Pakistan Air Quality Initiative

Press release

Weather linked to 19% lower smog in Lahore this October; once the weather is accounted for, government measures and all other changes amount to 4%, finds Hawanama by the Pakistan Air Quality Initiative

Fine-particle pollution ($PM_{2.5}$) at 26 Lahore monitors fell 27% from October 2025. The weather helped: after dark, the layer of air that holds smoke near the ground was deeper than last year, so pollution could spread out. The 4% covers all other changes together, including government measures, crop burning and other sources; the data cannot tell them apart.

−27%
less $PM_{2.5}$ than in October 2025 at the same 26 sites (136 to 100 µg/m³)

−19%
the drop linked to this October's weather

−4%
the difference once the weather is accounted for

31/31
days above Pakistan's legal limit of 35 µg/m³

LAHORE, 2 November 2026. Lahore's air was cleaner in October 2026 than a year earlier, and the weather played a large part, according to an analysis of Hawanama data by the Pakistan Air Quality Initiative (PAQI).

At 26 monitoring sites that reported on the same days in both years, the average level of $PM_{2.5}$ fell from 136.3 µg/m³ in October 2025 to 100.1 µg/m³ in October 2026, a drop of 27%. Twenty-four of the 26 sites recorded a fall.

To separate the weather from everything else, PAQI built a computer model that learns how Lahore's pollution responds to the weather, using every autumn since 2018. It estimates that this October's weather lowered $PM_{2.5}$ by about 19% compared with what last October's weather would have produced. If both Octobers had the same, typical weather, the gap would be 4%.

The biggest weather difference came at night. After dark, cool air settles over the city and traps smoke and dust near the ground. This October that layer of air averaged 68 metres deep, against 43 metres a year earlier, giving pollution more room to spread. In the model it is the single largest weather factor.

Crop fires also fell. Satellites detected about a third fewer fires in Pakistani Punjab and in Indian Punjab and Haryana, and the main burning started about a week later than in 2025. Air arriving in Lahore spent more of its previous two days over India: 38% of the time, against 28% last year.

Lahore's air is still far from safe. The October average of 100 µg/m³ is nearly seven times the World Health Organization's daily guideline of 15 µg/m³, and every day of the month was above Pakistan's legal limit.

PAQI forecast: Lahore's $PM_{2.5}$ set to climb back to 149 µg/m³ by Wednesday, 49% above the October average

Monday 2 November	Tuesday 3 November	Wednesday 4 November
120 µg/m³	138 µg/m³	149 µg/m³
Unhealthy, 184 AQI	Very Unhealthy, 194 AQI	Very Unhealthy, 199 AQI
High confidence	High confidence	Medium confidence

Hawanama's PAQI forecast, issued 1 November 2026: the average of forecasts for 166 monitoring sites in Lahore, from three international air-quality models adjusted with local measurements. AQI on Pakistan EPA's index.

Lahore's nights opened up: the air layer that traps smoke was 68 metres deep, up from 43

At night, cool air settles over Lahore in a shallow layer that keeps smoke and exhaust close to the ground. The deeper this layer, the more room pollution has to spread out. In October 2026 it averaged 68 metres, well above a normal October.[1] A year earlier it was 43 metres, below normal. Wind and humidity were the same in both years.

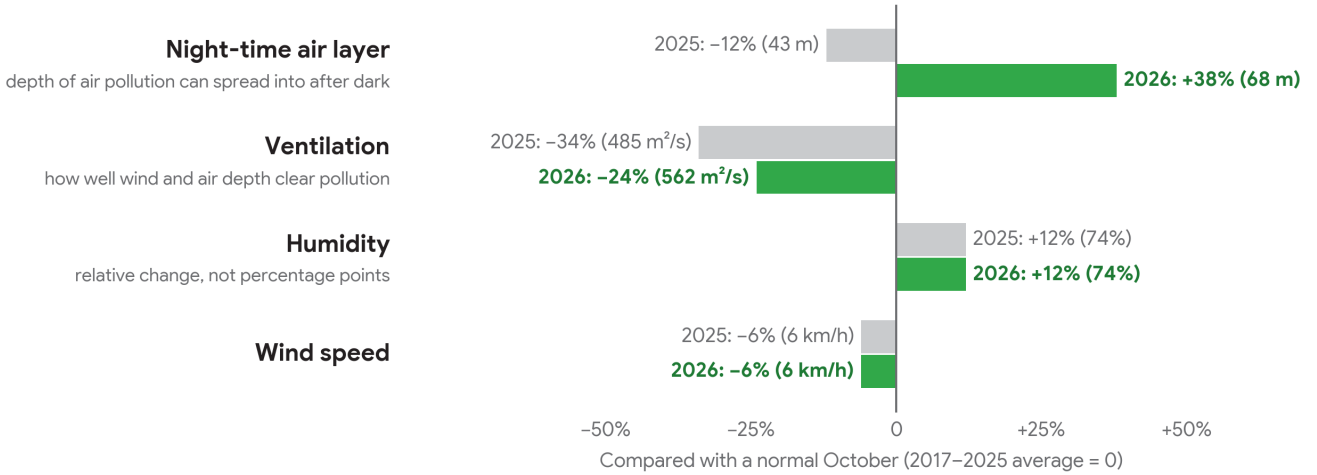


Figure 1. How Lahore's October weather compared with a normal October (2017–2025 average). Labels give each October's average. Night means 20:00 to 06:00. Source: ERA5 weather data via Open-Meteo.

68 m
depth of the night-time air layer, up from 43 m in October 2025

+16%
ventilation: how well wind and air depth can clear pollution[2]

0%
change in wind (6 km/h) and humidity (74%) between the two Octobers

The depth of the air layer was the biggest weather factor

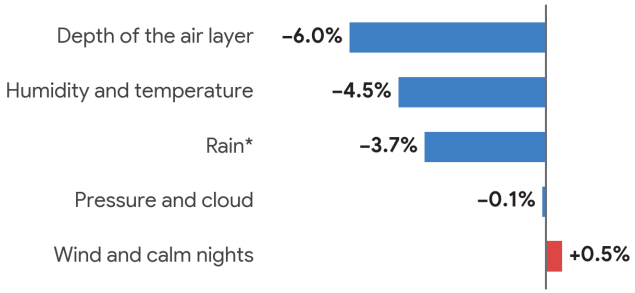


Figure 2. How much each type of weather changed this October's predicted $PM_{2.5}$, compared with last October's weather on the same dates.[3]

To see which weather mattered most, the model was re-run with one type of weather at a time switched back to last October's. The deeper air layer made the biggest difference, linked to 6% lower $PM_{2.5}$, followed by humidity and temperature (4.5%).

These effects overlap, so they do not add up to the overall 19%. Low-cost sensors read slightly higher in humid air, so part of the humidity effect may come from the sensors themselves. *The rain result does not match the rain totals and should not be read as a real effect.

Day and night, the drop held

At 29 Lahore sites with hourly readings in both years, $PM_{2.5}$ fell **22% at night** (20:00 to 06:00) and **25% in the afternoon** (11:00 to 16:00). The improvement was not limited to the night, when pollution usually builds up.

Across the border in New Delhi

Delhi saw a similar fall of 23% at 26 government monitors, almost the same at night (−22%) and in the afternoon (−22%). The same analysis links 8% lower $PM_{2.5}$ in Delhi to this October's weather.

Take the weather out of the picture and Lahore's improvement shrinks to 4%

The model answers two different questions. How much cleaner was this October because of its weather, compared with last October's weather? About 19%. How different are the two Octobers if both had the same, typical weather? About 4%. These are separate answers, not pieces of the 27% fall.[4]

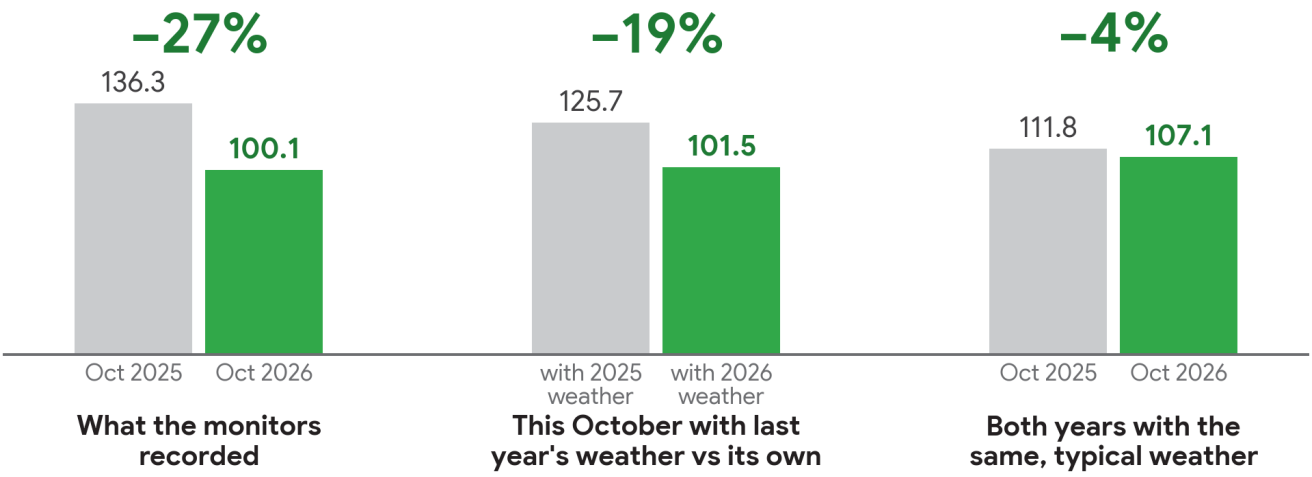


Figure 3. Lahore, 26 sites, 1–31 October, average $PM_{2.5}$ in µg/m³. Left: what the monitors recorded. Centre: this October as the model predicts it with last October's weather and with its own. Right: both Octobers predicted with the same, typical weather.

Lahore's cleanest October since 2021, 18% below the 2020–2025 average

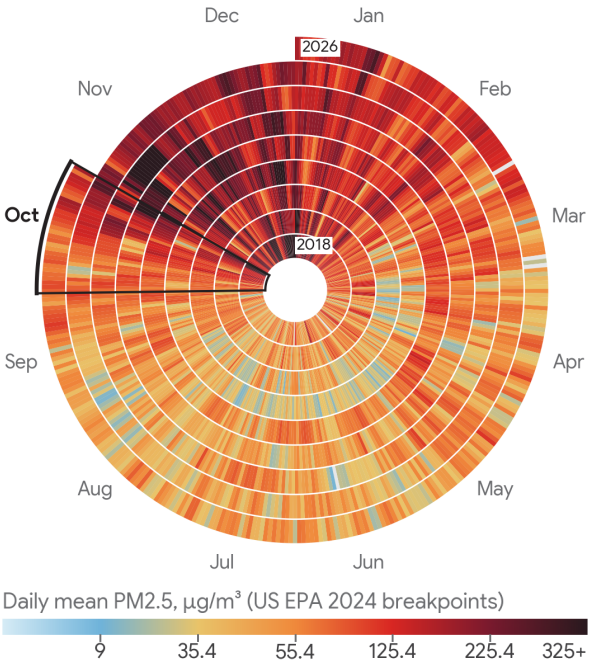


Figure 4. Every day of Lahore's $PM_{2.5}$ from 2018 to October 2026. Each ring is a year (2018 in the centre) and each thin slice a day, starting with January at the top. October is outlined. Grey: no data.

Across all its monitors, Lahore averaged 100 µg/m³ this October, against 122 µg/m³ for the Octobers of 2020 to 2025 (116, 96.5, 133, 128, 130 and 126). Only October 2021 was cleaner. The number of monitors grew from 19 to 76 over that time, so these yearly figures are a guide; the 27% headline compares the same 26 sites in both years.

31 of 31 days were above Pakistan's legal limit (35 µg/m³)

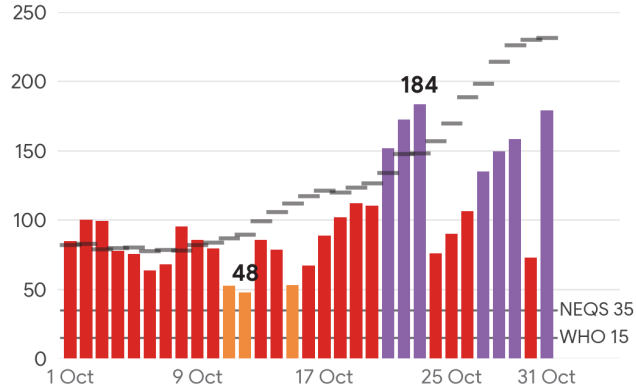


Figure 5. Lahore, October 2026, daily $PM_{2.5}$ (µg/m³). Black marks: a normal level for that date, based on earlier years. Colours: health categories as on Hawanama.

From mid-October, Lahore's air stayed below last year's on 14 of 17 days

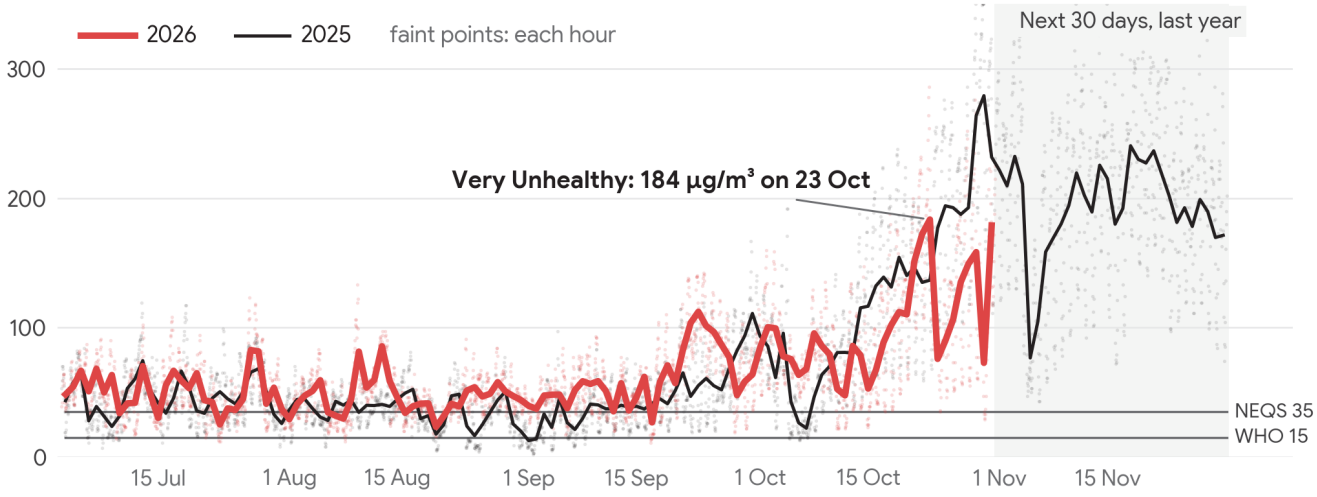


Figure 6. Lahore's daily $PM_{2.5}$ (µg/m³) since July: 2026 in red, 2025 in black. Faint points are individual hourly readings. Shaded: how the next 30 days went last year.

Crop-fire detections fell by a third, and the burning surge came a week later

−35%
fewer fire detections in Pakistani Punjab

−35%
fewer in Indian Punjab and Haryana

−24%
fewer fires close to the path of air reaching Lahore

38%
of the air's previous two days spent over India, up from 28%

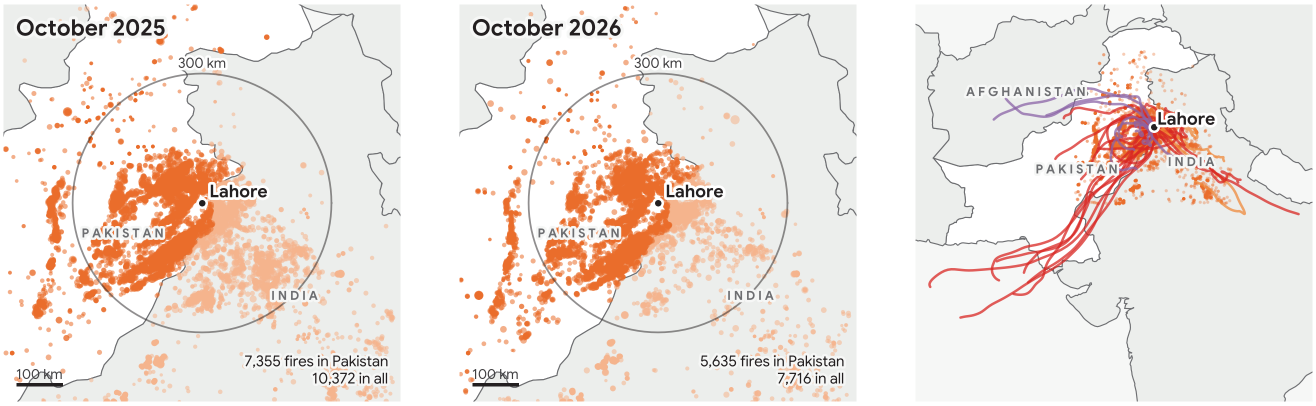
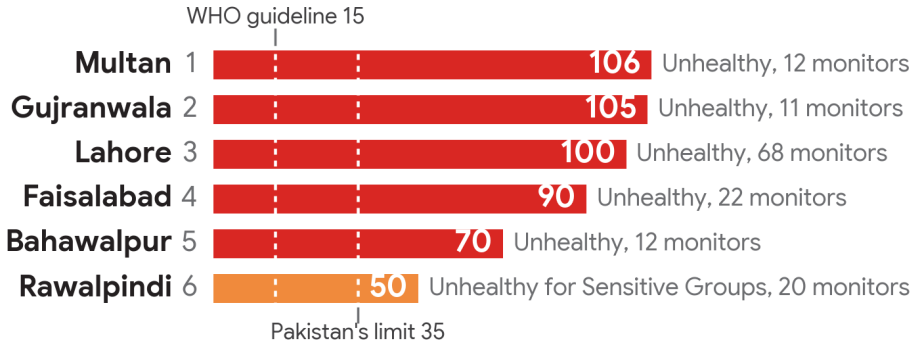


Figure 7. Left and centre: fires seen by satellite within about 460 km of Lahore, October 2025 and October 2026 (NASA FIRMS). Bigger dots are more intense fires; lighter dots are across the border; the ring marks 300 km. **Right: the path of air arriving in Lahore each day of October 2026**, traced three days back (NOAA HYSPLIT) and coloured by that day's pollution level in Lahore; faint orange: fires.

On the Pakistani side, satellites counted more than 100 fires a day on most days from 9 October in 2025, but only from 17 October in 2026, after a lull from 13 to 16 October. So part of October's fall may be burning that has shifted into November rather than less burning; November's figures are not in yet. The air paths show where Lahore's air had travelled, not how much pollution each area added. Fire counts are 1 km squares with at least one fire on a given day: 10,642 to 6,944 in Pakistani Punjab and 2,924 to 1,914 in Indian Punjab and Haryana.

Punjab's best-monitored cities: all six above the national limit



PAQI forecast

	Mon 2 Nov	Tue 3 Nov	Wed 4 Nov
Multan	121	138	**144**
Gujranwala	113	134	**145**
Lahore	120	138	**149**
Faisalabad	118	134	**151**
Bahawalpur	101	122	**120**
Rawalpindi	76	82	**90**

Figure 8. October 2026 average $PM_{2.5}$ (µg/m³) in Punjab cities with more than five monitors, and Hawanama's PAQI forecast issued 1 November. Colours: health categories as on Hawanama. Readings far below the rest of the city on the same day are treated as faulty sensors.

Multan (106 µg/m³) and Gujranwala (105) recorded higher October averages than Lahore (100), followed by Faisalabad (90) and Bahawalpur (70); Rawalpindi (50) was the cleanest. In October 2025 only Lahore and Rawalpindi had more than five monitors: Rawalpindi's average rose from 46 to 50 µg/m³ while Lahore's fell from 127 to 100. PAQI's forecast has $PM_{2.5}$ rising by Wednesday 4 November in all six cities, reaching 151 µg/m³ in Faisalabad and 149 in Lahore.

How the numbers were produced

1. **Monitoring data.** Daily averages for each monitor from the Hawanama archive, counting days with at least 18 hours of readings. The Lahore comparison uses 26 low-cost sites with readings on the same October days in both years.
2. **Punjab cities.** All monitors in each city; a reading below a quarter of the city's typical level that day is treated as a faulty sensor.
3. **Weather and model.** Hourly ERA5 weather data via Open-Meteo (27–31 October 2026 from preliminary analyses). A machine-learning model of $PM_{2.5}$ using weather, season, day of the week, the long-term trend, site and festival days, trained on September to December 2018–2025 and September to October 2026. Its uncertainty was checked by refitting it 60 times on resampled data.
4. **Fires and air paths.** NASA FIRMS satellite fire detections; NOAA HYSPLIT air paths.
5. **Forecast.** Hawanama's daily PAQI $PM_{2.5}$ forecast: ECMWF IFS, CAMS and GEOS-CF model output adjusted with local measurements.

About Hawanama and PAQI

The **Pakistan Air Quality Initiative (PAQI پاکی)** provides data-driven scientific research and advocacy for clean air in Pakistan.

Hawanama (hawanama.org) is PAQI's air-quality platform: hourly readings from more than 300 monitors in Pakistan with weather data, satellite fire detections and a daily $PM_{2.5}$ forecast.

Notes for editors

Please attribute figures to **Hawanama by the Pakistan Air Quality Initiative (PAQI)**. Data: Hawanama archive (IQAir AirVisual sensors; Punjab EPA); Delhi CPCB, DPCC and IMD; ERA5 via Open-Meteo; NASA FIRMS; NOAA HYSPLIT.

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Notes on the calculations

[1] **Compared with a normal October (Figure 1).** Each October's average from hourly ERA5 data is compared with the average of the nine Octobers 2017 to 2025: (October average ÷ 2017–2025 average − 1) × 100. The night-time air layer (boundary-layer or mixing height) averages 20:00 to 06:00; 68 m against a normal of about 49 m gives +38%. Ventilation is that height multiplied by wind speed (m²/s). Humidity: 74% is 12% above a normal of about 66%, not 12 percentage points.

[2] **Change from October 2025 to October 2026.** (2026 value ÷ 2025 value − 1) × 100; for ventilation 562 ÷ 485 − 1 = +16%. Values are calculated before rounding.

[3] **One type of weather at a time (Figure 2).** (predicted October 2026 $PM_{2.5}$ with all of its own weather ÷ prediction with one type switched to last October's values on the same dates − 1) × 100. A negative value means this October's weather of that type is linked to lower $PM_{2.5}$.

[4] **Headline changes.** Recorded: 100.1 ÷ 136.3 − 1 = −27%. Linked to weather: this October predicted with its own weather ÷ predicted with last October's − 1 = 101.5 ÷ 125.7 − 1 = −19%. Once the weather is accounted for: 107.1 ÷ 111.8 − 1 = −4%, where each day's prediction is averaged over 100 days of weather from the same time of year in all years.