SPHERE
Driving development through data

October 2026

The same crisis, every winter

Understanding Punjab’s recurring smog problem



Part I/III

Acronyms

Abbreviation	Full Form
AQI	Air Quality Index
COVID-19	Coronavirus Disease 2019
EPA	Environmental Protection Agency
ICG	International Growth Center
NOx	Nitrogen Oxides
O3	Ozone
PM2.5 / PM10	Particulate Matter 2.5 / 10
UV	Ultraviolet
VOCs	Volatile Organic Compounds
WHO	World Health Organisation



Background

Air pollution in Pakistan has been a massive concern for decades. The population increases significantly each year, placing burdens on the existing infrastructure and skyrocketing the demands for energy and agriculture.

Air pollution in Punjab, Pakistan, is a deeply complex issue shaped by multiple contributing factors. Punjab spans both Pakistan and India, enabling pollution to cross the border freely, which makes accountability for its causes and solutions even harder to pin down. Punjab is an agriculture-intensive province whose crop-burning practices on both sides of the border have significantly contributed to air pollution. Several cities of Punjab have recorded extremely dangerous levels of air quality index over the last few years. Specifically, Lahore has consistently experienced the worst air quality records in the world due to an increasing population and its consequent demand for increased urbanization, vehicles, and industrial practices. These factors combined have ranked Lahore as the worst city to live in, as it consistently puts public health at a disadvantage. Multan comes next, having on occasion surpassed even Lahore's AQI, followed by Gujranwala, Faisalabad, and Bahawalpur. Vulnerable segments of the population, namely the elderly, children, and unhealthy people with pre-existing health conditions, are at a higher disadvantage. Moreover, the air quality drastically drops in colder months, which follow the monsoon season, i.e., the crop burning season, and the fog traps the air pollutants close to the ground, forming 'smog' which is the thick, hazy layer of air pollution.

City of Punjab	Highest Recorded AQI
Multan	2,135
Lahore	1,900
Faisalabad	1,037
Gujranwala	762
Bahawalpur	469

**All AQI records are from 2024 and 2025 and have been taken from the official data of Punjab Environmental Protection Department and IQAir records.*





The Lahore issue

Lahore, Pakistan, the capital of the province of Punjab, is one of the most urbanized cities in the South Asian region. However, Lahore has been experiencing a record high of worst air quality in the world for the past couple of years. The records show that,

Air Quality Index (AQI) crossed over 600 and went up to 1,900 in the winter months of 2025, according to IQAir, a Swiss company that monitors air quality around the world

The US Environment Protection Agency classifies a situation with an AQI of 300 and above as 'hazardous'.



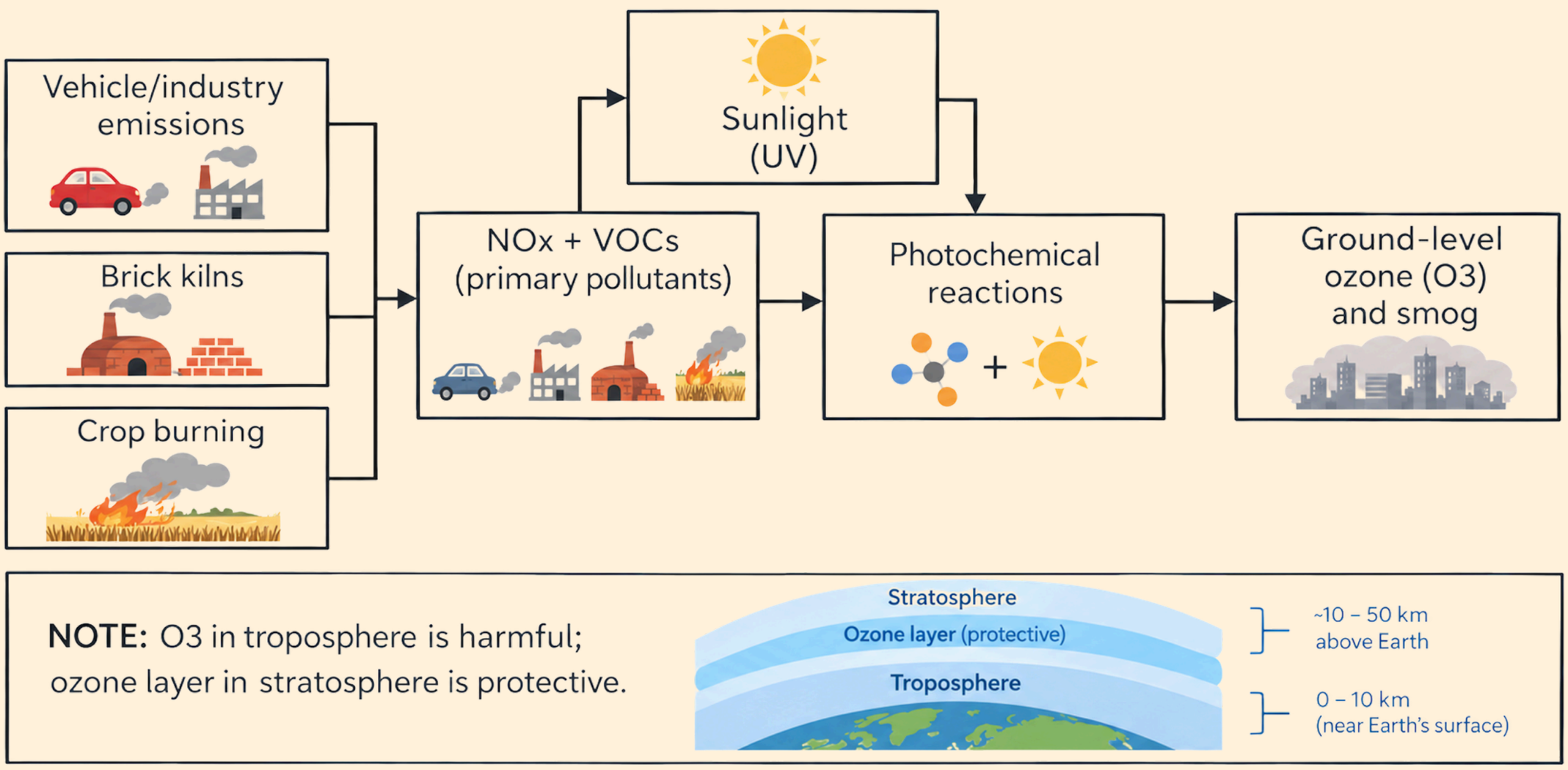
What is SMOG?

In simple terms, smog is the mixture of smoke and fog that forms a thick layer close to the ground. According to Airly, “Smog forms when pollutants released into the atmosphere interact with environmental conditions.”



How is smog formed?

Smog formation begins with three main sources of primary pollutants: vehicle and industry emissions, brick kilns, and crop burning. These sources release nitrogen oxides (NOx) and volatile organic compounds (VOCs) into the air, which then react with sunlight, specifically ultraviolet (UV) radiation, in a process known as photochemical reaction. This reaction produces ground-level ozone (O3), the key component of smog. It is important to distinguish this harmful ground-level ozone from the protective ozone layer found much higher in the atmosphere. The ozone that contributes to smog forms in the troposphere, the layer closest to Earth's surface (0 to 10 km above ground), whereas the ozone layer that shields the planet from harmful UV radiation sits in the stratosphere, roughly 10 to 50 km above Earth. In other words, the same gas that protects life at high altitude becomes a health hazard when it forms at ground level.



Primary contributors, as reported in the Lahore High Court judgment

In August 2026, the Lahore High Court delivered its final judgment in an eight-year public interest litigation case, Haroon Farooq vs. Government of the Punjab, which directed Punjab's government departments to take concrete, verifiable action against smog and broader environmental degradation. The ruling documents the contribution of various pollution sources to Punjab's air quality crisis, drawing on data reported by the Environment Protection Department, Punjab, the Japan International Cooperation Agency, and other bodies over the course of the proceedings. The table summarizes these reported contributions.

Source	Reported share	Cited Source
Vehicular/transport emissions	**43%** of overall ambient air pollution load in Lahore	EPD Punjab & JICA
Industrial emissions	**25-30%** of overall ambient air pollution load in Lahore	EPD Punjab & JICA
Crop residue burning	**20-30%** of PM2.5 concentrations in Punjab during smog season	Journal of Atmospheric Pollution
Brick kilns	**18-22%** of Lahore's ambient PM2.5 pollution	EPD Punjab & JICA

The role of crop burning: The Punjab context

Crop burning, particularly of rice residue, is arguably one of the biggest drivers of smog formation. Punjab's economy is largely agricultural, earning it the title of "bread basket" for both Pakistan and India.

- Rice is a highly water-intensive crop, with plantation typically following the wheat harvest in June.
- To meet the crop's water demands, farmers rely heavily on tubewells and other sources that draw from the water table.
- To promote more sustainable water use, the government has decided to shift rice plantation to the monsoon season, when heavy rainfall can meet water requirements naturally.



The timing issue and its consequences

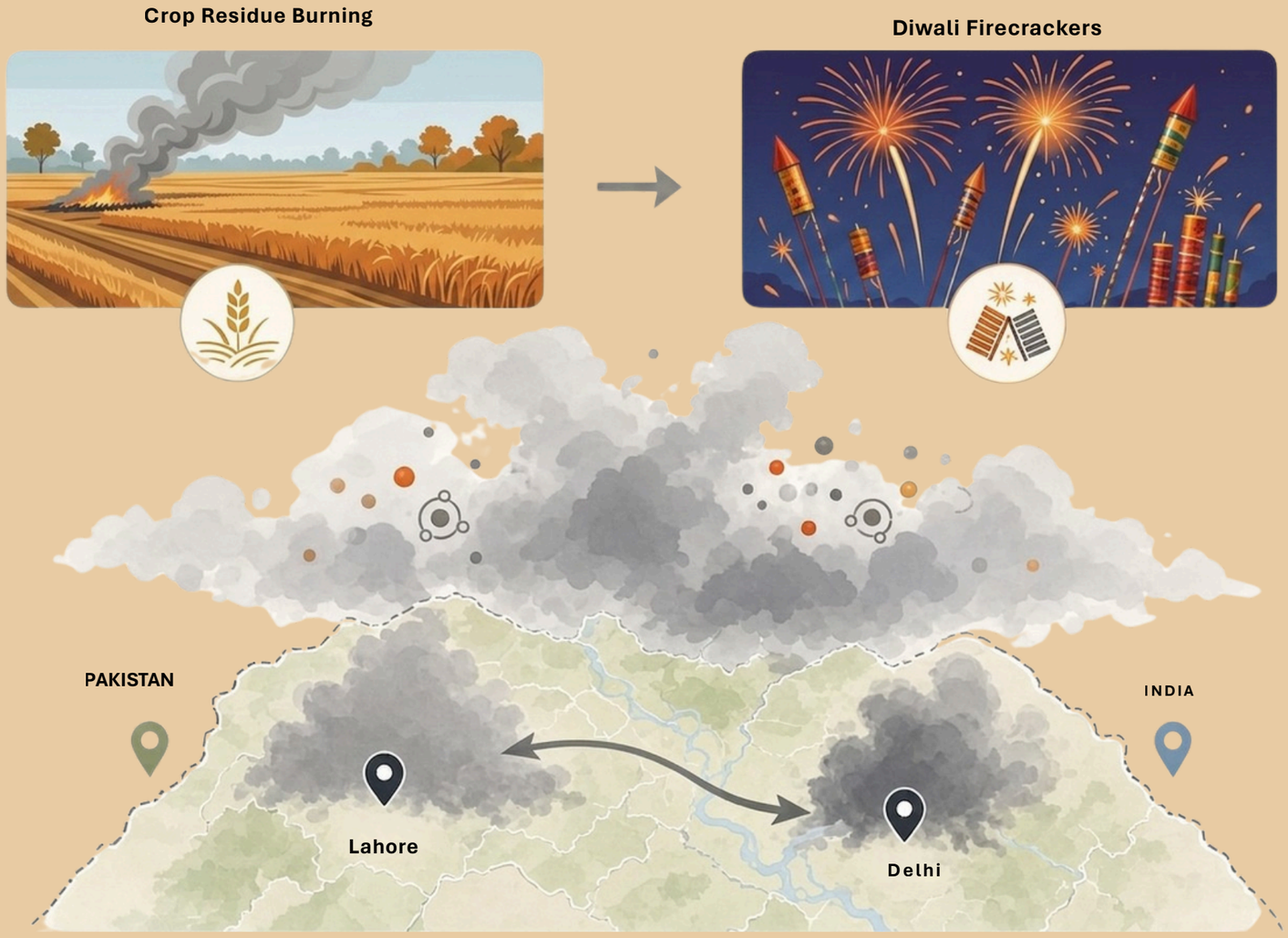


The issue with this practice is that the harvest time is delayed until the latter half of the year which is September/October that marks the end of the monsoon season.

- Low wind speeds and high atmospheric moisture content mark this time. This leaves farmers less time to prepare their fields for their next sugarcane crop plantation.
- In preparation for the next plantation, the easiest way get rid of the rice residue, which is the leftover part of the rice crop, is to burn it.
- Therefore, farmers burn rice residue to conserve time and economic resources. This burning of crops, along with environmental influences such as low wind speeds, causes the emissions to be trapped in the atmosphere, eventually forming smog.

Additional contributing factors: The transboundary aspect

This plantation season is also followed by the Diwali occasion in India, which is characterized by widespread celebrations with the burning of firecrackers, which also deteriorates the air quality by increasing fine particle concentrations in the air. This is accompanied by crop burning in the agricultural parts of Indian Punjab. Therefore, transboundary emissions exacerbate the issue of smog across both regions.



Environmental Impact



Smog damages vegetation by hindering the process of photosynthesis.



Interference with photosynthesis stunts plant growth and damages aquatic cycles further disrupting the ecosystems and threatening local biodiversity



Air pollution in different areas of Punjab remains consistently high due to high concentrations of fine particles (PM2.5), and the more coarse, inhalable particles (PM10), nitrogen oxides and sulfur dioxides



Smog formation acidifies rain, dehydrates and degrades soil, and introduces toxins to aquatic animals and other microorganisms



Photochemical reactions that form smog also produce ground-level ozone (O3), which is harmful to plant tissue and further degrades air quality, unlike the protective ozone layer in the stratosphere.

Exposure to high smog levels can reduce yields of wheat, soybeans, rice, corn, and potatoes by

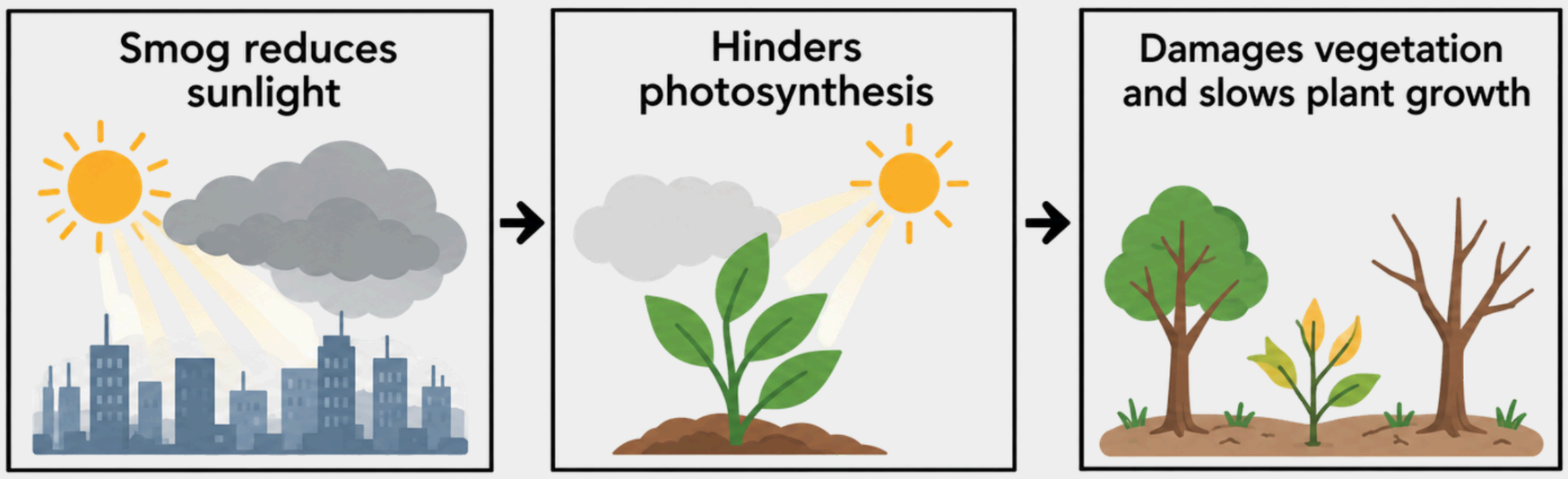
10-40%

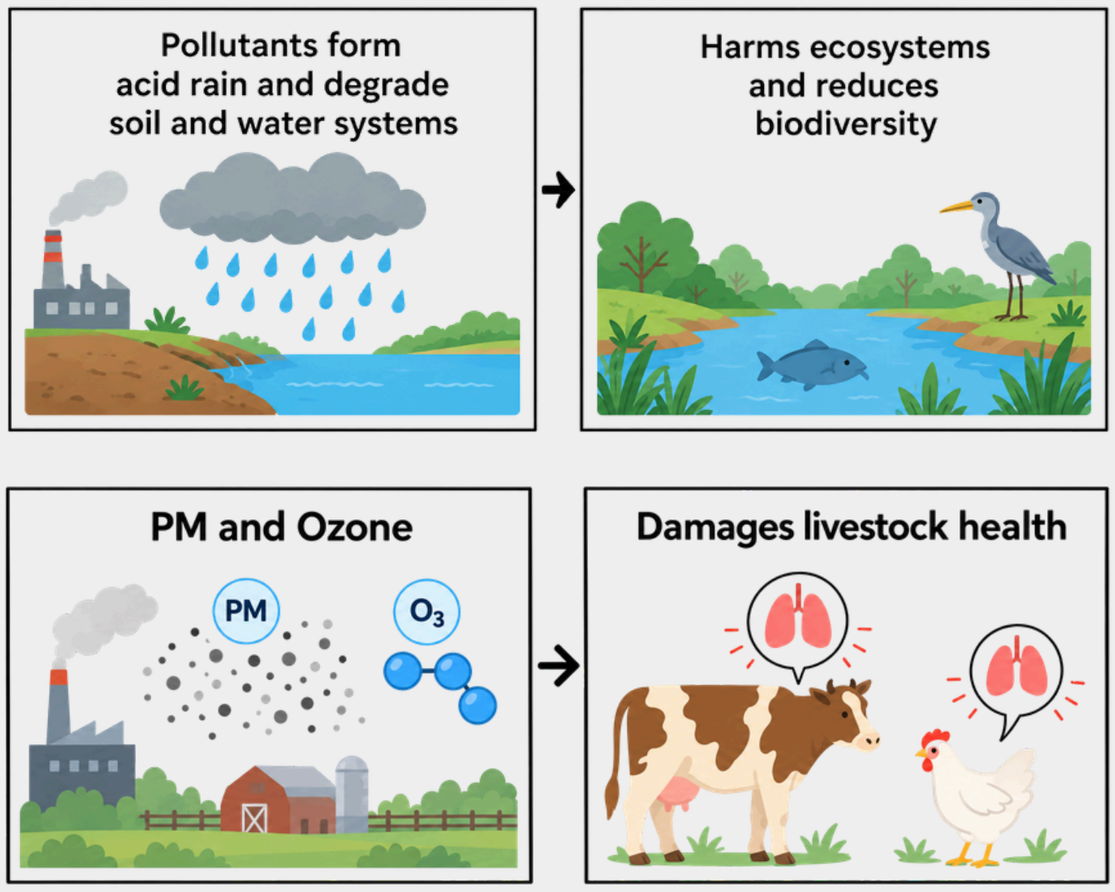
**Superior University*

Wheat, Pakistan's primary winter staple, shows an estimated yield loss of

10-30%

**NUST Journal of Social Sciences and Humanities*





Health Impact

Smog in Punjab creates additional risks due to the prolonged presence of harmful pollutants, including fine particles (PM2.5), and more coarse, inhalable particles (PM10), carbon monoxide, nitrogen oxides, sulfur dioxide and ozone (O_3). Nitrogen oxides can weaken the body's natural defence against respiratory infections, while PM2.5, PM10 and ozone can further reduce immunity and increase susceptibility to respiratory diseases.

According to World Health Organisation (WHO), air pollution causes;

7 million premature deaths globally

According to Our World in Data, ambient air pollution causes;

4.2 million deaths globally

Therefore, smog does not only carry environmental implications but is also a growing public health concern that demands greater awareness and collective and preventive action.

Respiratory health and immunity

- Asthma exacerbation
- Respiratory infections
- Allergies

Cardiovascular health

- Stroke
- Cardiovascular disease

'Pink eye' and other complications

- Eye irritation
- Cancer risk

Vulnerable groups

- Children and elderly at higher risk
- Blood pressure increase in children

Reduced life expectancy in Lahore

Lahore's air pollution could reduce life expectancy by

7-7.5 years

**according to International Growth Center (IGC)*

Increased mortality

- Road accidents from low visibility
- Premature deaths from long-term exposure

Social Impact

Along with environmental and health impacts, smog also has social consequences. It not only affects life expectancy and mortality rate in the region but also hinders with the daily lives of the people.

Smog disrupts daily life for people in certain occupations and areas across Punjab's cities, particularly those working in the automobile, manufacturing, and pharmaceutical sectors. On days when visibility drops to near zero, commutes become difficult, traffic jams and road crashes increase, and daily routines are disrupted. In the most severe cases, entire cities have gone into lockdown, hitting daily and hourly wage earners hardest, including taxi drivers, mill workers, gardeners, and cleaners, and disrupting the academic schedule at schools.





Residents have reported that smog takes a toll on their mental well-being, with many describing it as one of the biggest daily nuisances they face.



In some cases, symptoms were severe enough that people mistook them for COVID-19, when they were in fact caused by smog-related irritation.

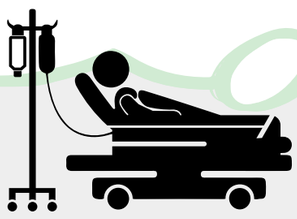


Some residents have criticized the government's inaction on smog-related issues, while others question the lack of progress in developing proper healthcare diagnoses and treatments.

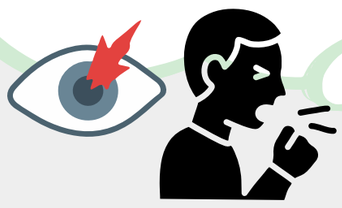
How has smog affected your life?

Voices from Lahore

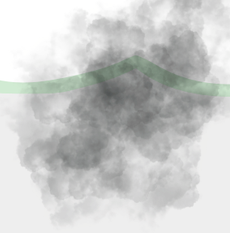
"I knew that the smog can be bad for health, but I didn't know it would be so bad that my son would be hospitalized."



"Pollution is a problem even inside the class. We see children with red eyes and irritation,others continually cough."



"When I reach home, I am always smelling of smoke; my clothes, my hair, and my hands are dirty. But what can one do? I can't sit at home. I got used to it."



QUESTION

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What is Punjab doing about smog, and is the response keeping pace with what's being done globally?

Stay tuned as we explore Punjab’s smog-control mechanisms and global practices in the next part of our series.

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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.

For questions/comments, please feel free to reach out to us at info@sphereconsulting.services

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