Market Fit Research for Air Purifier Development Using AQI Analytics

AirPure Innovations

Domain: Consumer Appliances

Function: Market Research Analytics

Codebasics Resume Challenge #16

Presented By: Rishita Singh

A Solution for a Growing Crisis

The Problem

AirPure Innovations needs to validate market demand before committing to significant R&D and production.

The Urgency

India's Air Crisis: 14 of the world's 20 most polluted cities are in India.

Growing Public Awareness: High-profile events (e.g., Bryan Johnson's walkout) and business responses (e.g., Taj Hotels' AQI displays) highlight a shift from an environmental issue to a daily health and business reality.

Guiding Questions for Our Product Strategy

Primary Analysis: Uncovering pollution severity, geographical patterns, and health correlations directly from the data.

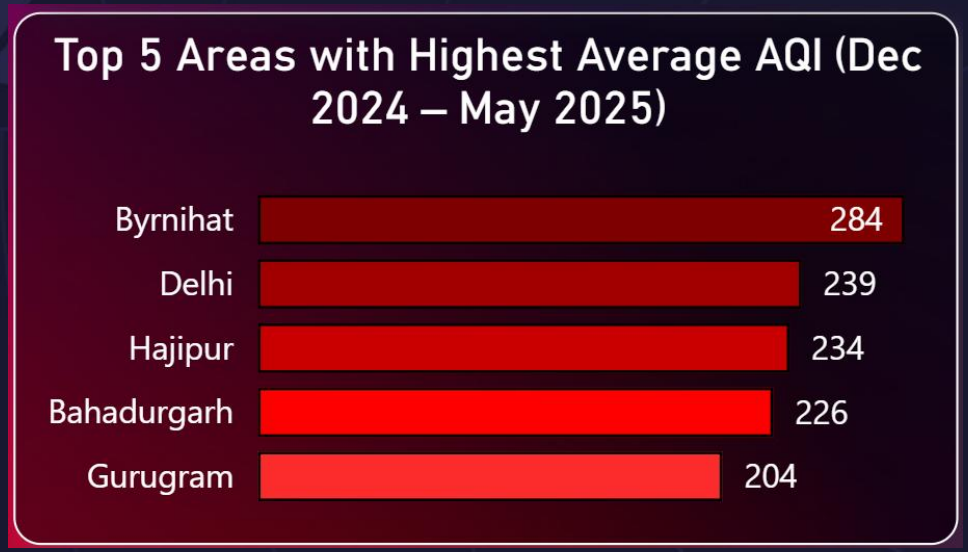
Secondary Analysis: Understanding the broader market, consumer behavior, and competitive landscape.

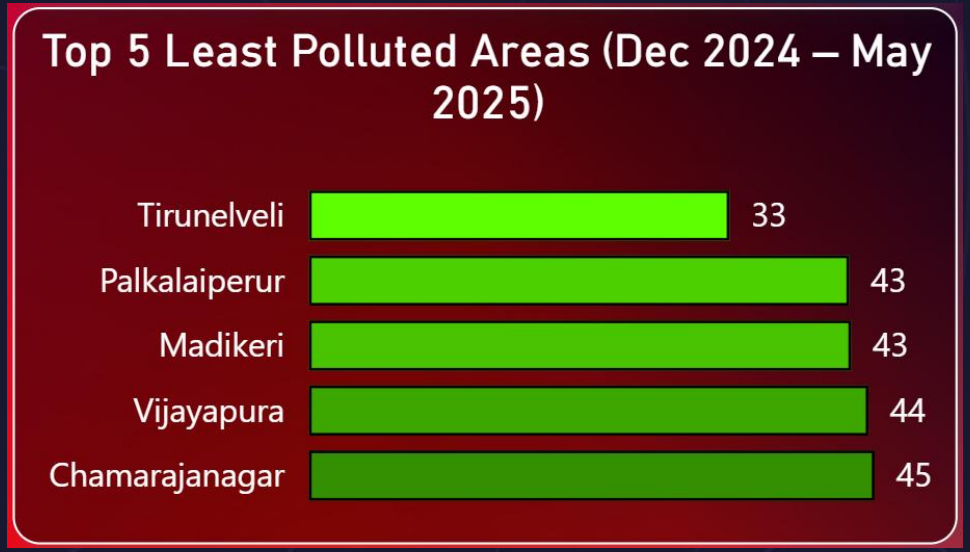
Critical Questions: Translating these findings into actionable strategies for our product, marketing, and R&D.

Primary Analysis

AQI Severity & Top Polluted Areas

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)





Insight 1: Northern and Eastern India face the most severe pollution challenges, with an average AQI in the 'Very Poor' category.

Insight 2: Conversely, cities in Southern states like Tamil Nadu and Karnataka show significantly better air quality, often in the 'Good' to 'Satisfactory' categories.

Pollutant Patterns in Southern India

List out top 2 and bottom 2 prominent pollutants for each state of southern India. (Consider data post covid: 2022 onwards)

Top & Bottom 2 Pollutants – Southern States (2022 Onwards)

State	Top 2 Pollutants	Bottom 2 Pollutants
Andhra Pradesh	PM10 (3606), PM2.5 (2244)	NO2 (259), SO2 (11)
Karnataka	PM10 (14572), CO (3456)	NH3 (34), SO3 (1)
Kerala	PM10 (3538), PM2.5 (1344)	NH3 (10), SO2 (7)
Tamil Nadu	PM10 (7187), PM2.5 (3016)	NO2 (500), NH3 (11)
Telangana	PM10 (1002), PM2.5 (590)	O3 (152), NO2 (119)

Insight 1: Particulate Matter is the Primary Threat
PM10 and PM2.5 are the consistent top pollutants in every Southern state.

Insight 2: Gaseous Pollutants are a Lower Priority
Pollutants like SO2 and NO2 are not major contributors to poor air quality in these regions.

Weekday vs Weekend AQI Trends in Metro Cities

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)

Weekend vs Weekday AQI Trends in Indian Metro Cities (Last 1 Year)

Area	Weekdays AQI	Weekends AQI	AQI Diff (%)
Ahmedabad	114.89	113.32	-1.37%
Bengaluru	73.97	73.87	-0.14%
Chennai	72.19	70.98	-1.68%
Delhi	209.48	207.57	-0.91%
Hyderabad	76.74	76.89	0.20%
Kolkata	101.01	100.48	-0.52%
Mumbai	90.65	92.88	2.46%
Pune	96.70	96.27	-0.45%
Total Avg AQI	**104.45**	**104.03**	**-0.40%**

Main Finding: AQI shows a marginal improvement on weekends in most major metro cities, with Delhi seeing a nearly 1% drop.

Exceptions: Cities like Mumbai and Hyderabad either show no change or a slight increase, indicating unique pollution drivers.

Conclusion: This trend highlights that a significant portion of pollution is tied to daily human and economic activity.

Worst Months for Air Quality Across States

Which months consistently show the worst air quality across Indian states — (Consider top 10 states with high distinct areas)

Key Finding: The months of **November, December, and January** consistently show the worst air quality across most Indian states.

Consistently Worst Months (Top 10 States)

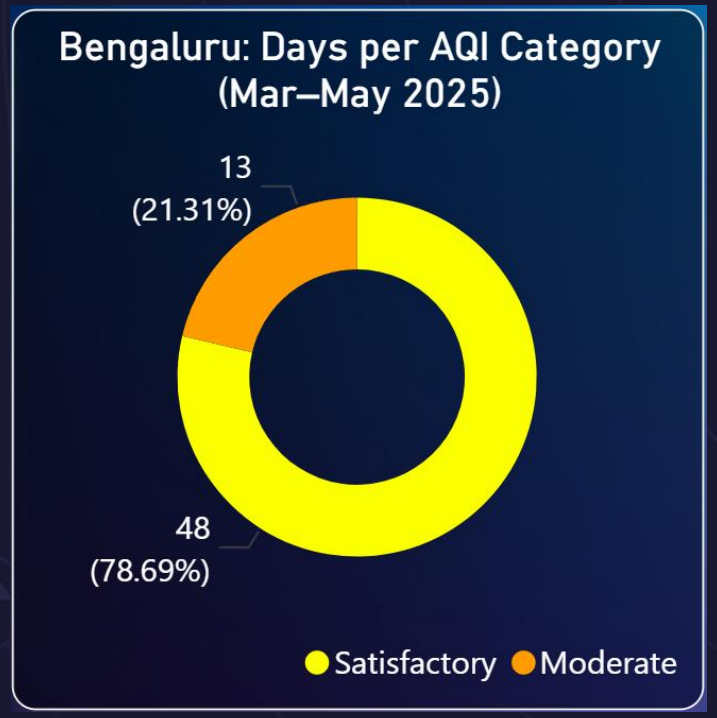
State	January	February	March	April	May	June	July	August	September	October	November	December
Andhra Pradesh	114.74	94.38	78.55	70.89	68.96	63.19	49.71	55.24	52.96	77.19	95.25	99.07
Bihar	245.57	188.38	147.44	161.41	132.23	123.32	79.25	80.33	79.33	120.33	229.58	251.81
Haryana	182.05	139.75	112.13	149.71	156.46	133.03	74.87	74.85	83.64	152.96	239.46	185.77
Karnataka	76.64	76.64	72.73	66.46	60.23	50.31	44.99	46.61	44.73	60.51	74.96	71.61
Madhya Pradesh	141.35	117.45	105.42	119.29	115.48	86.67	56.91	62.59	66.30	114.67	164.54	144.83
Maharashtra	141.34	128.36	122.87	104.36	99.17	70.24	51.38	53.91	59.01	108.85	158.83	138.71
Odisha	193.61	144.89	137.73	129.21	98.81	92.40	57.66	65.73	61.35	91.33	153.51	167.74
Rajasthan	165.44	131.83	118.79	132.31	137.71	110.34	82.08	79.34	79.58	120.97	193.22	176.34
Tamil Nadu	90.18	81.79	69.80	61.69	61.29	55.13	56.13	55.86	50.65	59.19	71.84	77.94
Uttar Pradesh	160.45	122.91	108.84	138.23	135.87	122.77	63.50	70.23	77.51	144.28	200.61	166.22

The 'Why': This is due to a combination of meteorological factors like cooler temperatures and lower wind speeds, as well as seasonal events.

Actionable Insight: This seasonal pattern creates a clear, predictable window for our product launch and a targeted marketing push.

Bengaluru Air Quality Category Distribution (Mar–May 2025)

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?



Air Quality Status (March - May 2025):
Satisfactory: **48 days (78.69%)**
Moderate: **13 days (21.31%)**

Strategic Takeaway: This highlights a market where a need for a solution exists for a significant portion of the time, even in a city with a better overall reputation.ps.

Top Disease Illnesses & Corresponding AQI by State

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.

Top 2 Diseases in Each State (3-Year Trend)

State	Top Disease	2nd Top Disease	Avg AQI
Delhi	Dengue (40)	Measles (2)	206.42
Jharkhand	Malaria (5991)	Acute Diarrheal Disease (1700)	164.94
Himachal Pradesh	Acute Diarrheal Disease (2273)	Hepatitis A (559)	160.26
Bihar	Acute Diarrheal Disease (1388)	Dengue (856)	157.16
Chandigarh	Cholera (16)		141.56
Haryana	Cholera (972)	Acute Diarrheal Disease (733)	140.85
Rajasthan	Acute Diarrheal Disease (1655)	Dengue (836)	127.99
Tripura	Acute Diarrheal Disease (399)	Dengue (259)	126.70
Uttar Pradesh	Acute Diarrheal Disease (4515)	Food Poisoning (2482)	126.42
Odisha	Acute Diarrheal Disease (6362)	Food Poisoning (4125)	124.88
Punjab	Acute Diarrheal Disease (1934)	Cholera (715)	117.85
West Bengal	Acute Diarrheal Disease (3752)	Food Poisoning (3256)	114.19
Assam	Acute Diarrheal Disease (2803)	Food Poisoning (2057)	114.12
Gujarat	Acute Diarrheal Disease (5230)	Food Poisoning (3983)	110.63
Madhya Pradesh	Acute Diarrheal Disease (6991)	Food Poisoning (2371)	108.72
Maharashtra	Acute Diarrheal Disease (7649)	Food Poisoning (5029)	103.64
Manipur	Dengue (3072)	Food Poisoning (173)	100.93
Uttarakhand	Dengue (1300)	Acute Diarrheal Disease	87.90

Outbreaks Over Time

Month	2022	2023	2024	2025	Total
January	506	3696	6350	6582	**17134**
February	1125	4229	7858	5934	**19146**
March	1229	2315	7307	5220	**16071**
April	3075	3485	9180	3768	**19508**
May	6073	2903	9880		**18856**
June	3146	6175	10373		**19694**
July	2724	9303	16067		**28094**
August	2321	7421	12241		**21983**
September	2287	6623	11556		**20466**
October	2909	6492	8597		**17998**
November	2177	12251	6082		**20510**
December	2922	3200	4894		**11016**
Total	**30494**	**68093**	**110385**	**21504**	**230476**

Top Reported Illnesses: The data shows top reported illnesses are Acute Diarrheal Disease and Food Poisoning.

Growing Cases: A significant, upward trend in total cases has been observed from 2022 to 2025.

2022: 30,494 < 2023: 68,093 < 2024: 110,385
2025: 21,504 (Jan – Apr)

EV Adoption & AQI Correlation in Top States

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

Top 5 States with High EV Adoption

State	No. Of EV Vehicles	Avg AQI
Uttar Pradesh	921471	126.42
Maharashtra	650823	103.64
Karnataka	480191	62.67
Tamil Nadu	329634	67.76
Rajasthan	305605	127.99
Total	**2687724**	**101.27**

Key Insight : States with high EV adoption have an average AQI of **101.27**, which is significantly higher (worse) than states with low EV adoption, which have an average AQI of **67.66**.

Low EV Adoption States

State	No. Of EV Vehicles	Avg AQI
Andaman and Nicobar Islands	165	57.71
Ladakh	84	
Nagaland	84	80.46
Sikkim	29	53.69
Lakshadweep	11	
Total	**373**	**67.66**

Strategic Takeaway: While EV adoption is a positive step, this data shows it is not a direct or immediate solution for the broader air pollution problem. Other factors like industrialization and population density play a more significant role.

Secondary Analysis
&
Critical Questions

Age Groups Most Affected by Pollution

Which age group is most affected by air pollution-related health outcomes — and how does this vary by city?

Vulnerable Groups

Children (0–5 yrs):
Their developing lungs are highly vulnerable.
An estimated 464 children died every day in India due to air pollution in 2021.

Elderly (60+ yrs):
Chronic illness + lower resilience.
1.7M premature deaths in India (2019)

Most Affected Cities:
Delhi, Kolkata, Mumbai, Bengaluru, Kolkata

Why?
Weak immunity (kids, elderly)
Chronic diseases worsen impact
Urban traffic & poor air quality
Low-income areas = higher exposure

Sources
State of Global Air (SoGA) 2024 Report
ICMR Study (published in *The Lancet Planetary Health*, 2020)

Correlation Between AQI Spikes and Pediatric Asthma Admissions

Health Burden: How do AQI spikes correlate with pediatric asthma admissions?

According to a 2021 study in Delhi, children's emergency room visits for respiratory issues increased by **29% on high-pollution days** compared to low-pollution days.

The research also found a clear link to other pollutants, including:
Nitrogen Dioxide (NO2): A **1.5% increase** in ER visits for every 10 µg/m³ increase in NO2.
Carbon Monoxide (CO): A significant **46.7% increase** in ER visits for every 10 µg/m³ increase in CO.

These increases were observed not just on the same day as the pollution spike, but also on the days following exposure.

Source: Yadav et al., "Effects of ambient air pollution on emergency room visits of children for acute respiratory symptoms in Delhi, India," *Environmental Science and Pollution Research* (2021).

Public Awareness of AQI and Health Implications

How aware are Indian citizens of what AQI (Air Quality Index) means — and do they understand its health implications?

1. Lung Care Foundation Survey (2020)

This survey, conducted by the Lung Care Foundation and supported by the U.S. Embassy, confirms the lack of technical knowledge among the public. The findings show that a vast majority were unaware of key pollution terms.

Key Data Point: "Approximately, 92.2 per cent of respondents were not aware of the difference between PM2.5 and PM10."

2. Chintan Survey (2024)

This report highlights the stark awareness gap between socioeconomic groups, which is a crucial insight for your marketing strategy. The survey was titled **"Saaf Saans: A Citizen Survey on Air Pollution."**

Key Data Point: "Only 10 per cent of people were aware of air pollution terms like AQI (air quality index) and PM 2.5, while 71 per cent of middle-class settlements were aware."

Impact of Government Pollution Control Policies

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?

Policy	Measurable Impact	Regional Variation
National Clean Air Programme (NCAP)	Mixed results. Some cities (Varanasi, Agra) showed significant PM reduction, while others saw an increase.	Highly varied across cities. The Indo-Gangetic Plain (IGP) continues to struggle despite NCAP.
Graded Response Action Plan (GRAP)	Provides direct, short-term relief during severe pollution episodes in Delhi-NCR. Most effective in temporary reduction.	**Specific to the Delhi-NCR region.** Has no direct measurable impact on other parts of the country.
Bharat Stage VI (BS-VI) Emission Norms	Drastically reduced tailpipe emissions from new vehicles nationwide. Long-term, foundational impact expected.	**Nationwide mandate**, but the impact is most pronounced in densely populated cities like **Delhi**, Mumbai, and Bengaluru with high vehicle density.

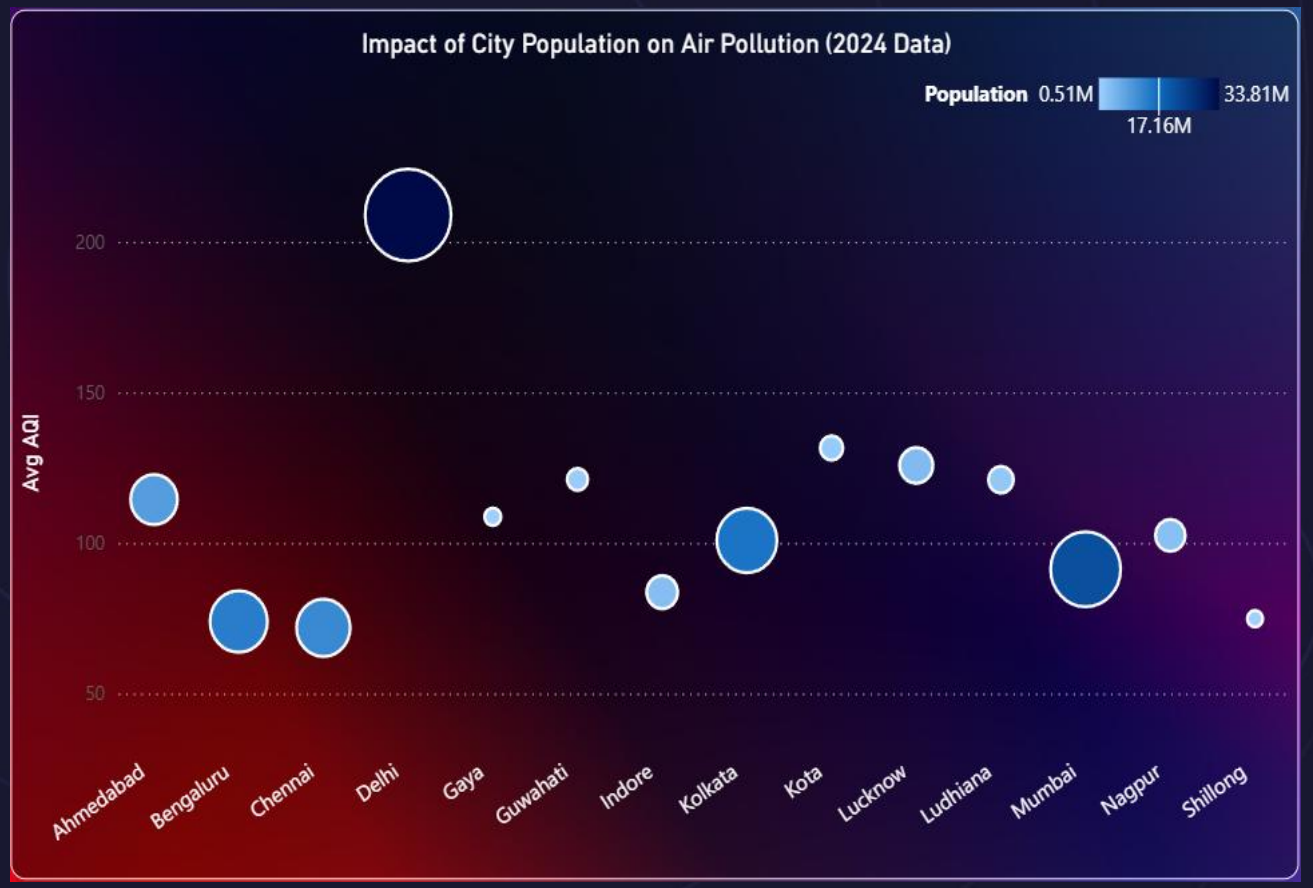
City Population vs Average AQI Relationship

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)

Larger cities (bigger bubbles) tend to have higher AQI, but this is not always the case.

Cities with the largest populations like **Mumbai**, **Bengaluru**, **Kolkata** and **Chennai** have surprisingly low AQI levels compared to other smaller cities.

This shows us that the market for our product isn't just in the cities with the highest AQI, but in many different urban areas where the problem exists.



Priority Cities with Irreversible AQI Degradation

Priority Cities: Which Tier 1/2 cities show irreversible AQI degradation?

Upward Trend: Delhi, Ahmedabad, Chandigarh, and Jaipur show a consistent year-over-year increase, indicating a worsening problem.

High-Pollution Threshold: Kolkata and **Visakhapatnam** also meet the criteria with average AQI values well above the 100 mark, confirming a chronic pollution problem.

Cities with Irreversible AQI Degradation

City	Tier	AvgAQI_2022	AvgAQI_2023	AvgAQI_2024
Ahmedabad	Tier 1	109.23	110.13	114.45
Chandigarh	Tier 2	130.57	138.81	151.76
Delhi	Tier 1	198.89	203.63	208.93
Jaipur	Tier 2	121.97	131.83	135.39
Kolkata	Tier 1	95.35	105.05	100.86
Visakhapatnam	Tier 2	103.32	129.38	110.27

The problem in these cities is widespread and chronic, making all of them high-priority markets for a long-term solution.

The cities on this slide are considered high-urgency markets based on two key criteria:
Upward Trend: They show a steady, year-over-year increase in their average AQI (2022–2024).
High Pollution: Their overall average AQI over the three-year period is consistently above 100.
Any city meeting either of these conditions represents a priority market.

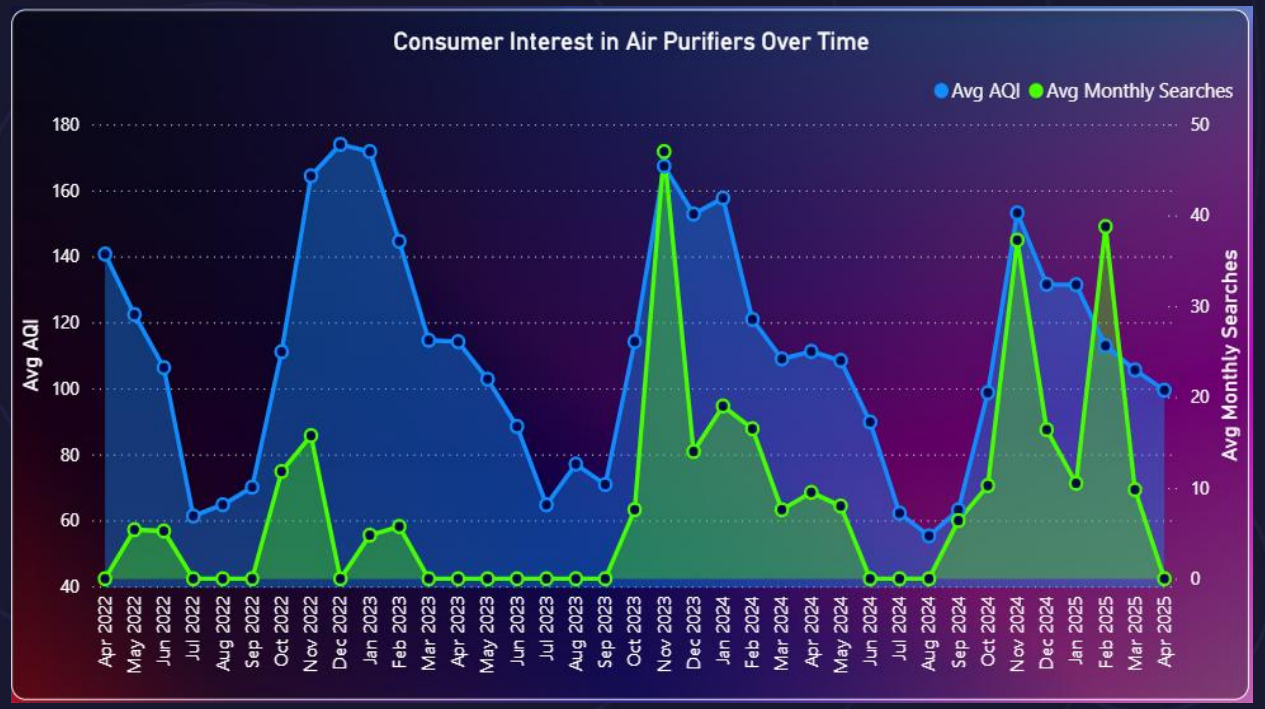
Pollution Emergencies and Air Purifier Demand Surges

Behavior Shifts: Do pollution emergencies increase purifier searches/purchases?

The chart shows a clear visual connection. As the AQI line rises, the searches line rises with it.

Demand for air purifiers consistently peaks during the winter months, from **October to February**, when AQI levels are at their highest.

Conversely, searches drop to near zero during the summer and monsoon seasons when AQI levels are lowest.



Note: The search data is from Google Trends for the word “Air Purifiers” for shopping category

City Risk Scores - Market Prioritization

Behavior Shifts: Do pollution emergencies increase purifier searches/purchases?

City Risk Scores: Market Prioritization

City	Tier	Risk Score	Avg_AQI
Delhi	Tier 1	2169.29	206.42
Mumbai	Tier 1	1572.49	105.93
Kochi	Tier 2	1276.22	99.98
Kolkata	Tier 1	1187.64	102.03
Surat	Tier 2	820.13	116.57
Ahmedabad	Tier 1	775.47	113.60
Chennai	Tier 1	659.63	74.01
Hyderabad	Tier 1	551.83	81.01
Bengaluru	Tier 1	498.32	74.89
Pune	Tier 1	443.15	111.97
Chandigarh	Tier 2	395.50	141.56
Patna	Tier 2	316.97	179.93
Visakhapatnam	Tier 2	209.38	116.11
Jaipur	Tier 2	203.63	131.38
Nagpur	Tier 2	198.27	111.11

(Risk Score > 1,500): Delhi and **Mumbai** stand out as our immediate, highest-priority markets. Their extreme AQI, density, and income make them undeniable targets.

(Risk Score 800 - 1,300): Kochi, **Kolkata**, and **Surat** represent a critical mid-tier. Kochi is a high-potential Tier 2 outlier, while Kolkata and Surat offer a perfect mix of risk and opportunity.

(Risk Score 400 - 800): Ahmedabad, Chennai, Hyderabad, Bengaluru, and Pune are the foundation of our long-term growth. These cities have strong risk scores and will be vital for sustained market penetration.

We have a diverse portfolio of high-priority markets, from immediate targets to key cities for future growth.

Note: To keep values manageable, the Risk Score is divided by 1,000,000,000 (one billion) in calculations.

Feature Gaps in Existing Products

Feature Gap Matrix: Competitor Analysis

Feature	Philips (India)	Honeywell	Sharp	Dyson	Coway	Xiaomi
Auto Mode	Yes	Yes	Yes	Yes	Yes	Yes
Compact Design	Medium	Medium	Medium	Compact (slim tower)	Medium	Compact
HEPA Filter	True HEPA (H13+)	True HEPA (H13+)	H14 (some models)	True HEPA (H13+)	Green Anti-Virus HEPA	True HEPA
PM2.5 Sensor	Yes	Yes	Yes	Yes	Yes	Yes
Price Range (₹)	7,000 – 30,000	6,000 – 20,000	8,000 – 30,000	35,000 – 70,000	12,000 – 45,000	8,000 – 14,000
Real-time AQI	Yes	Yes	Yes	Yes	Yes	Yes
Sleep Mode	Yes	Yes	Yes	Yes	Yes	Yes
Smart Sync (App)	Yes (Air+ App)	Partial (models vary)	No	App + voice, but limited models	Yes (Coway App)	Yes (Mi Home App)
VOC Sensor	No	No	Yes	No	Yes	No
Voice Control	Alexa/Google	Alexa (some models)	No	Yes	Alexa/Google	Alexa/Google

Common Features

PM2.5 & VOC sensors
Real-time AQI display
Wi-Fi & app control
HEPA filtration
Auto & sleep modes
Compact design

Current Gaps

Missing smart AQI syncing
Limited personalized alerts
Noisy operation
Bulky designs
Weak voice assistant support

Potential Innovations

AI-powered pollution forecasting
Personalized health alerts
Energy-efficient smart sensors
Modular/upgradable parts
Seamless smart device integration

Recommendations & Strategy

Product

Powerful Core: Superior HEPA filter for PM2.5/PM10.

Innovative Features: Advanced sensors (CO2, pollen) & AI-powered intelligence.

Design & Experience: Compact, quiet, and aesthetic with smart maintenance.

Price

Positioning: Mid-to-high range to signal premium value.

Justification: Price is justified by unique features and advanced technology.

Place

Target Markets: Top 10 cities, with a focus on North & East India.

Channels: A mix of e-commerce and key electronics retailers.

Promotion

Timing: Launch and campaigns focused on the seasonal peak (Oct-Feb).

Messaging: Frame as a health essential; educate on pollutants; debunk false solutions.

People

Target Audience: Health-conscious families and tech-savvy urbanites in high-AQI cities.

Mission: Position as a brand that is a long-term solution to a chronic problem.

THANK YOU