



Pollution, People & Product:

Journey to Design the Perfect Air Purifier for India

Codebasics RPC July 2025

Created by Archit Kannan

The Story So Far...



“AirPure Innovations” is a response to India’s severe air pollution crisis, with 14 of its cities among the world’s top 20 most polluted.

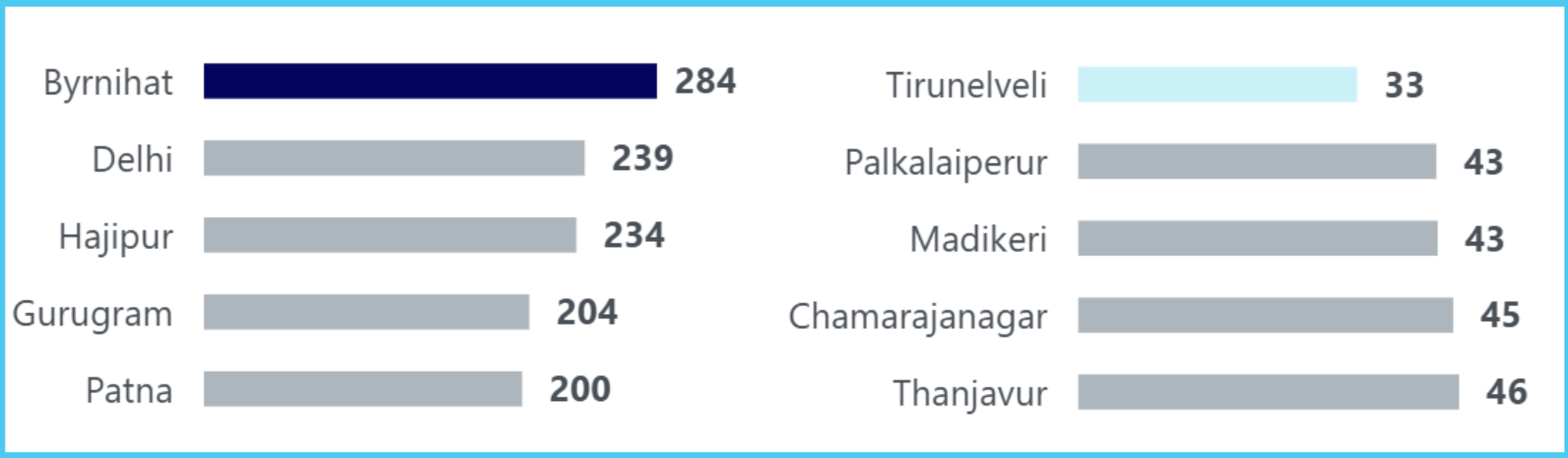
The startup faces a crucial challenge: is there lasting demand for their air purifier?

Before investing in full-scale development, AirPure needs know:

- Which pollutants plague Indian cities most?
- What features do customers truly need?
- Where is demand strongest, and how big are those markets?
- And finally, how can R&D be tailored for each city’s unique pollution profile?



Byrnihat's AQI (N-E India) was ~9x higher than Tirunelveli between 1 Dec'24 to 31 May'25



Note: Calculations considered only those areas that had consistent monthly AQI readings between Dec'24 to Apr'25



PM10 and PM2.5 mostly dominate as key pollutants across South India (similar trend across regions)

Major Pollutants

State	Pollutants	Concentration %
Andhra Pradesh	PM10	1.3%
	PM2.5	0.8%
Karnataka	CO	1.3%
	PM10	5.4%
Kerala	PM10	1.3%
	PM2.5	0.5%
Tamil Nadu	PM10	2.7%
	PM2.5	1.1%
Telangana	PM10	0.4%
	PM2.5	0.2%

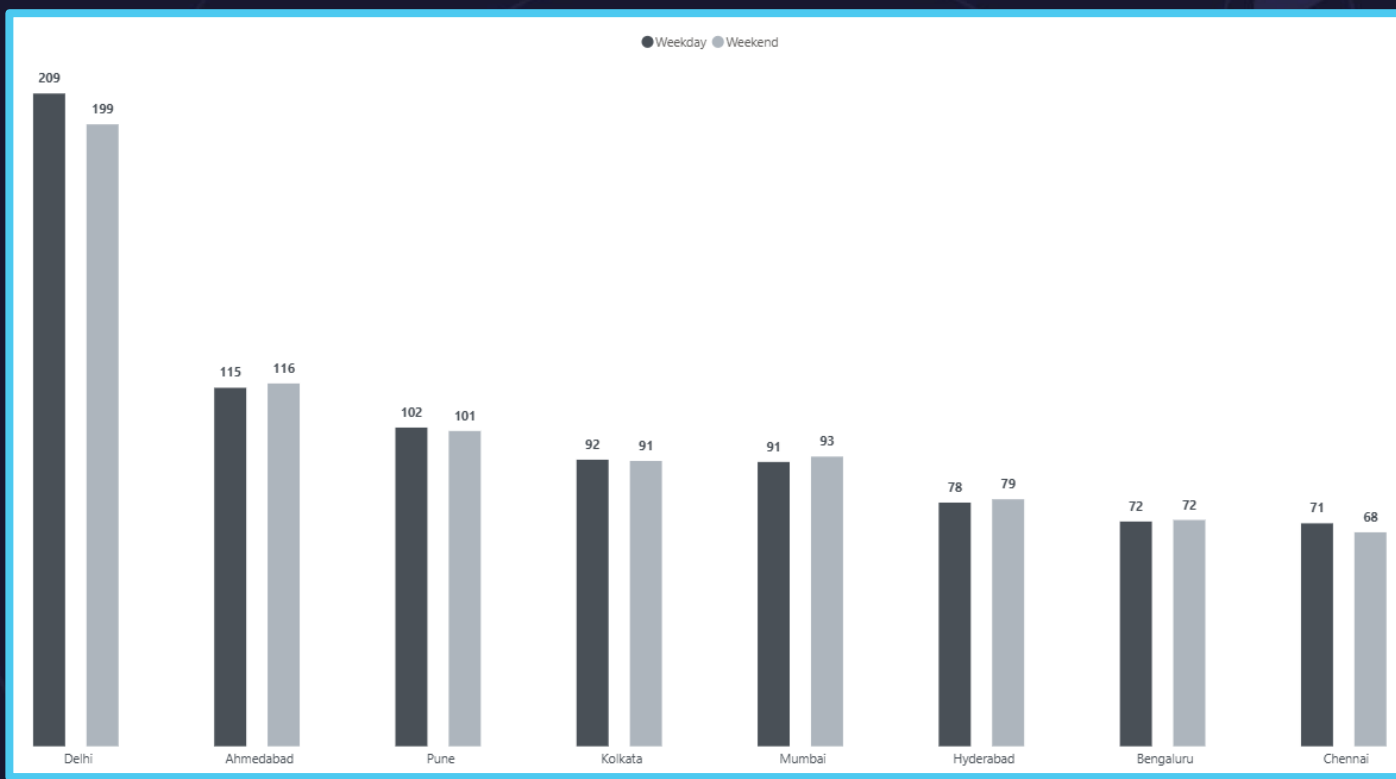
Minor Pollutants

State	Pollutants	Concentration %
Andhra Pradesh	NO2	0.1%
	SO2	0.0%
Karnataka	NH3	0.0%
	SO3	0.0%
Kerala	NH3	0.0%
	SO2	0.0%
Tamil Nadu	NH3	0.0%
	NO2	0.2%
Telangana	NO2	0.0%
	O3	0.1%

Note: Calculations considers periods on or after 1 Jan 2022



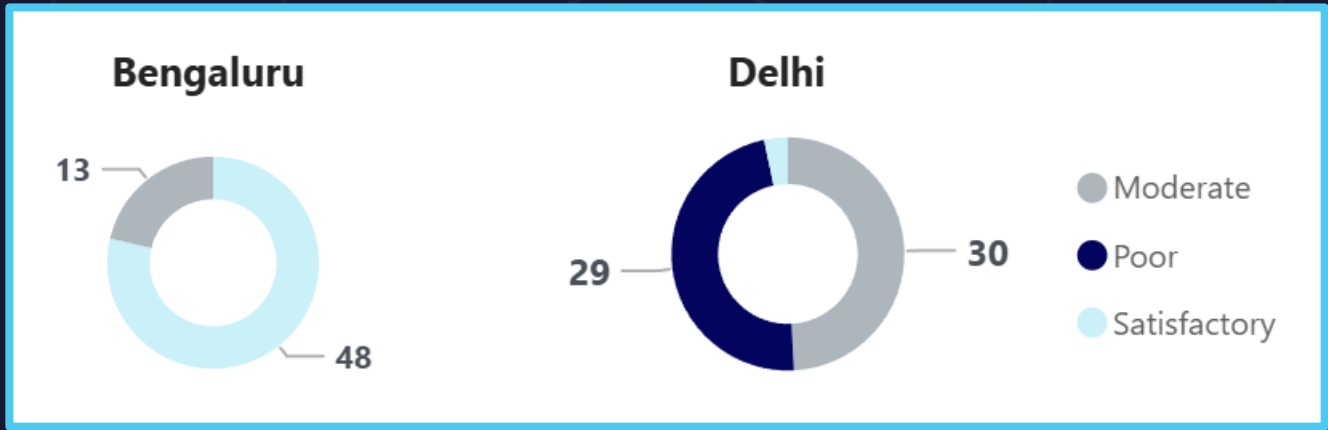
Air quality remains consistent across the week



From 1 May' 24 to 30 April'25, average AQI across metro cities showed negligible variation between weekdays and weekends



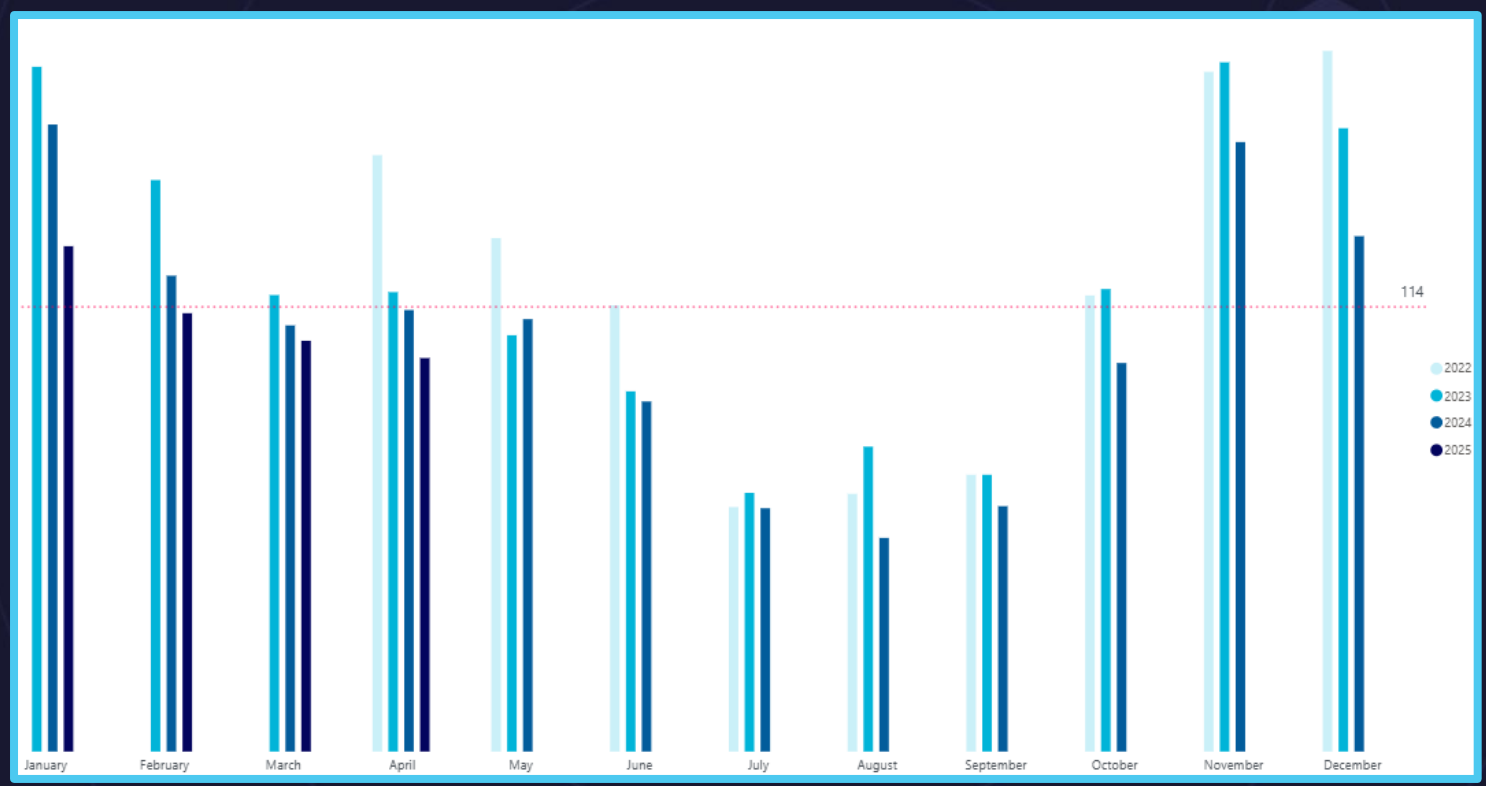
Bengaluru recorded 24X more 'Satisfactory' air quality days than Delhi between March and May 2025



Note: Calculations considered only those areas that had consistent monthly AQI readings between Dec'24 to Apr'25



AQI during Nov, Dec and Jan were consistently poor in India's largest states by distinct monitoring area



AQI during November, December and January (across April 2022 to April 2025) consistently exceeded the mean (114) in India's 10 largest states by distinct area - Andhra Pradesh, Bihar, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, and Uttar Pradesh - indicating a recurring seasonal dip in air quality.



No direct correlation between high AQI and ambient respiratory disease prevalence (based on available data)

State	Total Cases	Average AQI
Delhi	42	188
Dengue	40	
Measles	2	
Jharkhand	7691	164
Acute Diarrheal Disease	1700	
Malaria	5991	
Himachal Pradesh	2832	160
Acute Diarrheal Disease	2273	
Hepatitis A	559	
Bihar	2244	153
Acute Diarrheal Disease	1388	
Dengue	856	
Haryana	1705	140
Acute Diarrheal Disease	733	
Cholera	972	
Chandigarh	16	133
Cholera	16	
Rajasthan	2491	128
Acute Diarrheal Disease	1655	
Dengue	836	
Tripura	658	125
Acute Diarrheal Disease	399	
Dengue	259	
Odisha	10440	124
Acute Diarrheal Disease	6315	
Food Poisoning	4125	
Uttar Pradesh	6997	119
Acute Diarrheal Disease	4515	
Food Poisoning	2482	

Between May 2022 and April 2025, the available datasets shows no clear, direct correlation between high AQI and disease prevalence - especially for ambient respiratory diseases.

However, poor air quality is well documented as a major contributor to weakened immunity and overall health.

List of top 10 states with high average AQI and their top 2 reported diseases

India's ambient PM2.5 levels far exceed global standards



Numerous studies have indicated that PM2.5 is far more harmful than PM10 due to its ability to penetrate deeper into the lungs.

Most cities in the Indo-Gangetic Plain and NCR exceed safe PM2.5 levels.



Children under 5 and adults over 70 are the most affected health-wise*



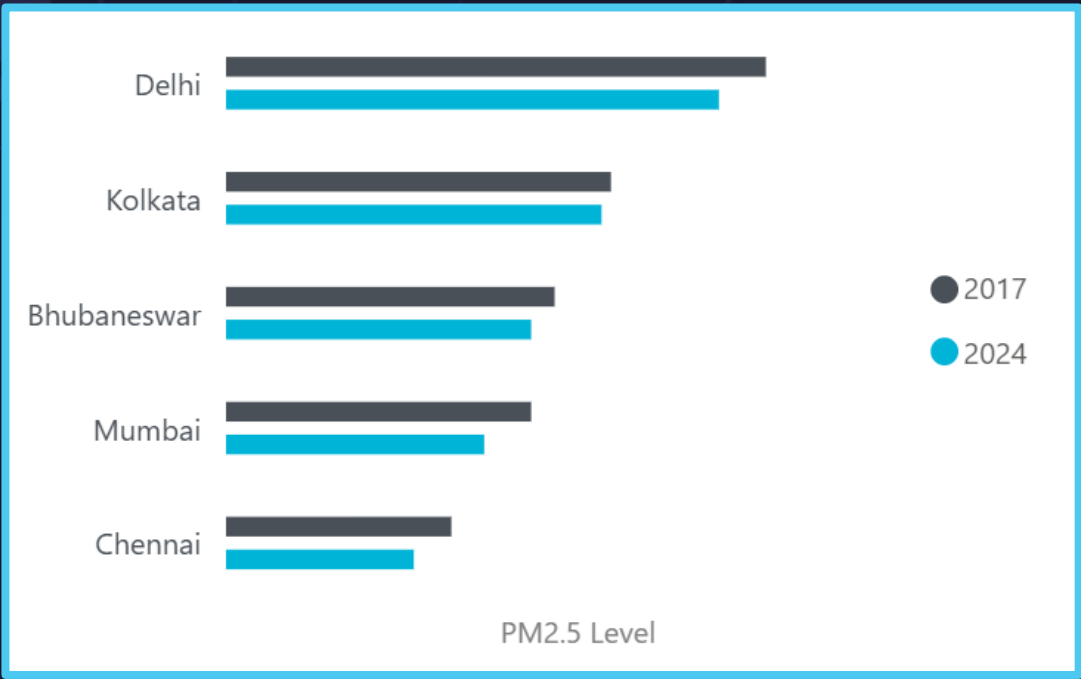
Children under 5 are more affected by PM2.5 - they breathe more per body weight and cannot clear toxins effectively.

Adults over 70 years face higher death risk from heart and lung diseases, made worse by age and existing health issues.

**Composite Vulnerability Score calculated based on multiple academic studies - Impact of ambient air pollution and socio-environmental factors on the health of children younger than 5 years in India: a population-based analysis, The Lancet Regional Health - Southeast Asia, Volume 20, 100328 ; Investigating the Nexus of Ambient and Household Pollution Across Life Stages. Geohealth. 2024 Aug; Spatiotemporal analysis of the burden of lower respiratory infections in the older adult population due to air pollution: trends from 1990 to 2021 and predictions for the next 30 years. Front. Public Health.*



Policies are working - but not everywhere, and not enough...

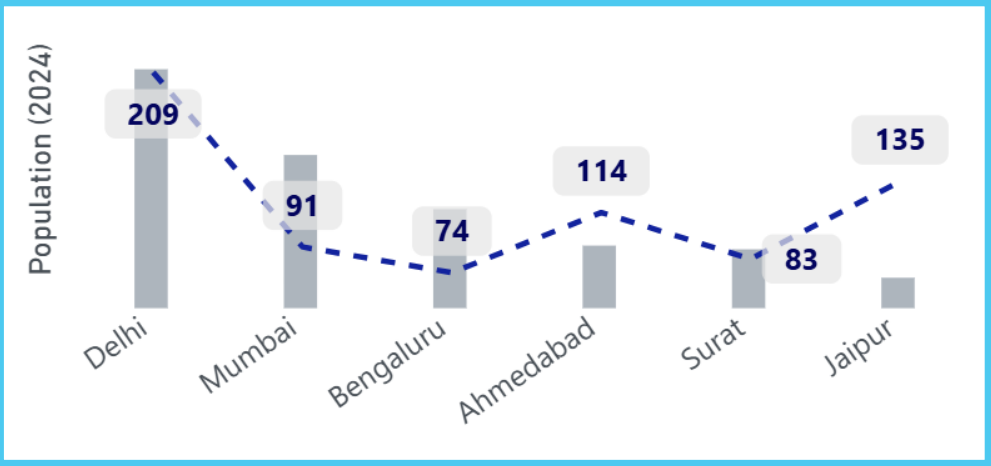


NCAP, BS-VI, PMUY, and GRAP have improved air quality, but enforcement remains uneven.

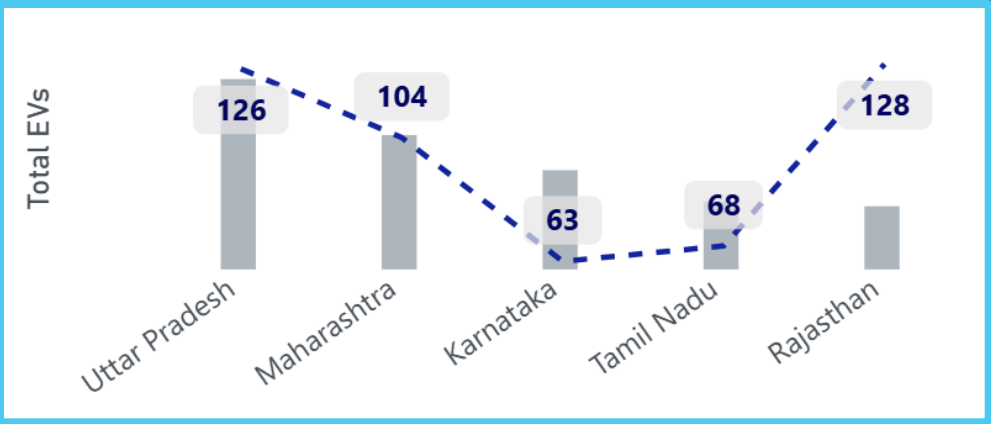
Northern cities have higher PM2.5 baselines and slower reductions than southern cities due to stubble burning, geo and meteorological factors, household biomass burning and higher vehicle density.



Location determines city air quality, not population size



In 2024, air quality shows a clear geographic divide — cities towards the north like Delhi and Jaipur have far higher AQI than others, regardless of population size.



This finding is further confirmed, when analyzing top 5 EV adopter states against air quality.

From April 2022 to April 2025, the top 5 states for EV adoption do not show better air quality. Instead, the data mirrors India’s geographic divide — northern states, despite high EV uptake, continue to record significantly worse air quality.



Indians recognize what AQI is, but not its implications*

Survey Questions	Delhi	Other Metros	Other Cities
Heard of AQI	82%	60%	24%
Can link AQI to lung health risk	73%	70%	60%
Can link AQI to overall health	63%	40%	20%
Know what AQI means	63%	35%	18%
Know color codes	60%	55%	15%

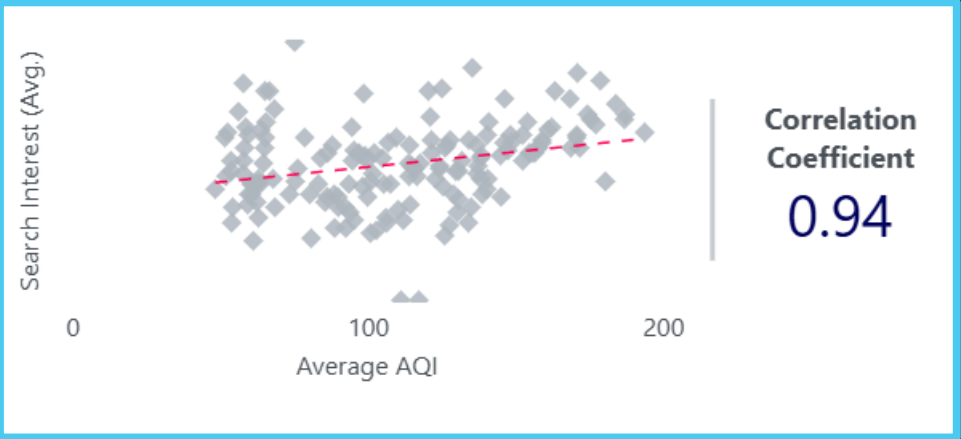
While many in metros recognize the term AQI, few grasp its actual health impact; in smaller cities, both awareness and understanding remain low.

Above all, there is a need to close the gap between 'hearing about poor air quality' and 'knowing what to do about it'.

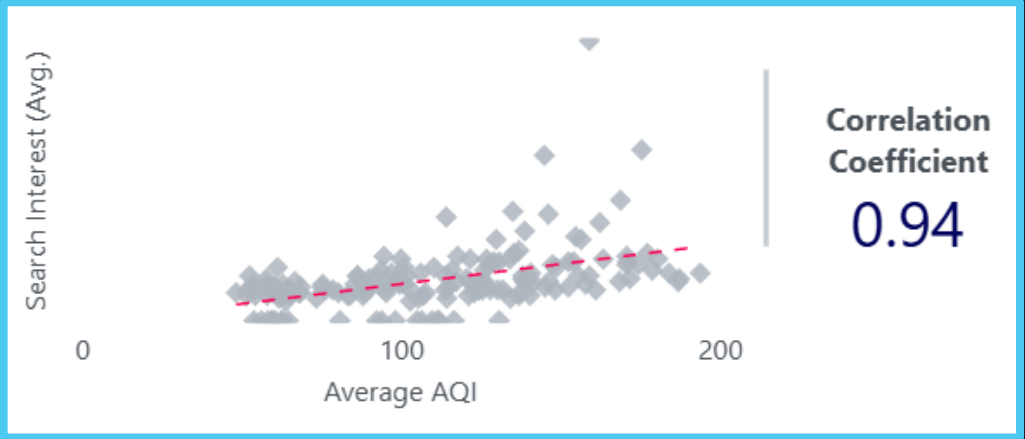
**Based on multi-city survey results (2018, 2020). No comparable national surveys available as of 2025. Digital trends in 2024–2025 (Google search data) suggest rising topic interest, but literacy and behavioral response gaps remain.*



Health and demand signals triggered by pollution spikes



From Apr 2022 to Apr 2025, national search interest for child asthma-related terms* showed a strong correlation (0.94) with average AQI, indicating public concern rises with worsening air quality.



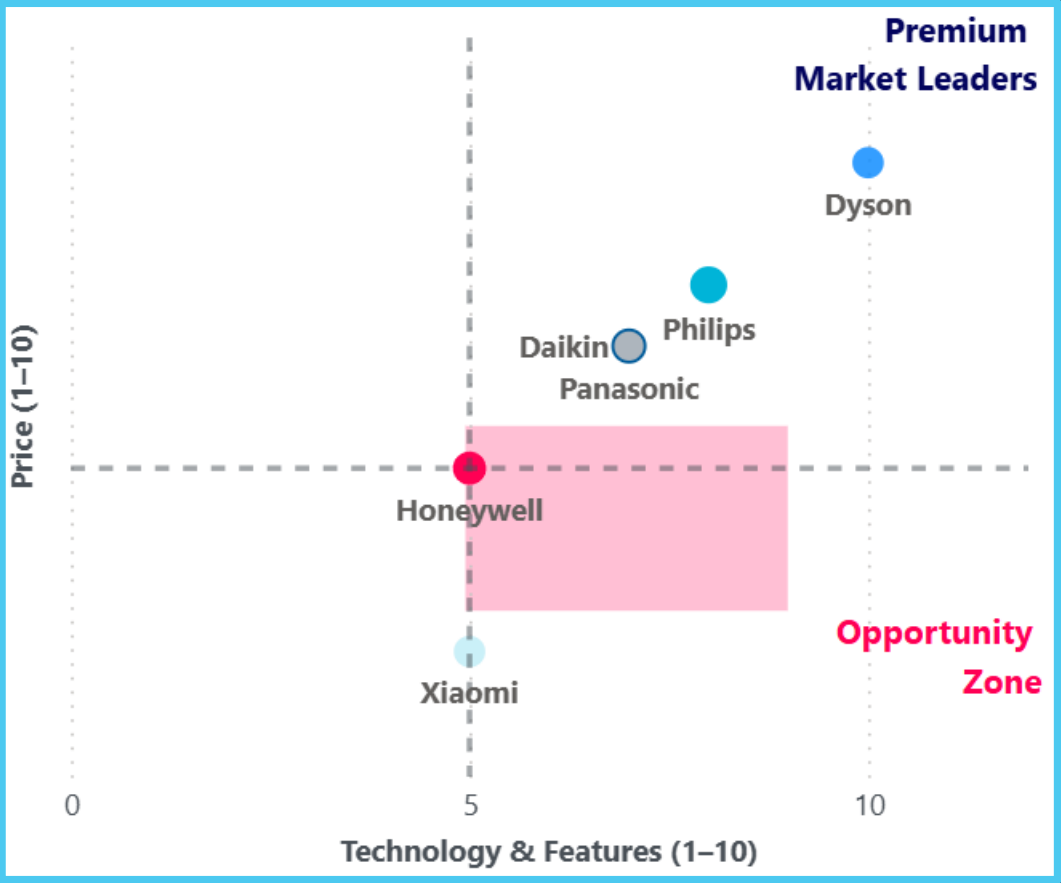
For the same period, national search interest for air purifier purchase related terms ^ again showed a strong correlation (0.94) with average AQI.

Both “air purifier purchase” and “child asthma” searches are near-perfectly correlated (0.99) and strongly linked to AQI (0.94), indicating both spike during the same pollution events

*child asthma + pediatric asthma + child asthma treatment + child wheezing: (India)
^ air purifier + best air purifier + HEPA air purifier + home air purifier + portable air purifier: (India)



Major competitors operate as Premium Market Leaders; opportunity lies in Mid-Tier Market for India's needs



Brands or new entrants that offer advanced technology and valuable features at affordable or mid-level prices can capture a wider market share, especially in a price-sensitive market like India.

Differentiators:

- Dyson - Most premium, high quality innovation in tech and design
- Philips - Premium, more accessible than Dyson, high trust
- Panasonic - Mid-premium with balanced features
- Daikin - Value for money, reliable, smart home integration
- Honeywell - Value focused, few smart features, energy efficient
- Xiaomi - Very affordable, strong IoT for price, basic filtration

3 out of 60 tier 1 and 2 cities show persistent AQI decline



City	AQI - 2Y Ago	AQI - 1Y Ago	AQI - Last 12M	Trend ▲
Gorakhpur	88	107	112	Declining
Nashik	80	82	92	Declining
Srinagar	44	67	71	Declining
Amravati		101	81	Improving
Bhiwandi		115	104	Improving
Bhubaneswar		174	99	Improving
Cuttack		174	104	Improving
Tiruchirappalli		71	60	Improving
Bareilly	101	78	56	Improving
Belgaum	100	60	55	Improving
Bengaluru	77	75	72	Improving
Bhilai	74	73	71	Improving
Bhopal	124	116	115	Improving
Chennai	78	76	70	Improving
Faridabad	208	185	153	Improving

Considering a trailing 12-month average AQI, only, air quality trends are improving in nearly half of Tier 1 & 2 cities, but 3 cities show sustained decline while the rest experience mixed patterns, indicating uneven progress.

Possibly because of varying local pollution sources, enforcement levels, and environmental conditions across cities.



Tier 1 metros: High-risk, high-potential markets for air quality solutions



Normalized city risk score scales population and income levels so that cities of differing sizes and conditions can be ranked or compared fairly.

City	Health Cost Impact (Per Capita)	City Risk Score (0-100)
Delhi	₹59,591	100.0
Mumbai	₹18,380	36.0
Bengaluru	₹15,582	5.5
Chennai	₹14,581	3.7
Hyderabad	₹18,054	3.2
Kolkata	₹9,828	2.7
Pune	₹19,428	2.1
Kozhikode	₹9,465	1.4

Several tier-2 cities register higher per-person health cost impacts than many metros, highlighting that pollution’s economic burden isn’t limited to India’s largest cities.



ANNEXURES



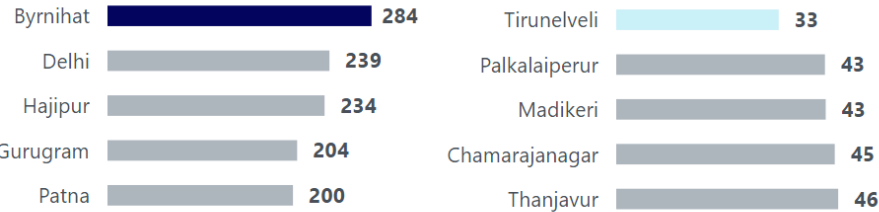
AQI Severity

Health Impact

People & Demand

Market & Competition

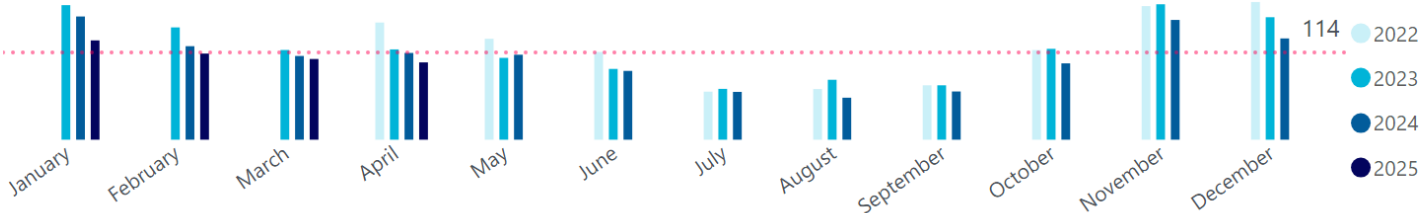
Where is air quality the highest and lowest?*



Byrnihat’s average AQI (an industrial town on the Assam-Meghalaya border) was nearly **9X** higher than Tirunelveli’s **between 1 December 2024 and 31 May 2025**.

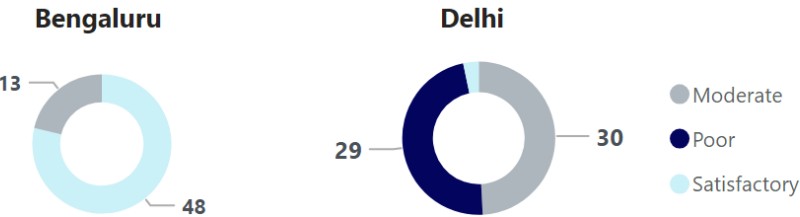
**Based only on locations with consistent monthly data across this period*

Which months show consistently poor air quality among select states?



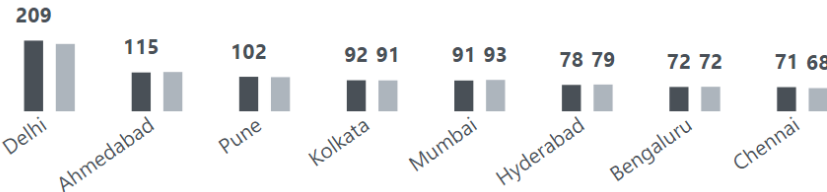
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Bengaluru vs Delhi: Who had better air?



Between 1 March and 31 May 2025, Bengaluru recorded **24X** more ‘Satisfactory’ air quality days than Delhi.

Does air quality improve on weekends in metros?



From **1 May 2024 to 30 April 2025**, average AQI across metro cities showed **negligible variation between weekdays and weekends**: this suggests **air quality remains consistent throughout the week**.

Major vs. Minor Pollutants – South India

Major	Minor
<input type="checkbox"/> Andhra Pradesh	PM10
	PM2.5
<input type="checkbox"/> Karnataka	CO
	PM10
<input type="checkbox"/> Kerala	PM10
	PM2.5
<input type="checkbox"/> Tamil Nadu	PM10
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<input type="checkbox"/> Telangana	PM10
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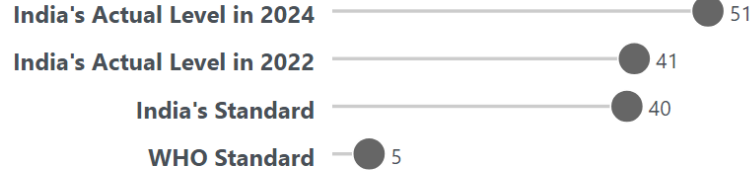
Is air quality linked to diseases across India's states?

State	Total Cases	Average AQI
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Dengue	40	
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However, poor air quality is well documented as a major contributor to weakened immunity and overall health.

India's ambient PM2.5 levels far exceed global standards



Numerous studies have indicated that **PM2.5 is far more harmful than PM10** due to its ability to penetrate deeper into the lungs.

Most cities in the Indo-Gangetic Plain and NCR exceed safe PM2.5 levels.

India can regain lost years of life by cutting PM2.5 levels

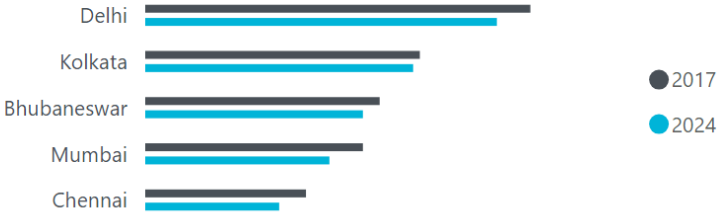
State	2022 PM2.5 Annual Average	Years Added by Meeting WHO PM2.5 Guideline	Years Added by Meeting India's PM2.5 Standard
Delhi	84.3	7.8	4.3
Uttar Pradesh	65.5	5.9	2.5
Bihar	61.6	5.5	2.1
Haryana	58.5	5.2	1.8
Punjab	51.6	4.6	1.1
Chhattisgarh	47.2	4.1	0.7
Tripura	45.7	4.0	0.6
West Bengal	43.4	3.8	0.3
Chandigarh	42.5	3.7	0.2
Jharkhand	41.5	3.6	0.1

Which age groups are most affected?



Children under 5 are more affected by PM2.5 - they breathe more per body weight and cannot clear toxins effectively. **Adults over 70 years** face higher death risk from heart and lung diseases, made worse by age and existing health issues.

Policies are working - but not everywhere, and not enough...



NCAP, BS-VI, PMUY, and GRAP have improved air quality, but enforcement remains uneven.

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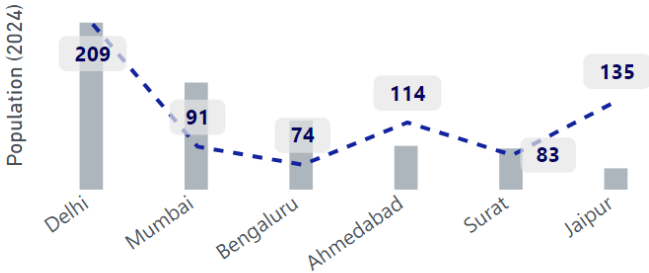
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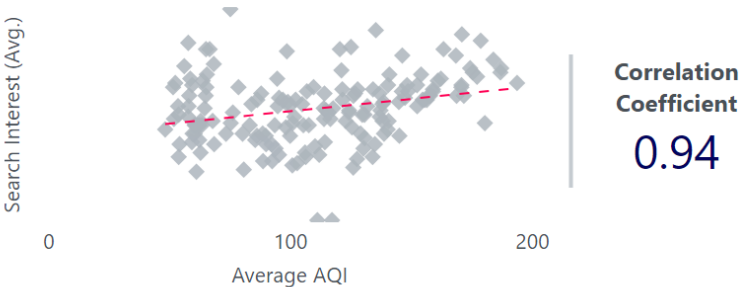
How aware are Indians of AQI and its health implications?

Survey Questions	Delhi	Other Metros	Other Cities
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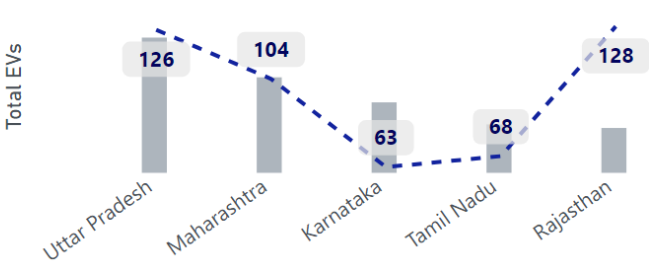
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Health and demand signals triggered by pollution spikes

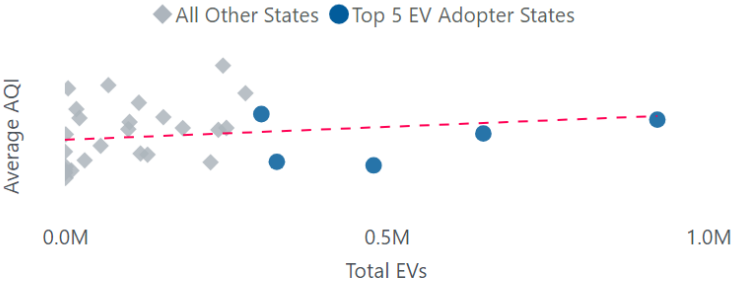


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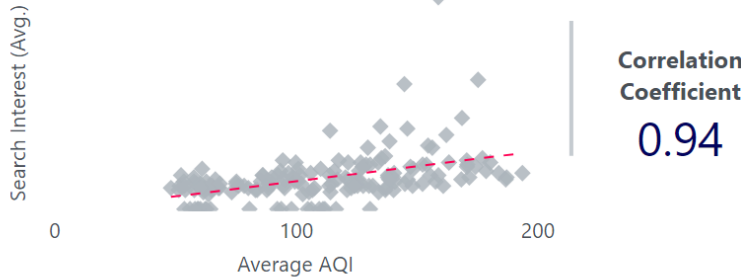
Do States with High EV Adoption Have Better Air Quality?



From April 2022 to April 2025, the top 5 states for EV adoption do not show better air quality. Instead, the data mirrors India's geographic divide — northern states, despite high EV uptake, continue to record significantly worse air quality.

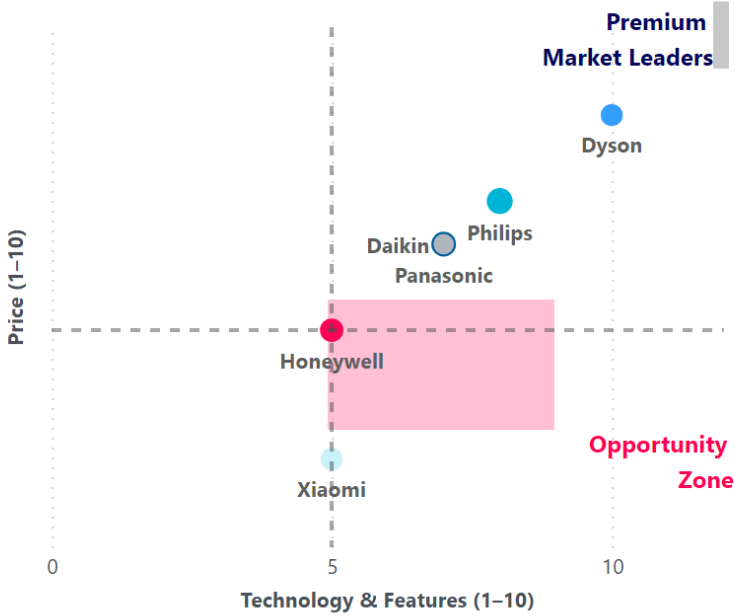


The upward trend line indicates that EV adoption alone can't ensure better air quality — the top five adopters are dense, urban, and economically hub areas where other pollution sources predominate.



Both "air purifier purchase" and "child asthma" searches are near-perfectly correlated (0.99) and strongly linked to AQI (0.94), indicating both spike during the same pollution events

Who are the major competitors and what are their differentiators?



Brands or new entrants that offer advanced technology and **valuable features at affordable or mid-level prices can capture a wider market share**, especially in a price-sensitive market like India.

Differentiators:

- **Dyson** - Most premium, high quality innovation in tech and design
- **Philips** - Premium, more accessible than Dyson, high trust
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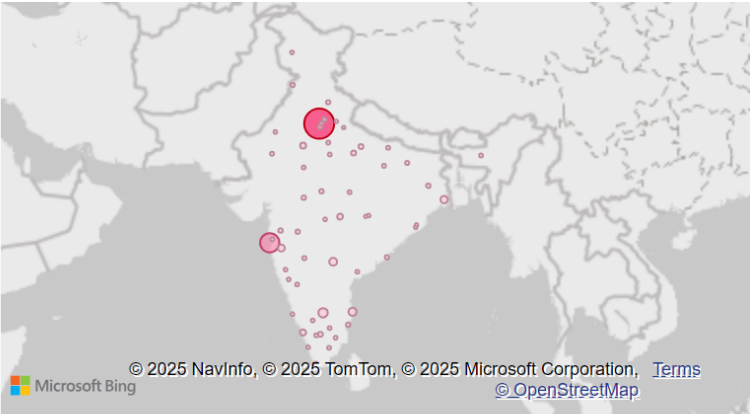
3 out of 60 cities show worsening air quality over 3 years

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Gorakhpur	88	107	112	Declining
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Cuttack		174	104	Improving
Tiruchirappalli		71	60	Improving
Bareilly	101	78	56	Improving
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Air quality trends are improving in nearly half of Tier 1 & 2 cities, but 3 cities show sustained decline while the rest experience mixed patterns, **indicating uneven progress**.

Possibly because of varying local pollution sources, enforcement levels, and environmental conditions across cities.

Tier 1 Metros: High-risk, high-potential markets for air quality solutions



Several tier-2 cities register higher per-person health cost impacts than many metros, highlighting that pollution's economic burden isn't limited to India's largest cities.

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Pune	₹19,428	2.1
Kozhikode	₹9,465	1.4



Primary Analysis (based on Dataful's Datasets)

1. List the top 5 and bottom 5 areas with highest average AQI. (Consider areas which contains data from last 6 months: December 2024 to May 2025)
2. List out top 2 and bottom 2 prominent pollutants for each state of southern India. (Consider data post covid: 2022 onwards)
3. Does AQI improve on weekends vs weekdays in Indian metro cities (Delhi, Mumbai, Chennai, Kolkata, Bengaluru, Hyderabad, Ahmedabad, Pune)? (Consider data from last 1 year)
4. Which months consistently show the worst air quality across Indian states — (Consider top 10 states with high distinct areas)
5. For the city of Bengaluru, how many days fell under each air quality category (e.g., Good, Moderate, Poor, etc.) between March and May 2025?
6. List the top two most reported disease illnesses in each state over the past three years, along with the corresponding average Air Quality Index (AQI) for that period.
7. List the top 5 states with high EV adoption and analyse if their average AQI is significantly better compared to states with lower EV adoption



Secondary Analysis (based on additional research)

- 1. Which age group is most affected by air pollution-related health outcomes? How does this vary by city?
- 2. Who are the major competitors in the Indian air purifier market, and what are their key differentiators (e.g., price, filtration stages, smart features)?
- 3. What is the relationship between a city’s population size and its average AQI — do larger cities always suffer from worse air quality? (Consider 2024 population and AQI data for this)
- 4. How aware are Indian citizens of what AQI (Air Quality Index) means — and do they understand its health implications?
- 5. Which pollution control policies introduced by the Indian government in the past 5 years have had the most measurable impact on improving air quality — and how have these impacts varied across regions or cities?



Critical Questions (based on additional research)

1. Answer Critical Questions:

- Priority Cities: Which Tier 1/2 cities show irreversible AQI degradation?
- Health Burden: How do AQI spikes correlate with pediatric asthma admissions?
- Behavior Shifts: Do pollution emergencies increase purifier searches/purchases?
- Feature Gap: What do existing products lack (e.g., smart AQI syncing, compact designs)?

2. Deliverables:

- Market Prioritization Dashboard with:
- City risk scores (AQI severity × population density × income)
- Health cost impact projections
- Competitor feature gap matrix

3. Product Requirements Document specifying:

- Must-have features (e.g., PM2.5/VOC sensors)
- Tiered pricing models for target segments