants driving health harm. Environmental academics went further, calling it "fake environmentalism," a visible but superficial fix that sidestepped the harder work of tackling pollution at its source. The practice was also costly and resource-intensive for a city already water-stressed: Zhengzhou was diverting over 2% of its freshwater supply, sourced almost entirely from the South-North Water Transfer Project, to fund an effort costing roughly 107,000 yuan a day, with officials and media even disputing how much water was actually being used. Together, these concerns pushed Chinese authorities toward abandoning the guns in favor of source-control measures, like banning coal-fired plants and removing high-emission vehicles, rather than continuing a measure widely seen as a cosmetic response.

**All facts and figures have been cited in the references section*

NEW DELHI

New Delhi faces a similar winter smog crisis each year when routine industrial, vehicular, and agricultural emissions collide with stagnant winter weather. Cold, stagnant air acts as a natural trap, locking dangerous PM2.5 particles close to the ground and causing pollution levels to surge by over 200%. Despite enforcing strict temporary bans, air pollution levels still spike massively during the colder months.

Before **After**



Primary air pollution sources:

Vehicular emissions (35%), industrial emissions (28%), crop residue burning (10–50% peak seasonal), construction dust, and coal units are the main sources of air pollution.

Strategic paradigm

Reactive emergency management triggered by AQI thresholds via Graded Response Action Plan (GRAP Stages I–IV).

The emergency plan (GRAP) and its limitation

What is GRAP?

The Graded Response Action Plan (GRAP Stages I-V) triggers emergency actions when air quality drops. This includes odd-even driving schemes, school closures, truck bans, and halting construction.

Why it is falling short?

Winter stagnation (calm winds and cold traps) completely overrides these efforts. Even after enforcing these strict emergency measures, PM2.5 levels still rise by 8% because the stagnant winter air keeps the pollution trapped close to the ground. Overall, winter sees a +220% surge in PM2.5.

Outcome

Peak smog reductions observed temporarily only. PM2.5 rises ~**8%** post GRAP enforcement, according to a study published in Springer Nature.

Long-term policies and controversial fixes

Agricultural changes

The government offers 80% machinery subsidies (like the "Happy Seeder"), promotes zero-tillage farming, and uses bio-decomposers to stop farmers from burning crops.

Structural upgrades

Permanent changes include closing the Badarpur coal plant, rolling out cleaner BS-VI fuel, and banning dirty fuels like petcoke and furnace oil.

The "Band-Aid" fix

The city has deployed around 200 anti-smog guns. However, this strategy is highly contested. Research shows these water sprayers actually raise humidity, which can unintentionally increase PM2.5 levels by up to 13%.

Anti-smog gun drew criticism and scrutiny

150-200 anti smog guns deployed but the machines only temporarily reduced PM2.5 from over 500 to around 160 µg/m^3. Settled particles were later re-suspended by sunlight and wind, producing a "double pollution" effect. Environmental groups have been blunt about it: the Center for Science and Environment called it "a temporary local measure, not a long-lasting solution," and Greenpeace dismissed it as "tokenism and symbolism" rather than a real fix. Even the manufacturer, Cloud Tech, has conceded the device is meant for "instant relief and not a long-term solution."

**All facts and figures have been cited in the references section*

MEXICO CITY

Mexico City's unique high-altitude basin topography historically trapped severe emissions, making it one of the most polluted cities in the world. To combat this crisis, the city implemented a strategic dual paradigm combining ProAire (25+ years of continuous long-term planning) with the PCAA, which primarily refers to the 'Programa de Contingencias Ambientales Atmosféricas' translating to Atmospheric Environmental Contingency Program.



Primary air pollution sources:

Vehicles (80% of NOx) emissions, Solvents and LPG Leakages account for 57% of PM10 and industrial fuel contributes to 47% of SO_2.

Strategic paradigm

Integrated dual approach: 25+ years of continuous planning (ProAire) paired with mandatory emergency alerts (PCAA). Mexico City has been tackling severe air pollution through a multi-layered strategy with three main components:

ProAir (1995 to Present)

A long-term strategic programme with four phases covering energy, public transport, technology, environmental education, and green areas. It reduced dangerous pollution days from 344 in 1994 to 118 in 2012.

PCAA (Environmental Alerts)

An emergency system activated when ozone exceeds 155 ppb, which imposes: (a) driving restrictions on ~50% of private vehicles, and (b) industrial curbs requiring 40-50% emission reductions from thermoelectric plants, brick kilns, and factories. This reduced ozone by 75%, SO_2 by 71%, and respiratory emergency visits by 56%.

Speed Limits (2015)

Lowering speed limits on main roads (70→50 km/h) with speed cameras, which improved NO_2 and PM2.5 levels.

Outcome

High-pollution days reduced significantly (from **344** to **118**), according to the Centre for Public Impact. PCAA industrial cuts reduced hospital visits by **56%** and SO_2 levels reduced by **71%**, according to a study published in Journal of Environmental Economics and Management.

Key interventions

Industrial curbs (PCAA)

40-50% mandatory emission cuts from industry gave largest short-term results:
SO_2 ↓71%, ozone ↓75%, hospital visits ↓56%

ProAire (long-term planning)

25+ years of sustained, multi-sector planning gave lasting improvement pollution days ↓66%

Speed limits

Lower speeds reduced NO_2 and PM2.5 unexpected co-benefit

Volatile Organic Compound (VOC) control

Modelling shows 40% VOC reduction = 16% ozone reduction but this is NOT yet implemented

**All facts and figures have been cited in the references section*

QUESTION ?

What could Punjab do better to avoid the long term implications of smog?

Stay tuned as we share the practical recommendations Punjab can adopt along with the cost implications of tackling SMOG.

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This report reflects the independent research conducted by the team at SPHERE Consulting. All facts and figures have been taken from the official newspaper articles and research papers.

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