

LAHORE'S AIR AND PUNJAB'S ENVIRONMENT SPENDING

Ten years of smog, and the money committed against it

A combined analysis of the Lahore Air Pollution Report 2016-2026 and the EPD/EP&CCD Procurement Report, with year-by-year profiles, regional checks and a data audit

Prepared by **Engineer Arshad H. Abbasi**

22 October 2026

Preface

Breathing the Cost of Good Intentions: Air Quality, Public Money and the Lungs of Lahore

There are cities that are remembered for their gardens, their poets and their gates. Lahore, increasingly, is being remembered for its air. On 22 October 2026, while this report was being finalised, Lahore again ranked among the three most polluted major cities in the world on the IQAir live ranking. We record this without surprise, and without comfort. Surprise belongs to those who have not watched the winter smog return, year after year, to the same streets and the same children.

The monthly record in this report tells the story plainly. The pattern from January 2016 to September 2026 is the same every year. A tolerable summer is followed by a climb through October into the dark months of November and December, when monthly PM_{2.5} has reached 290 µg/m³ in the worst recorded year, many times the World Health Organization's guideline. Ten years of data show seasons repeating, not a trend turning.

This repetition matters because the country can least afford to waste money. By the World Bank's own 2025 estimate, about 44.7 per cent of Pakistanis live below the US\$4.20-a-day poverty line. In March 2025 the Board of Directors of the World Bank Group approved a USD 300 million International Development Association (IDA) loan for the Punjab Clean Air Program (PCAP), to strengthen air quality management and combat air pollution. That loan is concessional, but it is not free: it is a promise made by the poor to the future. It carries a target of reducing PM_{2.5} by 35 per cent over a decade for the 13 million residents of Lahore Division. The World Bank is already a financier of this sector in Punjab: the Enhanced Air Quality Monitoring System and the monitoring of industrial units, both listed in Table 8, are schemes under the Punjab Green Development Program (PGDP) that the Bank supports. Beside it stand the seasonal closure of brick kilns, the shutting of industry and many other measures. Their economic cost falls on workers and families who can least absorb it. Yet the data in this report show no sustained improvement in Lahore's air.

We must be exact about what this report does and does not claim. It does **not** establish corruption, embezzlement or misuse of any fund dedicated to air quality, and nothing in it should be read that way. It does **not** conclude that the PCAP has failed, since the program is young and its horizon is long. What it does show is that, despite considerable spending and visible effort, the air has not measurably improved. Effort and outcome have parted ways, and that gap is the subject of this report.

Our reading is that such steps, taken without a rigorous scientific and engineering basis, are often wasted. On 31 October 2024 the author offered free advice to the Senior Minister of Punjab by email, with copies to Imtiaz Gul and Idress Abbasi for the record. That advice urged exactly this: that air quality be managed through source apportionment, measurement and engineering design, not seasonal bans and symbolic operations. The record since then supports that case. The author, Engineer Arshad H. Abbasi, who has worked in air pollution control for some three decades by his own account, writes not as a critic of the government but as one who wishes it to succeed.

This report therefore makes four requests:

1. That the **World Bank** conduct an independent **performance audit** of the USD 300 million PCAP financing and the related PGDP monitoring schemes, measuring results against stated air quality targets, with its findings made public.
2. That the **Chief Minister of Punjab** reset the paradigm of fund utilisation for air quality on scientific and engineering grounds, in which every rupee is tied to a measurable reduction in PM_{2.5}.

3. That the Chief Minister **review how the advice behind these projects was formed and by whom**, so that flawed project design can be corrected. This is a request for institutional learning, not an accusation against any person.
4. That the **federal government** adopt the same discipline of value for money, as the poor of this country deserve nothing less.

All cost estimates for projects reserved or completed are drawn from different published sources. If any contains an inadvertent error, the Government of Punjab is respectfully invited to send its feedback so that it can be corrected and the right steps taken. Air pollution is not only an engineering failure. It is a standing health hazard in Lahore and every other city of Punjab, and every winter it is paid for in hospital beds, lost school days and shortened lives.

Engr. Arshad H. Abbasi

22 October 2026

Contents

Preface.....	2
1. Executive summary	5
2. The two source reports, and how reliable they are	7
3. Lahore's air quality, 2016 to September 2026	8
4. Environment spending in Punjab	12
5. Air quality and spending together.....	16
6. Year-by-year profiles, 2016 to 2026	19
7. Regional comparison: Faisalabad and the Indian Punjab cities	26
8. Pollution sources, health claims and policy, as given in the PDF	28
9. Conclusions and recommendations	30
Appendix A. Full monthly PM2.5 matrix	32
Appendix B. Data conflicts in detail.....	33
Appendix C. Glossary	34
Sources	34

Note on the figures

Both source reports are reproduced in substance. Numbers marked 'printed' are as printed in the PDF; 'recomputed' are the means of its own monthly values; 'IQAir' are figures published on IQAir's pages.

What this report does

- Combines both source reports in full and tests them against each other and against IQAir's published figures.
- Shows month-by-month PM2.5 for Lahore from January 2016 to September 2026, and spending year by year.
- States what the data establishes about whether air quality improved, and where the evidence stops.

1. Executive summary

Across the ten years covered, Lahore's air did not get better. Over the same years Punjab approved and budgeted tens of billions of rupees for environment schemes. The data supports that statement. It does not yet support saying the spending failed, for the reasons in sections 5 and 9.

Table 1. Key numbers

Measure	Value	Source
Lahore annual PM2.5, 2016	106.7 $\mu\text{g}/\text{m}^3$	PDF
Lahore annual PM2.5, 2025	108.8 printed; 117.1 recomputed; 88.9 IQAir	PDF; IQAir
Change 2016 to 2025	+2.0% printed; +9.7% recomputed	PDF
Change 2019 to 2025	+4.7% printed; +8.3% recomputed; -0.7% IQAir	PDF; IQAir
Worst month on record	November 2024, 290.0 $\mu\text{g}/\text{m}^3$	PDF
Months meeting the WHO guideline (5 $\mu\text{g}/\text{m}^3$)	0 of 129	PDF
January to September mean, 2026 vs 2016	79.2 vs 78.0 (+1.5%)	PDF, author's calculation
October to December mean, 2025 vs 2016	221.5 vs 192.9 (+14.8%)	PDF, author's calculation
Selected schemes approved 2021 to 2024	Rs 20.67 billion	Procurement report
All 30 environment schemes, estimated cost	Rs 38.68 billion; Rs 11.05 billion spent by June 2025	Procurement report
Environment development budget FY2025-26	Rs 15.0 billion	Procurement report
Environment budget FY2026-27 (headline)	Rs 17.2 billion	Procurement report
World Bank PCAP loan (IDA), approved March 2025	USD 300 million; target: PM2.5 down 35% over a decade for 13 million residents of Lahore Division	World Bank press release

Main findings

- No improvement over ten years.** On the PDF's printed figures, Lahore's annual PM2.5 was 106.7 $\mu\text{g}/\text{m}^3$ in 2016 and 108.8 in 2025. Averaging its monthly values gives 117.1 for 2025. The peak year is 2024, when the annual mean was 124.6 by that method.
- No improvement since 2019 on any series.** 2019 to 2025: +4.7 percent (printed), +8.3 percent (recomputed), -0.7 percent (IQAir). Only IQAir's series, which starts in 2017, is lower than at the start, and nearly all of that fall happened by 2019.
- Winter is worse, not better.** October to December averaged 221.5 $\mu\text{g}/\text{m}^3$ in 2025, 14.8 percent above 2016. November 2025 (272.1) was 20.7 percent above November 2016 (225.4). The cleaner months of 2025 and 2026 are only back to 2016 levels.
- The one large drop was the 2020 lockdown.** April 2020 was 36 percent below April 2018, and the printed annual mean fell 25 percent from 2018. It reversed by 2021, and the lockdown came with none of the scheme money listed in the procurement report.
- Spending is large but mostly recent.** Of the Rs 20.67 billion of selected schemes approved in 2021 to 2024, 49 percent is monitoring and laboratories, 26 percent is the AirSafe smog project, 20 percent is buildings and administration. The direct anti-smog equipment (AirSafe fog cannons, and a Rs 3 billion expansion reported in February 2026) arrived from late 2024 onward.
- Cause and effect are not established.** Most of the money was committed after the last full year of data (2025), only 28.6 percent of the 30 schemes' cost had been spent by June 2025, and winter

weather and regional crop burning swamp local changes. The evidence supports 'the air did not improve while the money was committed', not 'the money did nothing'.

7. **The pollution PDF needs correction before publication.** Its printed annual averages are below the mean of its own monthly values for 2018 to 2025 (by up to $8.4 \mu\text{g}/\text{m}^3$), its 2025 figure equals IQAir's 2024 figure, its Indian-city values are about 1.5 to 1.8 times IQAir's published values, and its 2019 months do not match IQAir's. Details are in section 2 and Appendix B.
8. **World Bank financing is now part of the picture.** In March 2025 the World Bank Group approved a USD 300 million IDA loan for the Punjab Clean Air Program (PCAP), after earlier support to monitoring schemes under the Punjab Green Development Program (PGDP). The procurement report lists only Rs 3.46 billion of PCAP-linked items, all of them proposed and unapproved. The program is young, so the data cannot yet judge it; a performance audit against its 35 percent PM2.5 target is the right next step (section 4.8).

Wording that the evidence supports

"Lahore's annual PM2.5 was $106.7 \mu\text{g}/\text{m}^3$ in 2016 and $108.8 \mu\text{g}/\text{m}^3$ in 2025 ($117.1 \mu\text{g}/\text{m}^3$ when averaged from the report's own monthly values), and IQAir's published figure of $88.9 \mu\text{g}/\text{m}^3$ for 2025 is no better than its $89.5 \mu\text{g}/\text{m}^3$ for 2019. November 2024 was the worst month in the decade at $290.0 \mu\text{g}/\text{m}^3$. Over the same period Punjab's environment department approved Rs 20.7 billion of selected schemes between 2021 and 2024, and its development programme lists Rs 38.7 billion across 30 schemes, of which Rs 11.05 billion had been spent by June 2025. Air quality did not improve in this period. Most anti-smog equipment was procured from late 2024 onward, so its effect cannot yet be judged."

2. The two source reports, and how reliable they are

2.1 Lahore Air Quality Assessment Report (2016-2026)

A 9-page PDF published in October 2026. It presents monthly PM_{2.5} for Lahore from January 2016 to September 2026 (129 months), a five-city comparison with Faisalabad, Amritsar, Ludhiana and Jalandhar, source shares by sector, health and economic figures, a table of policy actions and a 2026-2030 target plan. It says its data are 'calibrated against monitoring networks published by IQAir, regulatory government sensors, and satellite remote-sensing validations', so it is not purely IQAir data.

2.2 Procurement Report: EPD and EP&CCD (Punjab)

A technical analysis by Amjad Butt, dated September 2026, of procurement by the Punjab Environment Protection Department (renamed Environment Protection & Climate Change Department after a 2024 reorganisation). It draws on PPRA tender notices, the Annual Development Programme (ADP) book for FY2025-26, and news reports. It states that the PPRA e-procurement system could not be queried directly, so a contract-by-contract register of awarded amounts was not compiled, and that several figures come from news reports of government announcements, not from audited contract documents.

2.3 Checks on the Lahore Air Pollution Report

Table 2. Data checks on the Lahore Air Pollution Report

Check	Result	Consequence
Printed annual average vs mean of its own monthly values	Match (within rounding) for 2016, 2017 and 2026 only. For 2018 to 2025 the printed figure is 0.8 to 8.4 µg/m ³ lower. Example: 2025 printed 108.8, months average 117.1	Headline annual numbers understate the PDF's own monthly data. Both are shown
Comparison table vs IQAir's published Lahore annuals	Identical for 2018 to 2023. 2024: PDF 108.2, IQAir 102.1. 2025: PDF 102.1, IQAir 88.9	The PDF's 2025 value equals IQAir's 2024 value, suggesting a one-year slip
2019 monthly values vs IQAir's published 2019 months	January: PDF 165.1, IQAir 199.1. December: PDF 220.5, IQAir 182.7	The monthly matrix cannot be traced to IQAir's published numbers
Indian-city annuals vs IQAir	PDF Amritsar 2019 78.4 vs IQAir 47.2; Ludhiana 81.0 vs 49.3; Jalandhar 72.1 vs 41.0	PDF Indian-city values are 1.5 to 1.8 times IQAir's
Headline '10-year average 105.4 µg/m ³ '	The mean of annual values 2016 to 2025 is 107.1, and the mean of all 129 months is 110.1	Headline does not tie to its own tables
Claim that all five cities show 'identical' seasonal spikes in late October and November	IQAir's 2019 months show Lahore, Faisalabad and Jalandhar peaking in December or January, and Ludhiana and Amritsar in October to November	Overstated

Full tables for each check are in Appendix B.

2.4 How the conflicts were handled

No series was chosen at the expense of the others. Throughout the report Lahore's annual PM_{2.5} appears three ways, and the conclusion is stated only where it holds in all three:

- **Printed:** the annual averages as printed in the PDF.
- **Recomputed:** the arithmetic mean of the PDF's own twelve monthly values. This is the most internally consistent version of the PDF's data.
- **IQAir:** annual values published on IQAir's historical-rankings page (2017 to 2025). This is the only independently verifiable series, but it covers fewer years, and IQAir's own Lahore page notes that public monitoring only began in 2017 and has expanded since.

Monthly values are available only from the PDF and are treated as unverified. The PDF's health, economic and sector-share figures are not used to draw conclusions, because it gives no sources for them, though they are reproduced in section 8.

3. Lahore's air quality, 2016 to September 2026

3.1 Annual averages

Table 3. Lahore annual PM2.5 ($\mu\text{g}/\text{m}^3$), three versions

Year	Printed in PDF	Mean of PDF monthly values	IQAir published	Rank (1 = worst of 10)
2016	106.7	106.7	n/a	8
2017	116.3	116.4	133.2	5
2018	119.3	120.1	114.9	2
2019	103.9	108.2	89.5	7
2020	89.2	95.0	79.2	10
2021	97.2	105.5	86.5	9
2022	104.1	112.5	97.4	6
2023	109.3	117.7	99.5	3
2024	116.2	124.6	102.1	1
2025	108.8	117.1	88.9	4
2026 (Jan to Sep)	79.2*	79.2	n/a	n/a

* Year to date, so not comparable with full years. 2020 is the COVID-19 lockdown year. Ranks use the recomputed series.

What the annual figures show

1. **2016 to 2025: no improvement.** Printed +2.0% (106.7 to 108.8); recomputed +9.7% (106.7 to 117.1). Only IQAir's series is lower than at the start of its record: from 133.2 in 2017 to 88.9 in 2025 (-33.3 percent), though most of that fall came by 2019, when the monitoring network was also expanding.
2. **2019 to 2025: flat to worse.** Printed +4.7%, recomputed +8.3%, IQAir -0.7%.
3. **The worst year is 2024.** Recomputed 124.6 (printed 116.2), the highest of the ten; 2018 is second (120.1) and 2023 third (117.7). The three worst years are 2024, 2018 and 2023.
4. **A straight-line fit through 2016 to 2025 is almost flat.** Using the printed values the slope is $-0.14 \mu\text{g}/\text{m}^3$ per year. From 2019 onward it is $+2.9 \mu\text{g}/\text{m}^3$ per year, upward.
5. **Against standards.** Even the best year (2020, recomputed 95.0; printed 89.2) is about 18 times the WHO annual guideline of $5 \mu\text{g}/\text{m}^3$, and every year is 2.5 to 3.6 times Punjab's own limit of $35 \mu\text{g}/\text{m}^3$.

3.2 The seasonal cycle

The PDF describes four phases driven by thermal inversion, crop burning and rainfall, and its monthly figures follow them closely:

- **Winter crisis (October to January):** a thermal inversion shrinks the mixing layer from about 1,500 m to under 100 m, trapping biomass smoke, vehicle exhaust and fog.
- **Post-winter dispersion (February to March):** a growing mixing layer and more sunlight steadily lower surface concentrations.

- **Pre-monsoon (April to June):** strong convection; wind-borne dust raises total suspended particles, but PM2.5 reaches mid-year lows.
- **Monsoon (July to September):** rain washes out particles, giving the year's lowest monthly values.

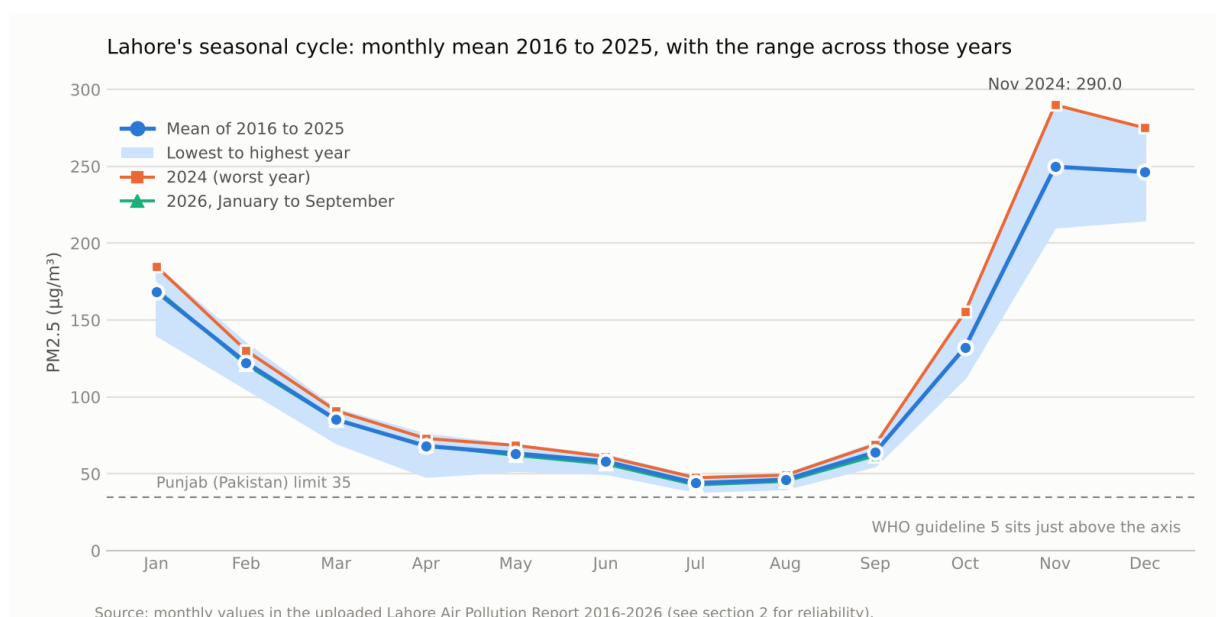


Figure 1. Lahore's seasonal cycle: monthly mean 2016 to 2025, with the range across those years

Table 4. Month by month across 2016 to 2025 ($\mu\text{g}/\text{m}^3$)

Month	Mean	Lowest year	Highest year	Highest as multiple of WHO 5
Jan	168.6	140.2 (2020)	185.0 (2024)	37x
Feb	122.4	105.3 (2020)	135.0 (2018)	27x
Mar	85.3	70.1 (2020)	92.3 (2018)	18x
Apr	68.1	48.2 (2020)	75.8 (2018)	15x
May	63.3	52.0 (2020)	68.9 (2018)	14x
Jun	58.1	50.1 (2020)	62.5 (2018)	13x
Jul	44.0	38.4 (2020)	48.2 (2018)	10x
Aug	46.2	40.2 (2020)	50.1 (2018)	10x
Sep	64.1	55.1 (2020)	70.4 (2018)	14x
Oct	132.3	112.5 (2016)	155.4 (2024)	31x
Nov	249.8	210.4 (2020)	290.0 (2024)	58x
Dec	246.4	215.0 (2020)	275.0 (2024)	55x

The cleanest month of any year, July 2020 (38.4), is still 7.7 times the WHO guideline. No month of the 129 met it.

3.3 Every month, 2016 to September 2026

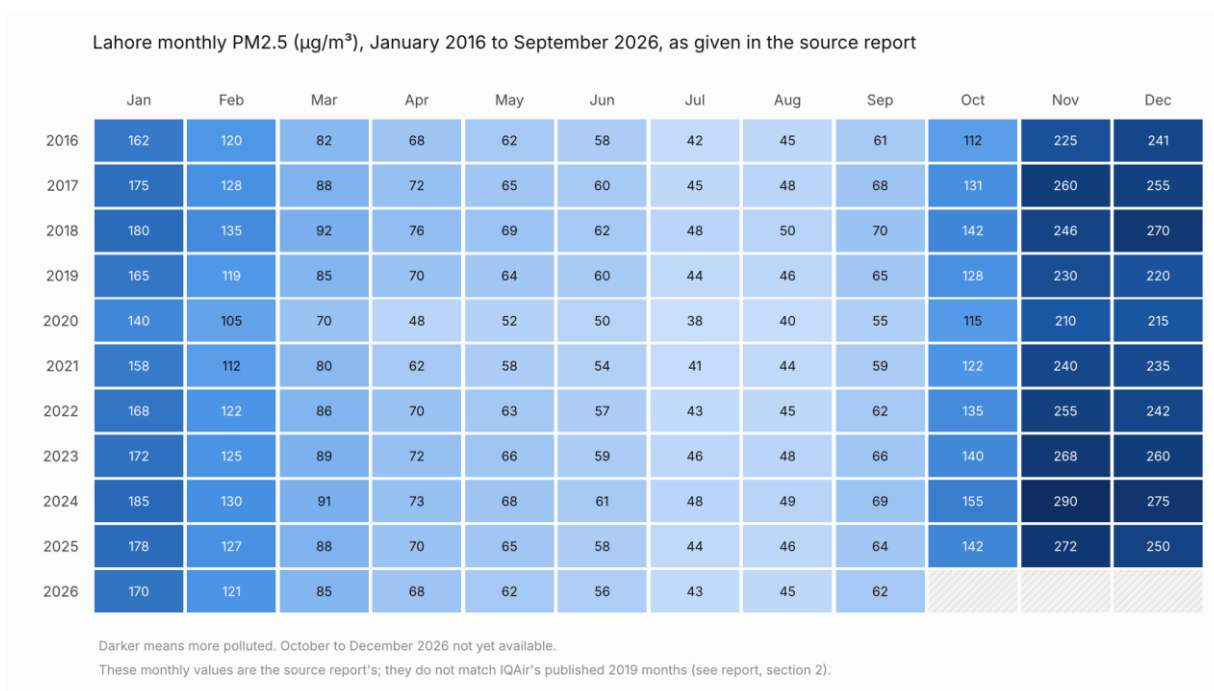


Figure 2. Lahore monthly PM2.5, January 2016 to September 2026 (the PDF's values)

The heatmap shows the same dark block every November and December. It is darkest in November 2024 and is not visibly lighter in 2025. Appendix A gives the full matrix as numbers.

3.4 Is any season improving?



Figure 3. January to September, October to December, November and July by year

- **January to September:** 78.0 in 2016 and 79.2 in 2026 (+1.5%), down 3.8 percent on 2025 and 9.1 percent on 2018. The 2026 level equals 2019 (79.9).

- **April to September (the months least affected by smog):** 56.2 in 2016, 61.4 in 2024, 58.0 in 2025 and 56.1 in 2026. The PDF's remark that late-2025 and 2026 summers show 'a slight mitigation' is correct, but 2026 has only returned to the 2016 level.
- **October to December:** 192.9 in 2016, 240.1 in 2024 (+24.5%) and 221.5 in 2025 (+14.8%). This is the season that matters most for annual averages and for health.
- **November:** 225.4 in 2016, a peak of 290.0 in 2024, and 272.1 in 2025 (+20.7% on 2016). The PDF itself says 'meteorology continues to override localized industrial emission reductions during cold months'.

3.5 The 2020 lockdown as a yardstick

The PDF reports that strict lockdowns between April and June 2020 cut traffic and industry. April 2020 was 48.2 against 75.8 in April 2018 (-36.4%), and the printed annual mean fell from 119.3 in 2018 to 89.2 in 2020 (-25.2%). The recomputed annual mean fell 20.9 percent. By 2021 the printed mean had risen 9.0 percent from its 2020 low, and by 2024 it was 30.3 percent above it. A one-year, economy-wide shutdown therefore did more than any of the listed schemes, and shows how large the contribution of human activity is. It also shows that the improvement is reversible unless the underlying emissions change.

3.6 Extremes

- **Highest month:** November 2024, 290.0 $\mu\text{g}/\text{m}^3$, with hourly spikes above 700 $\mu\text{g}/\text{m}^3$ on several days (PDF), coinciding with early-onset winter inversion and synchronised regional stubble burning.
- **Lowest month:** July 2020, 38.4 $\mu\text{g}/\text{m}^3$, during monsoon and the post-lockdown period.
- **IQAir's recent daily records:** 14 October 2025, AQI above 200; 18 January 2026, AQI above 500, ranking Lahore second in the world; 8 September 2026, AQI above 150 and Lahore in the top ten before the smog season began; 5 October 2026 at about 1 AM, AQI 158 and PM2.5 66 $\mu\text{g}/\text{m}^3$ (13.2 times the WHO guideline).
- IQAir's 2025 World Air Quality Report named Pakistan the most polluted country in the world for 2025, with a national average of 67.3 $\mu\text{g}/\text{m}^3$ (73.7 $\mu\text{g}/\text{m}^3$ in 2024).

4. Environment spending in Punjab

4.1 What the procurement report covers

The report covers procurement by EPD and EP&CCD over about three years (2023 to 2026), with ADP figures for FY2025-26 and budget figures for FY2026-27. It has no spending figures for 2016 to 2020, and no audited annual expenditure series for any year. What it has is the approval date and estimated total cost of each scheme. The schemes are grouped here by year of approval, which tells you when money was committed and not when it was spent.

- EPD is the parent provincial department; the Environmental Protection Agency (EPA) Punjab is its operational arm. After 2024 the department is titled EP&CCD.
- All procurement is governed by the Punjab Procurement Rules 2014 and published through the PPRA portal and the e-procurement system.

4.2 Categories of procurement

Table 5. Categories of procurement and their approximate scale (as given in the procurement report)

Category	Examples	Approximate scale
Anti-smog / fog cannons	'AirSafe' project fog cannons, 15 to 30 units	Rs 3 to 5.4 billion (multiple phases)
Air quality monitoring equipment	Monitoring stations, dust-fall and high-volume PM samplers, CO2 analysers, ion chromatographs, multi-gas analysers	Rs 5.2 to 8.1 billion (cumulative, multi-year)
Water quality monitoring	Enhanced Water Quality Monitoring System	Rs 2.97 billion (scheme cost)
Laboratory equipment and chemicals	EPA lab Rawalpindi chemicals; divisional labs (e.g. Sahiwal)	Rs 204 million or more
IT equipment	Computers and hardware for EPA headquarters	Tendered 2022 (value not disclosed)
Consultancy	Plastic Management Strategy and Single-Use Plastics Regulation	Expression of interest 2021
Civil works	Environment complexes (Sargodha, Faisalabad, Gujranwala, Multan); Green Building for EMC/EPD	Rs 3.7 billion or more (Green Building alone)
Vehicles	Electric fog-cannon carrier trucks (2026 phase)	Within the Rs 3 billion fog-cannon project
Environment Protection Force	Equipping a new enforcement force in 10 zones	Rs 2.95 billion (new scheme, FY2025-26)

4.3 The anti-smog fog-cannon programme

This is the most publicised line item, carried out mainly under the 'Punjab Smog Mitigation and Response Initiative - AirSafe'.

Table 6. AirSafe and fog-cannon procurement, by phase

Phase	Date	Details	Reported cost
Tender 1	27 Jan 2025	Machinery and equipment for AirSafe: dust-fall samplers, high-volume PM2.5/PM10/TSP samplers, ion chromatograph, CO2 analyser, fog cannons (lot-wise). Procured under PPRA Rule 59 'Urgency'	Line items: about Rs 20m (dust samplers, 2), Rs 16.9m (PM samplers), Rs 12m (ion chromatograph, 2). Fog-cannon lot not itemised
Tender 2	12 Mar 2025	Fog cannon machines with allied equipment, installation and commissioning (closing 17 Mar 2025). Also under the 'Urgency' rule, Rule 59(d)(iv)	Not separately disclosed

Phase	Date	Details	Reported cost
First deployment	2025 winter smog season	15 fog cannons imported from China, handed to Punjab EPA; each on a 16,000-litre tanker, mist range about 100 m	About Rs 45m per unit, about Rs 675m for 15 (media estimate)
Expansion	Reported ongoing	15 units operational, 5 more under construction domestically	Not separately disclosed
New project approval	20-21 Feb 2026	Rs 3 billion project: 30 modern fog cannons on electric trucks; Rs 2.25 billion under the 'Lahore Air Improvement Framework'; 50+ more monitors	Rs 3 billion
FY2026-27 budget	Jun 2026	Rs 4.74 billion for 30 anti-smog guns across major cities, within a Rs 5.3 billion 'Smog Mitigation Initiative' in a Rs 17.2 billion environment budget	Rs 4.74 billion

The report flags a discrepancy: Rs 3 billion (February 2026) and Rs 4.74 billion (June 2026) both describe a 30-unit rollout. They may be one project revised upward, or two tranches (capital versus capital plus running cost). The ADP scheme 'AirSafe' (ID 01192416078, approved 15 Nov 2024) has a total cost of Rs 5.381 billion, with Rs 3.381 billion for FY2025-26, consistent with the higher figure once samplers and analysers are included.

In July 2025 EPA Punjab set up a Technical and Human Resource Committee for Fog Cannon Operations (Office Order dated 22 July 2025) to decide staffing and operating needs and coordinate with the designated supplier(s), which indicates that the supplier relationship was already established by mid-2025.

4.4 Official development budget (ADP), environment and climate sector

Table 7. Sector summary, FY2025-26 (PKR million)

	Schemes	Capital	Revenue	Total 2025-26	Projection 2026-27
Ongoing	22	239.99	8,855.01	9,095.00	4,957.69
New	8	10.00	5,895.00	5,905.00	7,671.40
Grand total	30	249.99	14,750.01	15,000.00	12,629.09

Total estimated cost of all 30 schemes: Rs 38,678.28 million, of which Rs 11,048.93 million (28.6 percent) had been spent by June 2025.

Table 8. Key equipment- and procurement-heavy schemes

Scheme	Approved	Total cost (Rs m)	FY2025-26 (Rs m)	Notes
Punjab Smog Mitigation and Response Initiative - AirSafe	15-11-2024	5,381.0	3,381.0	Fog cannons, samplers, analysers
Enhanced Air Quality Monitoring System	14-10-2021	5,205.3	780.0	AQMS expansion (World Bank PGDP)
Enhanced Water Quality Monitoring System	28-10-2021	2,972.7	630.0	Water sensors and labs
Environmental Monitoring of Industrial Units	15-10-2024	861.0	413.0	World Bank PGDP
Establishment of Environmental Monitoring Center	10-05-2024	821.7	631.0	Equipment and facility
Green Building for EMC/EPD	30-11-2023	3,723.9	1,338.6	Includes lab fit-out
9th Divisional Laboratory of EPA, Sahiwal	22-07-2024	204.4	70.0	Lab equipment
EPA Upgradation, Restructuring, Revamping and Automation	22-07-2024	500.0	95.0	IT and automation
CM Punjab Green Credit Program	06-09-2024	1,000.0	547.0	-
New (unapproved): 25 monitoring stations (World Bank PCAP)	Proposed	2,900.0	50.0 (seed)	25 new air quality stations
New (unapproved): Fuel Quality Testing Labs, fixed and mobile (World Bank PCAP)	Proposed	560.0	40.0	Fixed and mobile labs

Scheme	Approved	Total cost (Rs m)	FY2025-26 (Rs m)	Notes
New (unapproved): Environment Protection Force (10 zones)	Proposed	2,948.0	1,948.0	Enforcement vehicles and equipment
New (unapproved): Climate Observatory in Punjab	Proposed	5,000.0	3,000.0	Later reported at Rs 14.6 bn in FY2026-27 budget; likely re-scoped

4.5 FY2026-27 environment budget (announced June 2026)

Table 9. FY2026-27 environment budget items

Item	Amount
Total environment budget, FY2026-27	Rs 17.2 billion
Climate Observatory	Rs 14.6 billion
Smog Mitigation Initiative	Rs 5.3 billion
Air Quality Monitoring	Rs 5.2 billion
Water Quality Monitoring	Rs 2.9 billion
Anti-smog guns (30 units)	Rs 4.74 billion

As the procurement report notes, the sub-items add to more than Rs 17.2 billion, so they overlap or are nested. Treat Rs 17.2 billion as the headline and the sub-items as illustrative. The ADP book projects Rs 12.63 billion for 2026-27.

4.6 Other documented tenders on the EPD page

Table 10. Tenders listed on the EPD/EPA Punjab tenders page

Title	Published	Closing	Type
Procurement of Fog Cannon Machines with Allied Equipment (AirSafe)	12 Mar 2025	17 Mar 2025	Goods
Procurement of Machinery/Equipment (AirSafe)	27 Jan 2025	04 Feb 2025	Goods
Procurement of Air Quality Monitoring Equipment	03 Feb 2024	26 Feb 2024	Goods
Supply of IT Equipment (EPA HQ)	21 Apr 2022	10 May 2022	Goods
R&M of AQMS, multi-gas analyser, calibrator and software	11 Feb 2022	28 Jan 2022	Services/maintenance
Consultancy for Plastic Management Strategy and Single-Use Plastics Regulation	18 Oct 2021	04 Nov 2021	Consultancy (EOI)
Procurement of Chemicals for EPA Laboratory, Rawalpindi	04 Apr 2020	19 Apr 2020	Goods
TORs to Rationalize Industry-Specific Environmental Quality Standards	23 Jan 2020	12 Feb 2020	Consultancy

Only the first three fall within the report's 2023 to 2026 window. The rest are the most recent entries on the page. The 28 January 2022 closing date for the R&M tender precedes its 11 February 2022 publication date in the source; It is reproduced as printed.

4.7 Oversight and audit context

- The Auditor General of Pakistan's report for audit year 2024-25 found over Rs 1 trillion in financial irregularities across Punjab government accounts as a whole (fraud and misappropriation Rs 3.1 billion; recoveries and unauthorised payments Rs 25.4 billion; financial mismanagement Rs 10.6 billion; HR-related Rs 8.2 billion). It recommended stricter adherence to the Punjab Procurement Rules 2014. This is a province-wide finding. No EPD/EP&CCD-specific audit objection on smog-gun or monitoring-station procurement was found.
- The AirSafe procurement used PPRA Rule 59(d)(iv), the 'Urgency' provision, instead of standard open bidding. This allows faster procurement but typically attracts more scrutiny. Commentators

have questioned value for money and water use (each fog cannon can use up to 360,000 litres per day if run continuously).

- No official unit price for a fog cannon appears in the documents reviewed. The Rs 45 million per unit is a media estimate.

4.8 World Bank financing for the sector

The World Bank supports Punjab's environment work in two ways, and both show up in the procurement report's scheme list.

- **Punjab Green Development Program (PGDP).** Two approved schemes in Table 8 are labelled as World Bank PGDP schemes: the Enhanced Air Quality Monitoring System (Rs 5,205.3 million, approved 14 October 2021) and Environmental Monitoring of Industrial Units (Rs 861.0 million, approved 15 October 2024). Together they come to Rs 6.07 billion.
- **Punjab Clean Air Program (PCAP).** In March 2025 the Board of Directors of the World Bank Group approved a USD 300 million International Development Association (IDA) loan for PCAP, to strengthen air quality management and combat air pollution. It supports the Punjab Smog Mitigation Action Plan across transport, agriculture, industry, energy and municipal services, and aims to cut PM2.5 by 35 percent over the next decade for the 13 million residents of Lahore Division. The World Bank also expects it to avoid 35.6 million metric tons of carbon dioxide over 12 years. The press release does not state the baseline year for the 35 percent target.
- **What is visible in the procurement report.** Only two PCAP items appear, both proposed and unapproved: 25 new air quality monitoring stations (Rs 2,900 million) and fixed and mobile fuel quality testing labs (Rs 560 million), together Rs 3.46 billion. At an illustrative rate of about Rs 280 to the US dollar, USD 300 million is roughly Rs 84 billion, so most of the loan is not visible in the department's own scheme list. That is expected in part: the program also reaches transport and agriculture (electric buses, vehicle renewal, crop technology, according to its task team leader), which sit outside this department.
- **What the data show so far.** The loan was approved in March 2025, so the winter of 2025-26 is the first season it could have touched, and nothing here concludes that PCAP has failed. The monthly figures to September 2026 show no sustained improvement, which is why an independent World Bank performance audit of PCAP results against its 35 percent target, with public findings, is the natural next step (section 9.3).

4.9 Summary totals

Table 11. Procurement report summary, total cost in rupees

Aggregation	Approximate total
FY2025-26 environment and climate ADP, all schemes, one year	Rs 15.0 billion
All 30 ongoing and new ADP schemes, life-of-project	Rs 38.7 billion
AirSafe smog project (fog cannons and monitoring gear)	Rs 5.4 billion
First-phase fog cannons (15 units at about Rs 45m)	Rs 0.68 billion
February 2026 30-unit electric fog-cannon expansion	Rs 3.0 billion
FY2026-27 total environment budget (headline)	Rs 17.2 billion
Enhanced air and water quality monitoring systems, combined	Rs 8.2 billion

The procurement report's overall reading: across FY2023-24 to FY2026-27, procurement-related development spending spans roughly Rs 15 to 39 billion depending on whether one year or the full multi-year scheme cost is counted, with the anti-smog gun and AirSafe programme alone about Rs 5 to 8 billion once its 2026 expansion is included.

4.10 Limitations stated by the procurement report

- PPRA's portal links to a separate, interactive e-procurement system, so a complete contract-by-contract register with awarded amounts could not be compiled.
- Several rupee figures come from news reports of government announcements, not audited contracts. Where figures conflict, both are shown.
- The report covers Punjab's EPD/EP&CCD only. Federal Pak-EPA or other provinces would need separate research.

5. Air quality and spending together

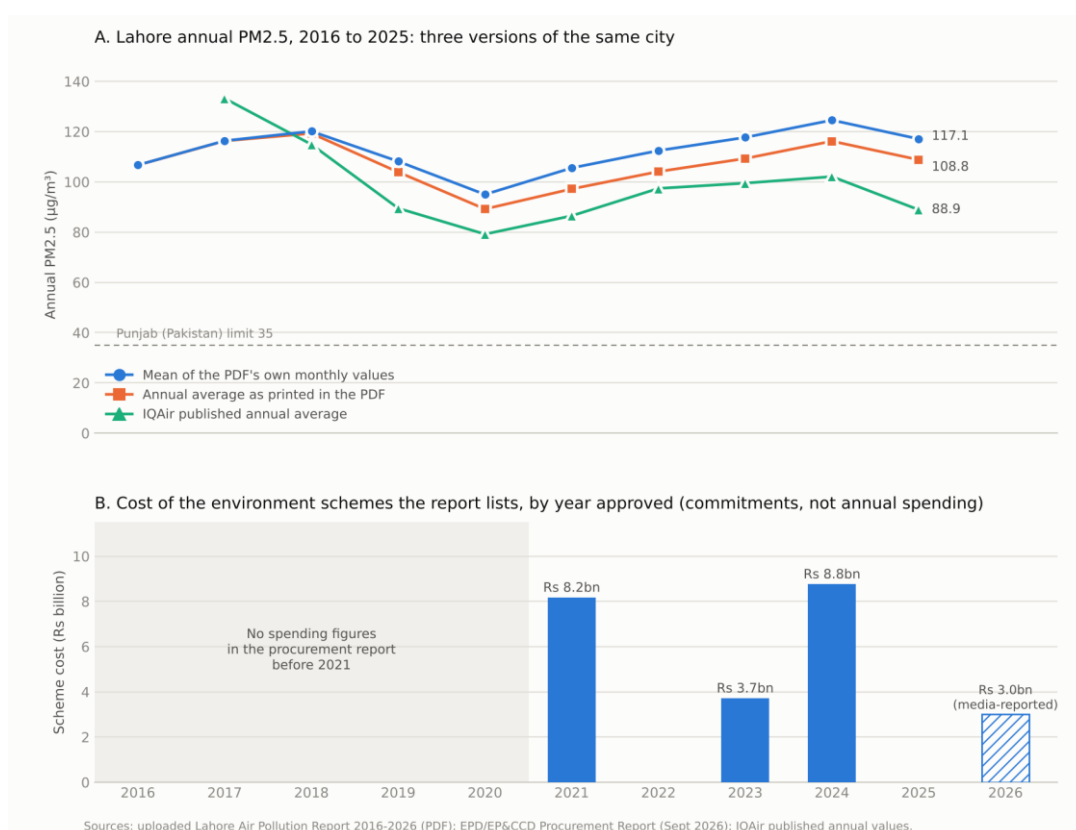


Figure 4. Annual PM2.5 (top) and the cost of schemes approved in each year (bottom)

5.1 Year by year

Table 12. Year-wise air quality against money committed

Year	PM2.5: mean of PDF months	PM2.5: printed	PM2.5: IQAir	Scheme cost approved (Rs bn)	Change in PM2.5 on previous year (recomputed)
2016	106.7	106.7	n/a	n/a	n/a
2017	116.4	116.3	133.2	n/a	+9.0%
2018	120.1	119.3	114.9	n/a	+3.3%
2019	108.2	103.9	89.5	n/a	-10.0%
2020	95.0	89.2	79.2	n/a	-12.2%
2021	105.5	97.2	86.5	8.18	+11.1%
2022	112.5	104.1	97.4	none listed	+6.5%
2023	117.7	109.3	99.5	3.72	+4.7%
2024	124.6	116.2	102.1	8.77	+5.8%

Year	PM2.5: mean of PDF months	PM2.5: printed	PM2.5: IQAir	Scheme cost approved (Rs bn)	Change in PM2.5 on previous year (recomputed)
2025	117.1	108.8	88.9	none listed	-6.0%
2026 (Jan to Sep)	79.2 (YTD)	79.2 (YTD)	n/a	3.00 (media)	n/a

'None listed' means the report gives no scheme approval dated in that year; money was still being spent that year (for example the FY2025-26 provisions). n/a for 2016 to 2020 means the report contains no spending data before 2021. Recomputed change for 2017 onward only.

- Air quality improved in 2019 and 2020 (the lockdown year), before any of the listed schemes were approved.
- It worsened in each of 2021, 2022, 2023 and 2024, the period when money was approved, on all three series.
- 2025 was better than 2024 on all three, but still above 2021 on all three (recomputed 117.1 vs 105.5; printed 108.8 vs 97.2; IQAir 88.9 vs 86.5).
- From 2021 to 2025, annual PM2.5 rose 10.9 percent (recomputed), 11.9 percent (printed) and 2.8 percent (IQAir). On no series did it fall.

5.2 What the money is for

What the money is for: schemes in the procurement report, by estimated cost

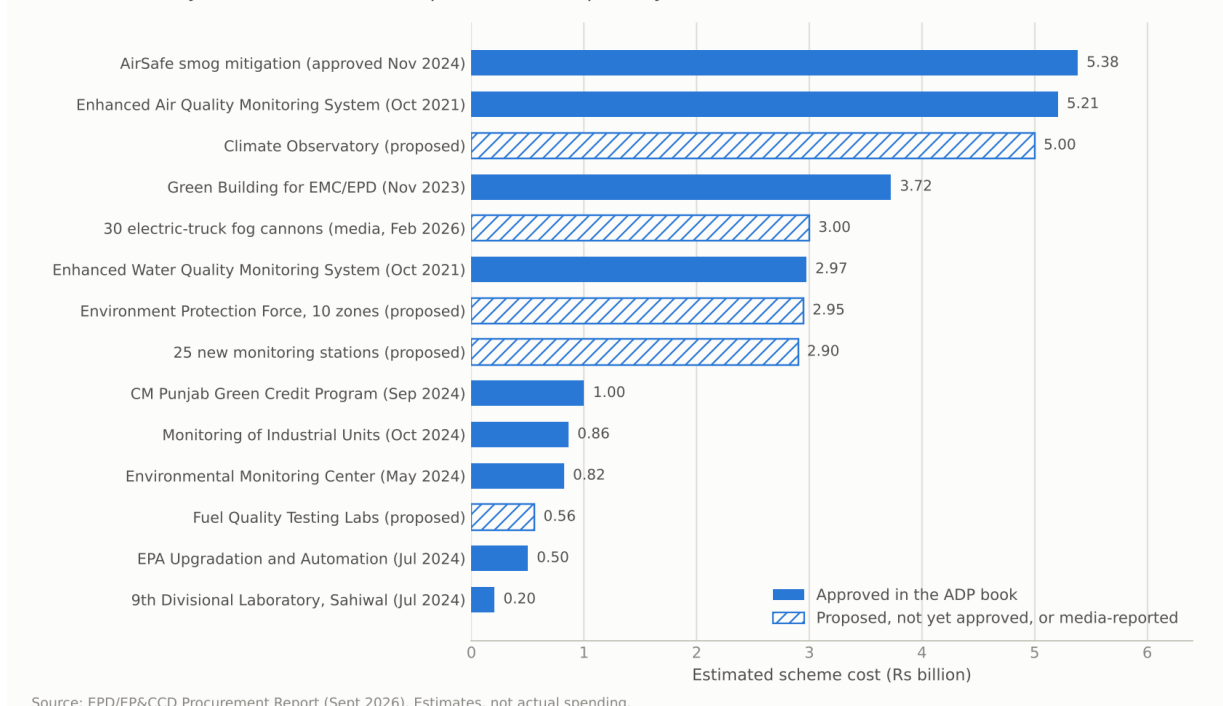


Figure 5. Schemes in the procurement report, by estimated cost

The listed schemes are grouped by purpose. The categories are the author's judgement and are meant to show where the money points, not to grade any scheme.

Table 13. Listed schemes by purpose (Rs million)

Purpose	Approved 2021-24	Share of approved	Proposed or media-reported	Total listed
Monitoring and laboratories (air, water, industry, labs)	10,065.1	48.7%	3,460.0	13,525.1
AirSafe: fog cannons plus samplers and analysers	5,381.0	26.0%	-	5,381.0

Purpose	Approved 2021-24	Share of approved	Proposed or media-reported	Total listed
Direct mitigation: 30 electric fog cannons (media)	-	-	3,000.0	3,000.0
Buildings, administration and automation	4,223.9	20.4%	-	4,223.9
Enforcement: Environment Protection Force	-	-	2,948.0	2,948.0
Other: Green Credit; Climate Observatory	1,000.0	4.8%	5,000.0	6,000.0
Total	20,670.0	100%	14,408.0	35,078.0

Shares are rounded and sum to 99.9 percent. 'Monitoring and laboratories' approved = air quality monitoring 5,205.3 + water quality monitoring 2,972.7 + industrial-unit monitoring 861.0 + Environmental Monitoring Center 821.7 + Sahiwal laboratory 204.4. Proposed monitoring = 25 stations 2,900.0 + fuel labs 560.0. Water monitoring (Rs 2.97 billion) does not address air pollution.

Reading the table: about half of the approved money measures or tests pollution, and a further fifth builds or equips offices and laboratories. Monitoring is necessary for enforcement and for judging results, but it does not by itself reduce emissions. The money that acts directly on emissions is the AirSafe fog-cannon component and the February 2026 project, and the effect of fog cannons on PM2.5 is contested (they spray water mist and use large amounts of water).

5.3 Testing the claims

Table 14. Claims, evidence and verdict

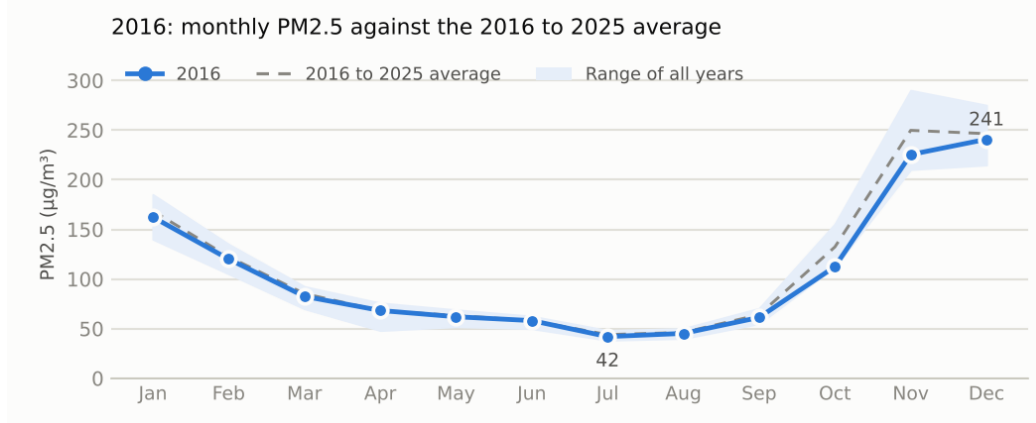
Claim	Evidence	Verdict
Lahore's air did not improve between 2016 and 2025	Printed +2.0%, recomputed +9.7% (2016 to 2025); IQAir lower than 2017 but -0.7% since 2019	Supported on the PDF's data; supported since 2019 on IQAir's
Winter pollution did not improve	October to December +14.8% and November +20.7% (2025 vs 2016)	Supported
Summer pollution improved	April to September in 2026 (56.1) equals 2016 (56.2) after peaking at 61.4 in 2024	Partly: only back to the 2016 level
Large sums were committed	Rs 20.67 billion approved 2021 to 2024; Rs 38.68 billion across 30 schemes; Rs 15.0 billion FY2025-26 budget	Supported (as estimates)
Large sums were actually spent	Rs 11.05 billion spent on the 30 schemes by June 2025 (28.6 percent); no later figure	Partly: spent figure is cumulative and stops at June 2025
The spending caused, or failed to prevent, the lack of improvement	Most direct anti-smog equipment arrived from late 2024; winter weather dominates; no before-and-after evaluation exists	Not established
The spending was irregular or wasted	Urgency rule used for AirSafe; province-wide audit findings; no EPD-specific objection found; value for money questioned by commentators	Not established

6. Year-by-year profiles, 2016 to 2026

Each profile gives the year's figures, a chart of its months against the 2016 to 2025 average, a short reading of the numbers, and the policy and spending events recorded in the two source reports or on IQAir's pages. Rank 1 means the worst of the ten full years on the recomputed series.

2016

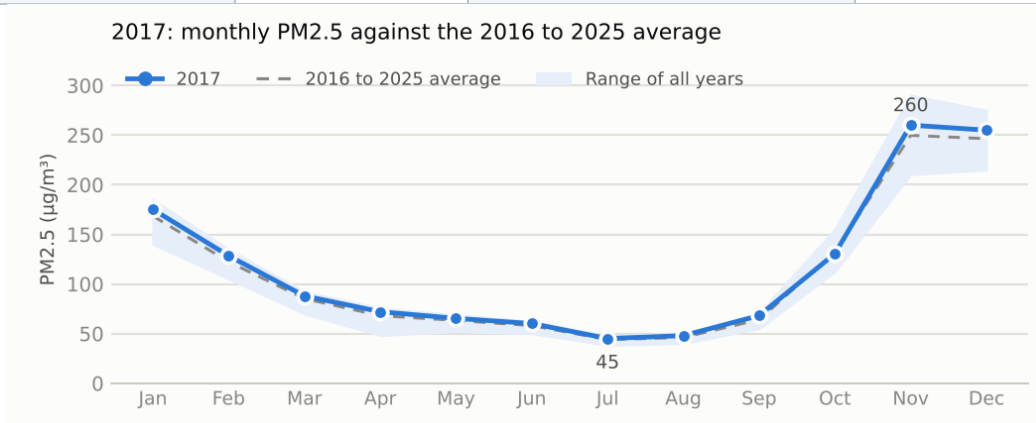
Annual, printed in PDF	106.7	Annual, mean of monthly values	106.7
IQAir published	n/a	Rank, 1 = worst of 10 years	8
Highest month	Dec 240.8	Lowest month	Jul 42.0
January to September mean	78.0	October to December mean	192.9



- The annual mean from the monthly values is 106.7 $\mu\text{g}/\text{m}^3$, ranking 8 of 10 (1 is worst).
- The highest month was Dec at 240.8, -2.3% against the 2016 to 2025 average for Dec (246.4). The lowest was Jul at 42.0, 8.4 times the WHO guideline.
- **Context:** First year in the PDF's series. The PDF records no policy or spending event for 2016 or earlier.
- **Context:** IQAir's Lahore page says Lahore's pollution reached public attention in early 2017, when citizen sensors first published data. Public monitoring in 2016 was therefore thin, and the PDF does not say where its 2016 monthly values come from.

2017

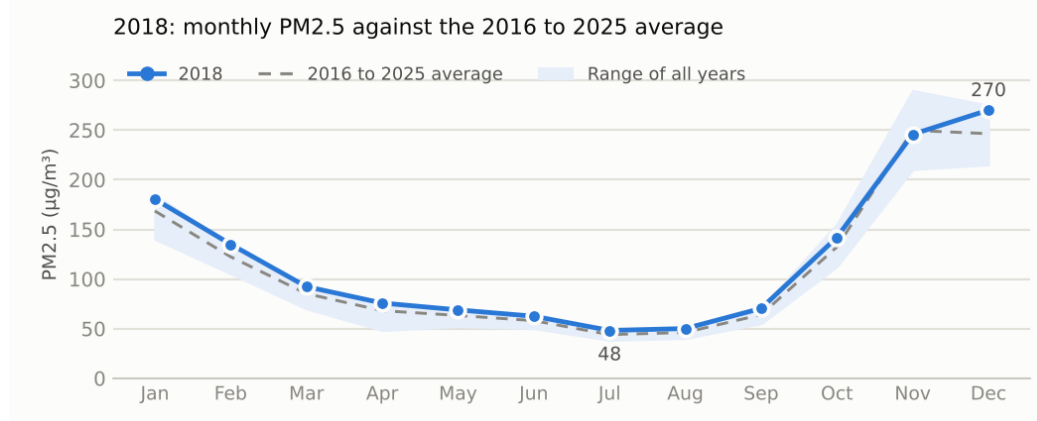
Annual, printed in PDF	116.3	Annual, mean of monthly values	116.4
IQAir published	133.2	Rank, 1 = worst of 10 years	5
Highest month	Nov 260.1	Lowest month	Jul 45.1
January to September mean	83.4	October to December mean	215.2



- The annual mean from the monthly values is 116.4 $\mu\text{g}/\text{m}^3$, up 9.0 percent on 2016, ranking 5 of 10 (1 is worst).
- The highest month was Nov at 260.1, +4.1% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 45.1, 9.0 times the WHO guideline.
- October to December averaged 215.2, +11.6% against 2016 (192.9).
- **Context:** The PDF lists the Punjab Clean Air Action Plan (2017): set up an air quality monitoring system and vehicle inspection stations. Outcome: 'Partial success, limited sensor density delayed tracking'.
- **Context:** IQAir records a Lahore High Court public-interest petition heard in November 2017, an order for an updated smog action plan, and the adoption of a Smog Action Plan and an AQI classification in 2017. IQAir's annual value for 2017 is 133.2 $\mu\text{g}/\text{m}^3$, the highest in its series.

2018

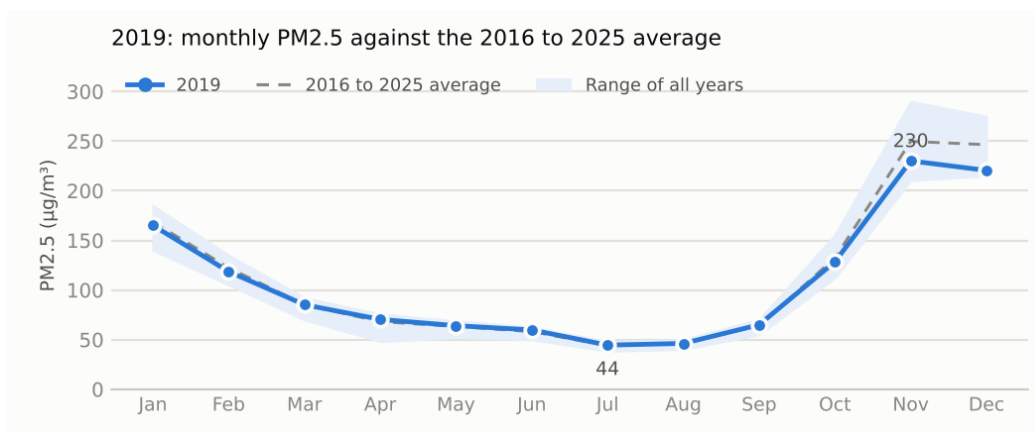
Annual, printed in PDF	119.3	Annual, mean of monthly values	120.1
IQAir published	114.9	Rank, 1 = worst of 10 years	2
Highest month	Dec 270.2	Lowest month	Jul 48.2
January to September mean	87.1	October to December mean	219.3



- The annual mean from the monthly values is 120.1 $\mu\text{g}/\text{m}^3$, up 3.3 percent on 2017, ranking 2 of 10 (1 is worst).
- The highest month was Dec at 270.2, +9.7% against the 2016 to 2025 average for Dec (246.4). The lowest was Jul at 48.2, 9.6 times the WHO guideline.
- October to December averaged 219.3, +13.7% against 2016 (192.9).
- **Context:** The PDF calls 2016 to 2018 an 'industrial and grid expansion era' and gives 2018 as the peak printed year (119.3).
- **Context:** IQAir ranked Lahore 10th in its 2018 World Air Quality Report, with Faisalabad third. Its Lahore annual value is 114.9 $\mu\text{g}/\text{m}^3$.
- **Context:** No scheme approvals are listed for this year.

2019

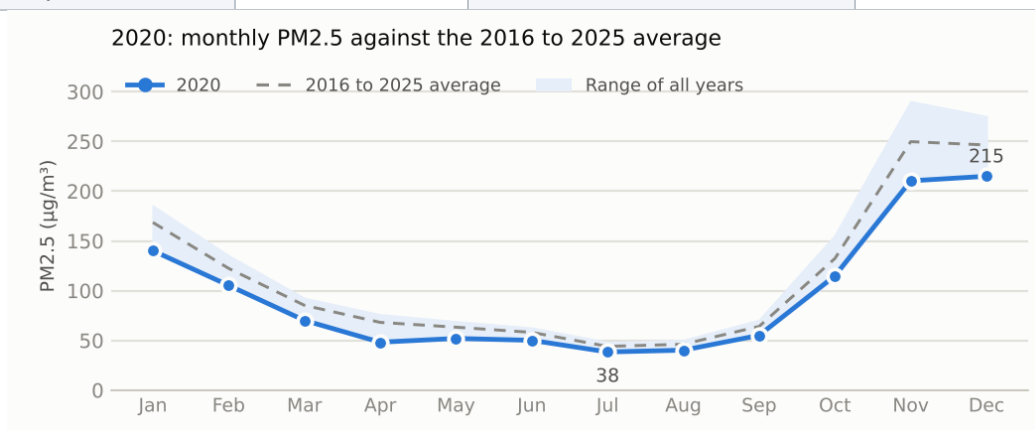
Annual, printed in PDF	103.9	Annual, mean of monthly values	108.2
IQAir published	89.5	Rank, 1 = worst of 10 years	7
Highest month	Nov 230.1	Lowest month	Jul 44.5
January to September mean	79.9	October to December mean	193.0



- The annual mean from the monthly values is 108.2 $\mu\text{g}/\text{m}^3$, down 10.0 percent on 2018, ranking 7 of 10 (1 is worst).
- The highest month was Nov at 230.1, -7.9% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 44.5, 8.9 times the WHO guideline.
- October to December averaged 193.0, +0.1% against 2016 (192.9).
- **Context:** The PDF lists the Zig-Zag Kiln Directive (2019): traditional Bull's Trench Kilns banned, with about 80 percent compliance around Lahore's perimeter by 2024 (high impact).
- **Context:** IQAir notes the US Consulate began publishing real-time PM2.5 data for Lahore in the first half of 2019, so 2019 is the first year with a government-linked monitor. Its published months for Lahore are January 199.1 and December 182.7, against the PDF's 165.1 and 220.5.

2020

Annual, printed in PDF	89.2	Annual, mean of monthly values	95.0
IQAir published	79.2	Rank, 1 = worst of 10 years	10
Highest month	Dec 215.0	Lowest month	Jul 38.4
January to September mean	66.6	October to December mean	180.1

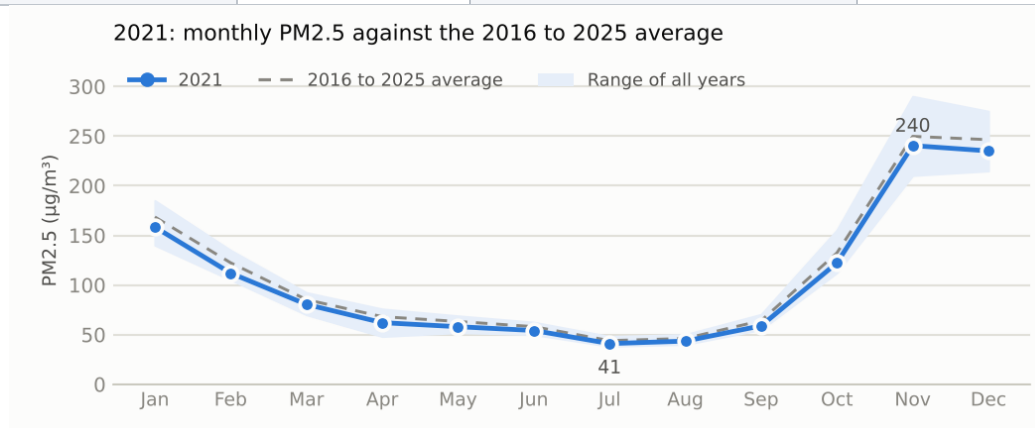


- The annual mean from the monthly values is 95.0 $\mu\text{g}/\text{m}^3$, down 12.2 percent on 2019, ranking 10 of 10 (the cleanest year).
- The highest month was Dec at 215.0, -12.8% against the 2016 to 2025 average for Dec (246.4). The lowest was Jul at 38.4, 7.7 times the WHO guideline.
- October to December averaged 180.1, -6.6% against 2016 (192.9).
- **Context:** COVID-19 lockdowns between April and June cut traffic and industry. The PDF gives April 2020 as 48.2 against 75.8 in April 2018.

- **Context:** IQAir's Lahore annual value, 79.2 $\mu\text{g}/\text{m}^3$, is the lowest in its series. EPD's tenders page shows only small items this year (chemicals for the Rawalpindi lab, terms of reference for industry standards).

2021

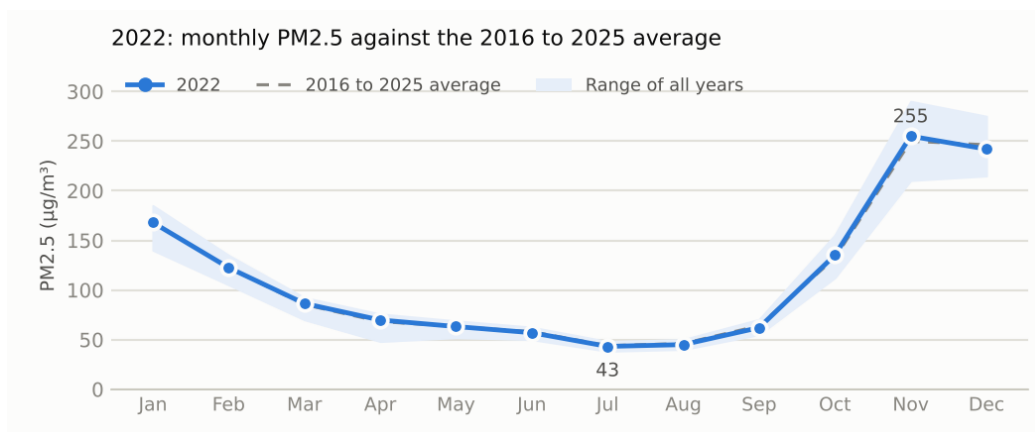
Annual, printed in PDF	97.2	Annual, mean of monthly values	105.5
IQAir published	86.5	Rank, 1 = worst of 10 years	9
Highest month	Nov 240.5	Lowest month	Jul 41.0
January to September mean	74.3	October to December mean	199.3



- The annual mean from the monthly values is 105.5 $\mu\text{g}/\text{m}^3$, up 11.1 percent on 2020, ranking 9 of 10 (1 is worst).
- The highest month was Nov at 240.5, -3.7% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 41.0, 8.2 times the WHO guideline.
- October to December averaged 199.3, +3.3% against 2016 (192.9).
- **Context:** The Enhanced Air Quality Monitoring System (Rs 5,205.3 million, 14 October 2021, World Bank PGDP) and the Enhanced Water Quality Monitoring System (Rs 2,972.7 million, 28 October 2021) were approved. Together Rs 8.18 billion.
- **Context:** The PDF lists annual Smog Emergency Directives from 2021 to 2024 (green lockdowns, early commercial closures, vehicle impoundment): short-term relief, limited structural change. It calls 2021 a post-pandemic rebound.
- **Context:** IQAir ranked Lahore 15th among metropolitan areas for 2021.

2022

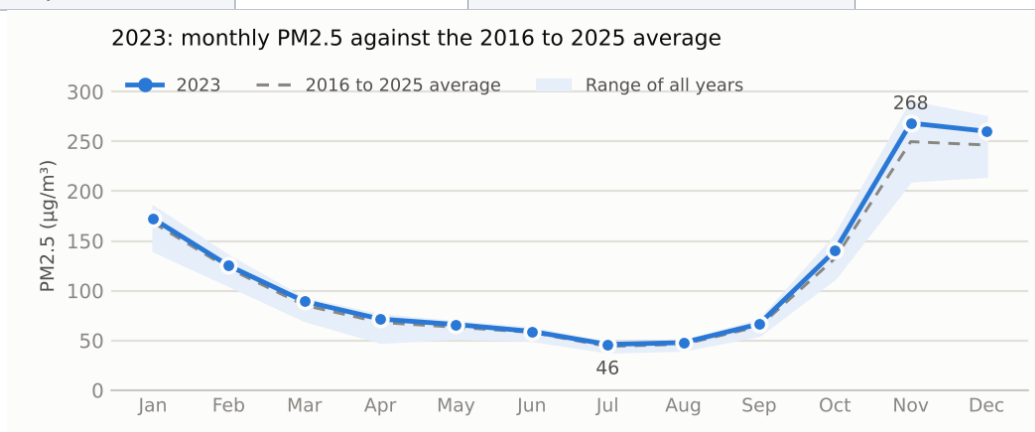
Annual, printed in PDF	104.1	Annual, mean of monthly values	112.5
IQAir published	97.4	Rank, 1 = worst of 10 years	6
Highest month	Nov 255.0	Lowest month	Jul 43.2
January to September mean	79.7	October to December mean	210.7



- The annual mean from the monthly values is 112.5 µg/m³, up 6.5 percent on 2021, ranking 6 of 10 (1 is worst).
- The highest month was Nov at 255.0, +2.1% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 43.2, 8.6 times the WHO guideline.
- October to December averaged 210.7, +9.2% against 2016 (192.9).
- **Context:** IQAir named Lahore the most polluted metropolitan area in the world for 2022 (annual value 97.4 µg/m³).
- **Context:** EPD tenders: supply of IT equipment for EPA headquarters (April), repair and maintenance of monitoring stations and analysers (February). No scheme approvals are listed for this year.

2023

Annual, printed in PDF	109.3	Annual, mean of monthly values	117.7
IQAir published	99.5	Rank, 1 = worst of 10 years	3
Highest month	Nov 268.4	Lowest month	Jul 46.0
January to September mean	82.6	October to December mean	222.9

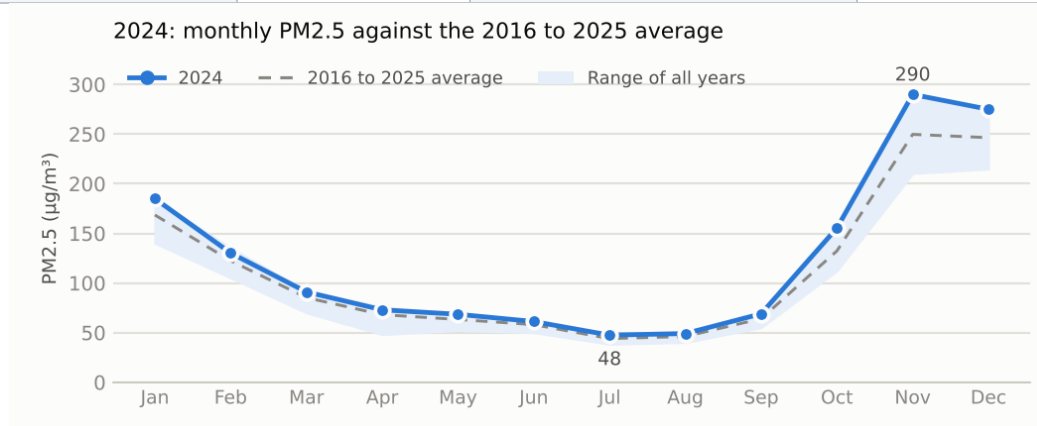


- The annual mean from the monthly values is 117.7 µg/m³, up 4.7 percent on 2022, ranking 3 of 10 (1 is worst).
- The highest month was Nov at 268.4, +7.5% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 46.0, 9.2 times the WHO guideline.
- October to December averaged 222.9, +15.6% against 2016 (192.9).
- **Context:** The Green Building for the Environmental Monitoring Center and EPD (Rs 3,723.9 million, including lab fit-out) was approved on 30 November 2023.

- **Context:** The PDF lists Happy Seeder distribution for farmers (2023 to 2025): moderate impact, with equipment costs still high for smallholders. It also records school closures in late 2023 during smog.

2024

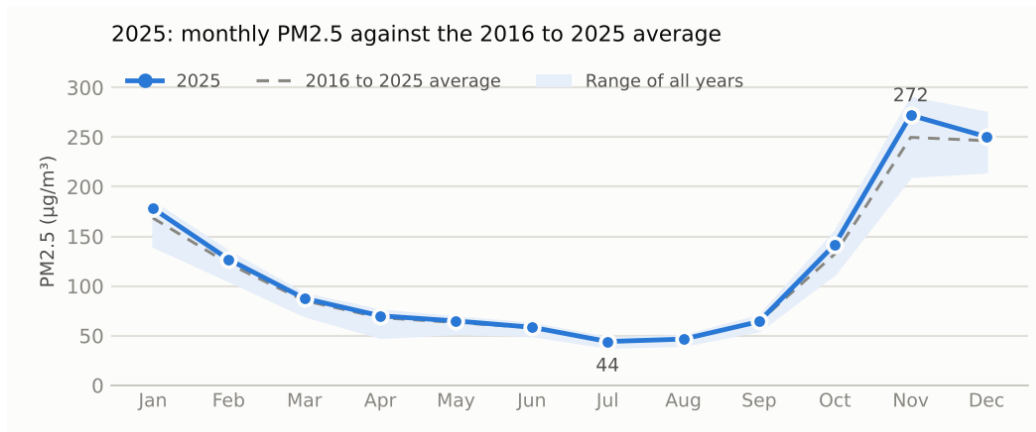
Annual, printed in PDF	116.2	Annual, mean of monthly values	124.6
IQAir published	102.1	Rank, 1 = worst of 10 years	1
Highest month	Nov 290.0	Lowest month	Jul 47.5
January to September mean	86.1	October to December mean	240.1



- The annual mean from the monthly values is 124.6 µg/m³, up 5.8 percent on 2023, ranking 1 of 10 (the worst year).
- The highest month was Nov at 290.0, +16.1% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 47.5, 9.5 times the WHO guideline.
- October to December averaged 240.1, +24.5% against 2016 (192.9).
- **Context:** Six schemes were approved totalling Rs 8.77 billion: Environmental Monitoring Center (10 May), the Sahiwal lab and EPA automation (22 July), the Green Credit Program (6 September), industrial-unit monitoring (15 October) and AirSafe (15 November, Rs 5,381 million). A tender for air quality monitoring equipment was published on 3 February.
- **Context:** The department was reorganised as EP&CCD. The PDF reports November 2024 as the worst month of the decade, with hourly spikes above 700 µg/m³ and early winter inversion coinciding with regional stubble burning.
- **Context:** IQAir's 2024 annual AQI for Lahore was 173.

2025

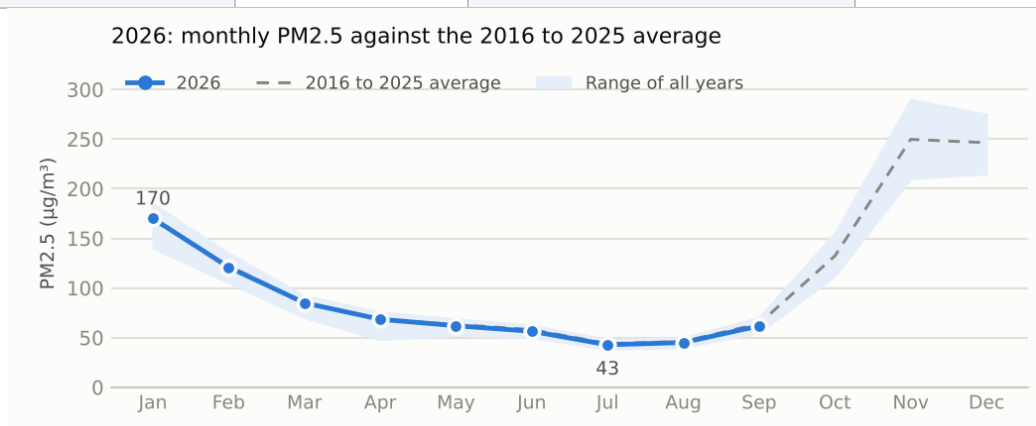
Annual, printed in PDF	108.8	Annual, mean of monthly values	117.1
IQAir published	88.9	Rank, 1 = worst of 10 years	4
Highest month	Nov 272.1	Lowest month	Jul 44.1
January to September mean	82.3	October to December mean	221.5



- The annual mean from the monthly values is 117.1 $\mu\text{g}/\text{m}^3$, down 6.0 percent on 2024, ranking 4 of 10 (1 is worst).
- The highest month was Nov at 272.1, +8.9% against the 2016 to 2025 average for Nov (249.8). The lowest was Jul at 44.1, 8.8 times the WHO guideline.
- October to December averaged 221.5, +14.8% against 2016 (192.9).
- **Context:** AirSafe tenders were issued on 27 January and 12 March under the 'Urgency' rule. 15 fog cannons were deployed in the winter smog season (about Rs 675 million, a media estimate). A technical committee for fog-cannon operations was formed on 22 July. The FY2025-26 environment development budget was Rs 15.0 billion, with Rs 3.38 billion for AirSafe.
- **Context:** The PDF says summer levels eased but November 2025 stayed severe (272.1) and that winter meteorology overrides local reductions.
- **Context:** IQAir's annual value is 88.9 $\mu\text{g}/\text{m}^3$ and Lahore ranked 8th worst city in the world for 2025. On 14 October 2025 IQAir reported AQI above 200.

2026 (January to September)

Annual, printed in PDF	79.2 (YTD)	Annual, mean of monthly values	n/a
IQAir published	n/a	Rank, 1 = worst of 10 years	n/a
Highest month	Jan 170.1	Lowest month	Jul 42.8
January to September mean	79.2	October to December mean	n/a



- Year to date, January to September averaged 79.2 $\mu\text{g}/\text{m}^3$: -3.8% against 2025, -0.9% against 2019 and +1.5% against 2016 (78.0).
- The highest month was Jan at 170.1, +0.9% against the 2016 to 2025 average for Jan (168.6). The lowest was Jul at 42.8, 8.6 times the WHO guideline.
- **Context:** On 20 to 21 February Punjab approved a Rs 3 billion project to deploy 30 fog cannons on electric trucks, with Rs 2.25 billion under the Lahore Air Improvement Framework and 50 or more

extra monitors. In June the FY2026-27 environment budget was announced at Rs 17.2 billion, including Rs 4.74 billion for 30 anti-smog guns.

- **Context:** IQAir reported AQI above 500 on 18 January (Lahore second in the world), AQI above 150 on 8 September, and AQI 158 with PM2.5 66 µg/m³ at about 1 AM on 5 October.
- **Context:** Only January to September is available. The smog season that decides the annual figure has not yet begun.

7. Regional comparison: Faisalabad and the Indian Punjab cities

The PDF compares Lahore with Faisalabad (Pakistan) and Amritsar, Ludhiana and Jalandhar (Indian Punjab) as one 'transboundary air basin'. Its table is compared here with figures on IQAir's own pages.

Table 15. The PDF's multi-city annual PM2.5 table (µg/m³)

City	Country	2018	2019	2020	2021	2022	2023	2024	2025
Lahore	Pakistan	114.9	89.5	79.2	86.5	97.4	99.5	108.2	102.1
Faisalabad	Pakistan	130.4	104.6	85.1	94.2	104.3	101.2	112.5	105.4
Amritsar	India	92.1	78.4	58.2	64.5	70.1	72.8	78.5	74.2
Ludhiana	India	95.3	81.0	61.4	67.8	73.5	75.2	81.0	77.0
Jalandhar	India	86.2	72.1	52.8	59.2	65.0	67.4	72.1	68.5

The PDF also gives 'variance vs WHO' for 2025: Lahore +1942%, Faisalabad +2008%, Amritsar +1384%, Ludhiana +1440%, Jalandhar +1270%. These follow from the 2025 values shown (for example $(102.1-5)/5 = 1942\%$).

Table 16. The same cities according to IQAir's published figures (µg/m³)

City	2018	2019	2020	2021	2022	2023	2024	2025	n/a means not published
Lahore	114.9	89.5	79.2	86.5	97.4	99.5	102.1	88.9	
Faisalabad	130.4	104.6	73.2	94.2	84.5	88.2	88.8	98.8	
Amritsar	60.6	47.2	n/a	n/a	n/a	n/a	n/a	n/a	
Ludhiana	n/a	49.3	n/a	n/a	n/a	n/a	n/a	n/a	
Jalandhar	56.4	41.0	n/a	n/a	n/a	n/a	n/a	n/a	

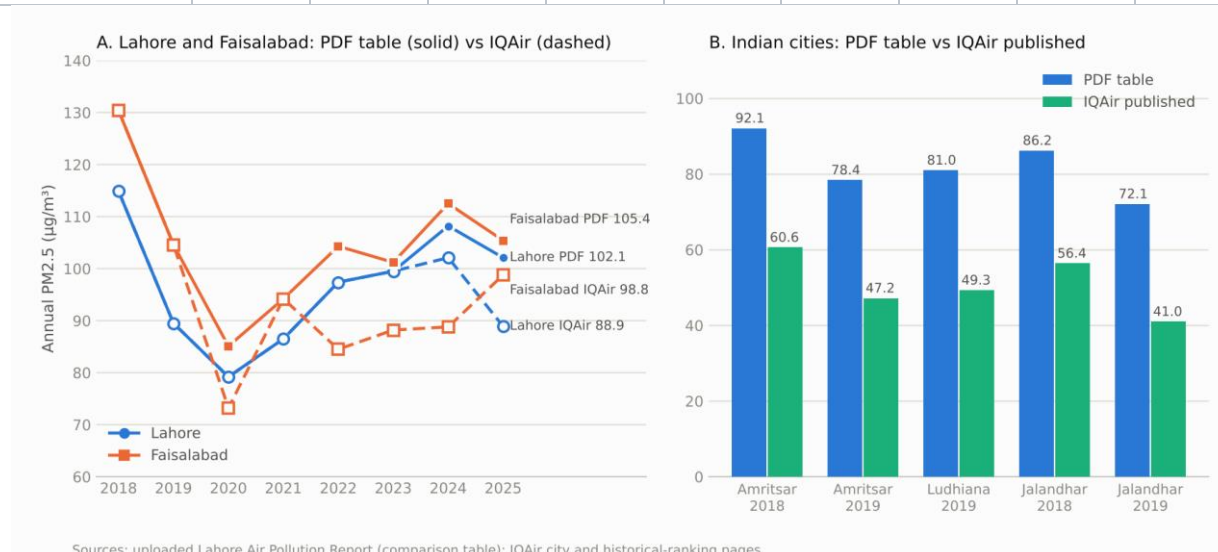


Figure 6. Comparison of the PDF's table with IQAir's published annual figures

What the comparison shows

- **Lahore matches IQAir to 2023, then diverges:** PDF 108.2 versus IQAir 102.1 in 2024, and 102.1 versus 88.9 in 2025.
- **Faisalabad matches only in 2018, 2019 and 2021:** the PDF is 6.6 to 23.7 $\mu\text{g}/\text{m}^3$ above IQAir in 2020 and in 2022 to 2025 (for example 2022: 104.3 versus 84.5).
- **Indian-city values are far above IQAir's:** Amritsar 2018 92.1 versus 60.6; 2019 78.4 versus 47.2. Ludhiana 2019 81.0 versus 49.3. Jalandhar 2018 86.2 versus 56.4; 2019 72.1 versus 41.0. The PDF's values are about 1.5 to 1.8 times IQAir's.
- **This changes the size of the cross-border gap.** In 2019 the PDF has Lahore (89.5) only 10 to 24 percent above the three Indian cities (72.1 to 81.0). On IQAir's figures Lahore is 1.8 to 2.2 times as polluted (Ludhiana 49.3, Amritsar 47.2, Jalandhar 41.0). The direction, that Lahore and Faisalabad are worse than the Indian Punjab cities, holds on both, but the gap is much larger on IQAir's numbers.
- **Timing of peaks differs:** IQAir's 2019 months put Ludhiana's worst months in October to December (November 78.8) and Amritsar's in November (86.2). Lahore peaks in January (199.1) and Faisalabad in January (220.4) and December (217.3). Jalandhar's worst month is December (63.8). The PDF's statement that all five cities show 'identical seasonal spikes during late October and November' is therefore true of the Indian pair and not of the Pakistani cities.

Table 17. Month-wise values published by IQAir for 2019 ($\mu\text{g}/\text{m}^3$)

City	Most polluted months	Least polluted months
Lahore	January 199.1; December 182.7	n/a
Faisalabad	January 220.4; December 217.3 (another IQAir page gives 226.2)	August 48.8
Ludhiana	November 78.8; October 69.9; December 62.4	February 23.1; August 29.1; September 35.2
Amritsar	November 86.2; December 70.1; October 67.1	February 14.2
Jalandhar	December 63.8; January 43.5	February, August and September (values n/a)

Snapshot, early on 5 October 2026 (IQAir)

City	AQI+ US	PM2.5 ($\mu\text{g}/\text{m}^3$)	Reading time
Jalandhar	188	108.5	5 Oct, 01:30
Ludhiana	176	91.5	5 Oct, 01:30
Amritsar	165	n/a	4 Oct, 16:44
Lahore	158	66	5 Oct, 01:00
Faisalabad	157	n/a	5 Oct (IQAir ranking list)

Readings were taken at different times, so this is a snapshot and not a trend. The Indian cities lead this morning because stubble-burning smoke reaches them first in October; Lahore's own peak normally comes in November to January.

8. Pollution sources, health claims and policy, as given in the PDF

This section reproduces the PDF's content. The PDF cites no sources for the shares, health statistics or economic estimates, so they are not used to draw conclusions in sections 3 to 5.

8.1 Sector contributions to PM2.5 in Lahore

Table 18. Sector shares (PDF, source apportionment not cited)

Sector	Share	Description in the PDF
Transport	43%	Diesel freight, older two-stroke engines, Euro-II fuel, unmaintained public transport. Over 4.5 million vehicles in the Lahore metropolitan area; local fuel has sulphur above 500 ppm
Industry	25%	Steel re-rolling, textiles, backup diesel generators on heavy fuel oil; industrial belt around Kala Shah Kaku and Sheikhpura
Brick kilns	15%	Traditional kilns burning coal, rubber and waste on the south-east periphery
Agriculture and waste	17%	Rice stubble burning (late October to November, 4 to 6 weeks) and open burning of municipal waste

8.2 Where the listed money points, set against those shares

Setting the PDF's shares against the procurement report's schemes is only indicative, because the procurement report covers one department. Spending on transport, fuel or agriculture by other departments is not in it (for example Happy Seeder subsidies are mentioned in the PDF without a cost). With that caveat:

- Transport is 43 percent of the PDF's source shares, yet the only transport-related item among Rs 35.08 billion of listed schemes is the proposed Fuel Quality Testing Labs at Rs 0.56 billion (1.6 percent), and it is unapproved.
- Brick kilns (15 percent) have no scheme in the procurement report. The PDF credits the 2019 Zig-Zag directive for about 80 percent compliance.
- Industry (25 percent) has Rs 0.86 billion for monitoring industrial units and Rs 2.95 billion proposed for an enforcement force.
- Agriculture and waste (17 percent) have no scheme in the procurement report.
- World Bank PCAP is also designed to reach transport and agriculture, so part of these gaps may be covered by PCAP spending outside this department. PCAP's own expenditure data are needed to settle it.

8.3 Health and economic claims

Table 19. Headline figures in the PDF (uncited)

Claim	Value
Average life expectancy lost	5.3 years
Estimated annual economic burden	US\$ 2.7 billion
Winter hospital admissions	+42%
Population exposed to smog	12.8 million

Table 20. Monthly hospital cases, baseline (July to August) against peak smog (November to December), per the PDF

Condition	Baseline cases	Peak cases	Increase	Main group affected
Acute upper respiratory tract infections	14,200	48,500	+241%	Children under 5, elderly

Condition	Baseline cases	Peak cases	Increase	Main group affected
Asthma exacerbations and bronchospasm	6,100	19,800	+224%	All ages
Ischaemic heart disease and vascular distress	3,400	7,200	+111%	Adults over 50
Ocular irritation and conjunctivitis	8,900	32,000	+259%	Outdoor workers, commuters

The PDF also lists productivity, education and logistics effects: absenteeism, school closures in late 2023 and 2024, and motorway and airport delays during dense smog.

8.4 Policy actions, 2016 to 2026

Table 21. Policy framework and outcomes (PDF)

Policy	Year	Target	Mandates	Outcome
Punjab Clean Air Action Plan	2017	Multi-sector	Air quality monitoring system; vehicle inspection stations	Partial success; limited sensor density delayed tracking
Zig-Zag Kiln Directive	2019	Brick manufacturing	Banned Bull's Trench Kilns; shift to Zig-Zag technology	High impact; about 80% compliance around Lahore by 2024
Smog Emergency Directives	2021-2024 (annual)	Urban transport and workplaces	Green lockdowns, early closures, vehicle impoundment	Short-term relief; limited structural change
Happy Seeder distribution	2023-2025	Agriculture	Subsidised equipment to sow wheat without burning paddy stubble	Moderate impact; equipment costs high for smallholders

The PDF identifies three enforcement gaps: fragmented inter-agency coordination, limited reference-grade public monitoring, and fuel quality standards. It also notes that Lahore sits downwind of crop-burning zones in autumn, so local measures yield limited results without regional coordination.

8.5 The PDF's 2026-2030 targets, and where Lahore stands

Table 22. Proposed action plan targets (PDF) and the gap from 2025

Phase	Window	Milestones	Target annual PM2.5	Gap from 2025 (printed / recomputed / IQAir)
I: Immediate stabilisation	2026-2027	Convert remaining kilns; night freight entry controls; scale stubble equipment	< 90.0	-17.3% / -23.1% / already met
II: Structural transition	2027-2029	Euro-V fuel import minimums; 30% of public buses electric; regional airshed monitoring	< 65.0	-40.3% / -44.5% / -26.9%
III: Advanced mitigation	2029-2030+	High electrification of light transport; industrial green energy; align standards closer to WHO	< 40.0	-63.2% / -65.8% / -55.0%

Whether Phase I is already met depends on the data series: IQAir's 2025 value (88.9) is under 90, while the PDF's own printed (108.8) and recomputed (117.1) values are well above it. This is one more reason to settle which series is authoritative before targets are set or judged.

8.6 Recommendations in the PDF

- **Transport and fuel (short to medium term):** national timeline for Euro-V/VI refinery standards; automated emissions testing for heavy vehicles entering the ring road; electrify buses and three-wheelers with charging support.

- **Industry and agriculture (medium to long term):** wet scrubbers and electrostatic precipitators for steel re-rolling mills and textile boilers; Happy Seeder and Smart Seeder subsidies; end open waste burning with better collection and waste-to-energy.

9. Conclusions and recommendations

9.1 What the evidence establishes

1. **Air quality did not improve over the decade.** On the PDF's data, 2025 was no better than 2016 (printed +2.0 percent, recomputed +9.7 percent), the worst year was 2024, and Oct to Dec was 14.8 percent worse. On IQAir's figures, 2025 is 0.7 percent better than 2019, within normal year-to-year noise.
2. **The only large reduction came from a lockdown, not a scheme.** The 2020 fall of about 25 percent was reversed within four years.
3. **Substantial money was committed.** Rs 20.67 billion of selected schemes approved in 2021 to 2024, Rs 38.68 billion across 30 schemes, Rs 15.0 billion for FY2025-26 and Rs 17.2 billion for FY2026-27, though only Rs 11.05 billion had been spent by June 2025.
4. **Most of the money measures pollution or builds capacity; relatively little acts on the largest emission sources.** Half of the approved money is monitoring and laboratories. The direct anti-smog items are fog cannons, whose effect on PM2.5 is contested.
5. **The World Bank is a major financier of the sector.** A USD 300 million IDA loan for PCAP was approved in March 2025, alongside PGDP monitoring schemes worth Rs 6.07 billion. The data to September 2026 show no sustained fall yet.

9.2 What it does not establish

1. That the spending caused the lack of improvement. The two largest air-mitigation items arrived late (AirSafe approved November 2024; fog cannons deployed in the 2025 winter; expansion in 2026), and there is no before-and-after evaluation.
2. That money was wasted or misused. No EPD-specific audit finding was found, though the urgency rule and value-for-money questions deserve scrutiny.
3. That weather did not matter. Winter meteorology and regional stubble burning dominate the annual figure, so a flat trend cannot isolate policy effects.
4. Any year-by-year spending before 2021. The procurement report does not cover it.
5. **That the World Bank financing failed or was misused.** PCAP is just over eighteen months old, neither source report holds PCAP outcome data, and nothing here suggests corruption or embezzlement in any air quality fund.

9.3 Recommended next steps

1. **Settle the data.** Replace the PDF's monthly matrix with an IQAir export for 2016 to 2026 (or a reference-grade government series), correct the printed annual averages, and fix the 2024 and 2025 table entries.
2. **Get actual expenditure.** Obtain annual expenditure by scheme from the Punjab budget books and Auditor General reports for 2016 to 2026, to replace approval-year totals, and request the PPRA contract-awarded register for AirSafe.
3. **Evaluate the fog cannons.** Compare PM2.5 near deployment sites with matched control sites, before and after, and report water use alongside.
4. **Match spending to sources.** Set the sector shares against spending across all departments, including transport, fuel standards and agricultural equipment, not only EPD's.

5. **Re-run this comparison after the 2026 smog season**, when the new fog cannons and 50 or more additional monitors have operated through a full winter.
6. **Audit the World Bank financing.** Ask the World Bank for an independent performance audit of the PCAP loan and the PGDP monitoring schemes against the 35 percent PM2.5 target, and ask the Government of Punjab to publish PCAP spending by component and year.

Appendix A. Full monthly PM2.5 matrix

Monthly means in $\mu\text{g}/\text{m}^3$ as given in the PDF, with the annual figure as printed and as recomputed.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Printed	Mean of months
2016	162.4	120.1	82.5	68.3	62.0	58.1	42.0	45.2	61.3	112.5	225.4	240.8	106.7	106.7
2017	175.2	128.4	88.0	72.1	65.4	60.2	45.1	48.0	68.2	130.6	260.1	255.0	116.3	116.4
2018	180.5	135.0	92.3	75.8	68.9	62.5	48.2	50.1	70.4	142.0	245.8	270.2	119.3	120.1
2019	165.1	118.6	85.2	70.4	64.1	59.8	44.5	46.2	65.0	128.4	230.1	220.5	103.9	108.2
2020	140.2	105.3	70.1	48.2	52.0	50.1	38.4	40.2	55.1	115.0	210.4	215.0	89.2	95.0
2021	158.4	112.0	80.5	62.1	58.0	54.2	41.0	43.5	58.9	122.3	240.5	235.1	97.2	105.5
2022	168.0	122.5	86.4	69.8	63.2	57.0	43.2	45.0	62.1	135.2	255.0	242.0	104.1	112.5
2023	172.5	125.1	89.2	71.5	66.0	59.1	46.0	47.8	66.5	140.1	268.4	260.2	109.3	117.7
2024	185.0	130.2	91.0	73.0	68.5	61.2	47.5	49.1	69.0	155.4	290.0	275.0	116.2	124.6
2025	178.2	126.8	87.5	70.0	64.8	58.5	44.1	46.5	64.2	142.0	272.1	250.4	108.8	117.1
2026	170.1	121.0	85.0	68.5	62.0	56.4	42.8	45.1	61.8	-	-	-	79.2*	79.2*

* 2026 is January to September only. The matrix reproduces the PDF; section 2 explains why its monthly values are unverified.

Appendix B. Data conflicts in detail

B.1 Printed annual averages vs the mean of the PDF's monthly values

Year	Printed	Mean of months	Printed minus mean	Matches?
2016	106.7	106.7	-0.02	Yes (rounding)
2017	116.3	116.4	-0.06	Yes (rounding)
2018	119.3	120.1	-0.84	No
2019	103.9	108.2	-4.26	No
2020	89.2	95.0	-5.80	No
2021	97.2	105.5	-8.34	No
2022	104.1	112.5	-8.35	No
2023	109.3	117.7	-8.40	No
2024	116.2	124.6	-8.38	No
2025	108.8	117.1	-8.29	No

B.2 The PDF's table against IQAir, Lahore and Faisalabad

Year	Lahore PDF	Lahore IQAir	Difference	Faisalabad PDF	Faisalabad IQAir	Difference
2018	114.9	114.9	+0.0	130.4	130.4	+0.0
2019	89.5	89.5	+0.0	104.6	104.6	+0.0
2020	79.2	79.2	+0.0	85.1	73.2	+11.9
2021	86.5	86.5	+0.0	94.2	94.2	+0.0
2022	97.4	97.4	+0.0	104.3	84.5	+19.8
2023	99.5	99.5	+0.0	101.2	88.2	+13.0
2024	108.2	102.1	+6.1	112.5	88.8	+23.7
2025	102.1	88.9	+13.2	105.4	98.8	+6.6

B.3 Indian cities: the PDF against IQAir

City and year	PDF	IQAir	Difference	Ratio (PDF to IQAir)	
Amritsar 2018	92.1	60.6	+31.5	1.52	
Amritsar 2019	78.4	47.2	+31.2	1.66	
Ludhiana 2019	81.0	49.3	+31.7	1.64	
Jalandhar 2018	86.2	56.4	+29.8	1.53	
Jalandhar 2019	72.1	41.0	+31.1	1.76	

B.4 IQAir's published 2019 months against the PDF's

Month, Lahore	PDF	IQAir	Difference	Comment
January 2019	165.1	199.1	-34.0	PDF below IQAir
December 2019	220.5	182.7	+37.8	PDF above IQAir

B.5 Smaller points

- The PDF's headline 'lowest monthly average (July 2020) 38.4' and 'peak monthly average (November 2024) 290.0' do match its matrix. Its headline 21.1 times WHO is 105.4 divided by 5, which uses the unsupported 105.4 average.
- The 2026 'annual' value 79.2 is a January to September year-to-date mean (the PDF says so), and should not be compared with full-year values.
- IQAir's own pages give two December 2019 values for Faisalabad (217.3 and 226.2).

Appendix C. Glossary

Term	Meaning
PM2.5	Fine particles 2.5 micrometres or smaller, small enough to enter the lungs and blood. Measured in micrograms per cubic metre ($\mu\text{g}/\text{m}^3$).
WHO guideline	The World Health Organization's annual PM2.5 guideline: 5 $\mu\text{g}/\text{m}^3$.
Punjab standard	Punjab's PM2.5 limit of 35 $\mu\text{g}/\text{m}^3$ (also written PEQS in the PDF).
AQI	Air Quality Index. IQAir's US AQI+ treats 150 to 200 as 'unhealthy' and above 300 as 'hazardous'; Punjab's own AQI scale has been criticised as more lenient.
Printed / recomputed	'Printed' means the annual average as printed in the PDF. 'Recomputed' means the arithmetic mean of the PDF's twelve monthly values.
EPD / EP&CCD	Punjab Environment Protection Department, renamed Environment Protection & Climate Change Department in 2024.
EPA Punjab	Environmental Protection Agency, Punjab; the operational arm of EPD.
ADP	Annual Development Programme: Punjab's yearly development budget book.
PPRA	Punjab Procurement Regulatory Authority. Rule 59 allows urgent procurement outside normal open bidding.
PGDP / PCAP	World Bank programmes funding Punjab environment schemes (Punjab Green Development Program; Punjab Clean Air Program).
IDA	International Development Association, the World Bank Group's concessional lending arm (the source of the USD 300 million PCAP loan).
AQMS	Air Quality Monitoring Station(s).
EMC	Environmental Monitoring Center.
AirSafe	The 'Punjab Smog Mitigation and Response Initiative - AirSafe': fog cannons, samplers and analysers.
Fog cannon / smog gun	A truck-mounted machine that sprays water mist to settle dust and particles.
BTK / Zig-Zag	Bull's Trench Kiln (older brick kiln) and the cleaner Zig-Zag kiln design.
YTD	Year to date: here, January to September 2026.
Rs, bn, m	Pakistani rupees; billion (1,000 million); million.

Sources

- Lahore Air Quality Assessment Report (2016-2026), published October 2026.
- EPD/EP&CCD Procurement Report, technical analysis by Amjad Butt, September 2026. It draws on PPRA Punjab; EPD/EPA Punjab tenders and AirSafe documents; the Punjab Planning & Development Department ADP FY2025-26; 24NewsHD; Asia News Network; Profit; The Express Tribune; Daily Times; Gulf News; The News/Geo; and Eco-Business/Dialogue Earth, as listed in that report.
- IQAir historical annual PM2.5, Lahore and Faisalabad 2018 to 2025: <https://www.iqair.com/world-most-polluted-cities>
- IQAir Lahore page, including real-time reading and background: <https://www.iqair.com/air-quality/pakistan/punjab/lahore>

- IQAir Faisalabad page: <https://www.iqair.com/air-quality/pakistan/punjab/faisalabad>
- IQAir Ludhiana page: <https://www.iqair.com/air-quality/india/punjab/ludhiana>
- IQAir Amritsar page: <https://www.iqair.com/in-en/air-quality/india/punjab/amritsar>
- IQAir Jalandhar page: <https://www.iqair.com/me-ar/india/punjab/jalandhar>
- IQAir Punjab (India) live ranking: <https://www.iqair.com/in-en/india/punjab>
- IQAir Pakistan page: <https://www.iqair.com/pakistan>
- IQAir World Air Quality Report press release 2022: <https://www.iqair.com/newsroom/world-air-quality-report-press-release-2022>
- IQAir newsroom, Lahore, 14 October 2025: <https://www.iqair.com/newsroom/lahore-among-top-10-most-polluted-cities-in-the-world-10-14-2025>
- IQAir newsroom, Lahore, 18 January 2026: <https://www.iqair.com/af/newsroom/lahore-among-top-10-most-polluted-cities-in-the-world-1-18-2026>
- IQAir newsroom, Lahore, 8 September 2026: <https://www.iqair.com/la-en/newsroom/lahore-among-top-10-most-polluted-cities-in-the-world-9-8-2026>
- World Bank press release, 28 March 2025, Pakistan: World Bank Supports Punjab's Smog Mitigation Action Plan with \$300 Million Concessional Loan: <https://www.worldbank.org/en/news/press-release/2025/03/27/pakistan-world-bank-supports-punjab-s-smog-mitigation-action-plan-with-300-million-concessional-loan>
- Arab News, 6 June 2025, Under new World Bank threshold, over 44% Pakistanis now live below poverty line: <https://arab.news/j6hwb>
- Al Jazeera, 24 March 2026, Pakistan world's most polluted country in 2025: <https://www.aljazeera.com/news/2026/3/24/pakistan-worlds-most-polluted-country-in-2025-report>