HOW RESPIRER IS TURNING
POLLUTION INTO DATA

Respirer Living Sciences' detailed air-quality data is reshaping how cities understand, manage and cut pollution

Samiksha Goel
Samiksha.goel@livemint.com
BENGALURU

When IntrCity SmartBus first decided to measure the air its passengers were breathing, the results were unsettling. Inside some of its long-distance buses, PM2.5 levels were five to six times higher than what the World Health Organization (WHO) considers safe, even though the cabins were sealed off by air-conditioning. PM2.5 is fine particulate matter, less than 2.5 microns in diameter, and is a pollutant.

"The AC was on, people felt fine. But the data told a very different story," said Manish Rathi, co-founder and chief executive officer (CEO) of IntrCity SmartBus. As the buses moved out of cities, through industrial belts and construction-heavy corridors, fine particulate matter seeped in steadily, turning what should have been a controlled indoor environment into a moving pocket of pollution.

IntrCity turned to Respirer, a Pune-based air quality-focused climate-tech startup, for a full retrofit. Today, every IntrCity SmartBus functions like a moving air-quality lab. Calibrated sensors track PM2.5, the air quality index (AQI), carbon dioxide, temperature and humidity inside the cabin, while simultaneously sensing outdoor air quality through Respirer's city-level sensor network. That data flows into Respirer's analytics platform, which decides, automatically, when filtration needs to be ramped up and how air quality can be kept within safe limits.

For passengers, the experience is simple. Real-time air quality readings show up on in-bus screens and on the IntrCity app. For operations teams, dashboards break the data down by route and vehicle, flagging alerts and maintenance needs. In early deployments, these buses managed to keep in-cabin PM2.5 levels around 30 micrograms per cubic metre for over 90% of the journey, on days when outdoor pollution in Delhi crossed 200.

Respirer Living Sciences isn't just about cleaner travel. The startup builds and operates hyperlocal air-quality monitoring systems that measure pollutants at street and neighbourhood level in real time. It has quietly built one of the country's largest independent, hyperlocal, air-quality monitoring networks. With more than 2,500 sensors across 40-plus cities, the company's dense, street-level data reveals what government stations often miss: school zones that see pollution spike at 8am, industrial clusters that go unmonitored, neighbourhoods where pollution doubles within a few hundred metres.

The data compiled by the company now feeds researchers, industries and climate-risk models, largely without fanfare.

Founded by Ronak Sutaria, who earlier helped build India's first independent air-quality monitoring initiative at the data journalism organization IndiaSpend, Respirer is an unlikely protagonist in India's pollution story. Taking on a public-health crisis driven by something invisible and hard to pin down, the company is doing the unglamorous work, building the data backbone needed to understand, and eventually fix, the quality of the air Indians breathe every day.

THE GENESIS

Sutaria did not set out to build an air-quality company. The idea took shape over more than a decade. An engineer by training, he graduated in 2001 and spent his early years working in Bengaluru before heading to the US for his master's degree. It was during this period, around 2005, that he first encountered the technologies that would later define his life's work. Sutaria's thesis advisor specialized in low-power sensor networks: systems designed to run nationwide sensing networks while consuming minimal energy. He was hooked.

In Bengaluru, Respirer's deployments have focused on evaluating traffic interventions; in Surat, on measuring exposure from textile industries.

five years, little came of it.

The turning point came in 2014, through an interaction with IndiaSpend. That conversation reframed his thinking, and he realized that technology could be harnessed to generate evidence, inform public discourse and influence policy. By 2015, that realization crystallized into action.

Sutaria joined IndiaSpend as chief technology officer and helped build India's first independent air-quality monitoring network, deploying around 50 devices across key locations. The next year, Delhi rolled out the odd-even policy, a traffic rationing scheme that allowed cars on the road on alternate days based on their licence plate numbers, with the aim of curbing vehicular pollution.

"At that point, our network was the only one with hyperlocal data," Sutaria recalled. "Suddenly, we found ourselves evaluating the odd-even policy. It was honestly a shock to me that something we were doing almost on the side was being used in the mainstream."

But questions around data accuracy and scientific rigour began to surface. "That's when I took a step back," he said. "The funds and effort needed to do this properly are quite substantial."

To build a robust, defensible monitoring system, Sutaria estimated the initial investment alone would have been around ₹50 lakh. Moreover, it was something that didn't quite fit within a journalism organization's mandate.

In April 2017, the air-quality work was spun off as a separate company, giving birth to Respirer Living Sciences.

In India, air quality is monitored by a network of government-run stations solutions to curb air pollution," she added.

The company has since received grants and support from the department of science and technology (DST) and formed partnerships with the Indian Institute of Technology (IIT), Kanpur, and CEPT University in Ahmedabad. Hindustan Petroleum Corp. Ltd and the Council of Scientific and Industrial Research-National Chemical laboratory's venture have provided seed investments of up to ₹1.4 crore.

According to the 2024 World Air Quality Report by IQAir, a Swiss air-quality technology company, 74 of the 100 most polluted cities in the world are in India, including three of the top four.

As *Mint* reported in an earlier story, in 2024, the average PM2.5 concentration in India was 50.6 micrograms per cubic metre. This is 10 times the WHO's guideline value, and higher than India's own annual PM2.5 standard of 40 micrograms per cubic metre.

INSIDE THE MECHANICS

At the heart of Respirer's system is a complex task of turning raw air into reliable data. Air quality is not a single number but a composite of multiple pollutants: particulate matter such as PM2.5 and PM10, nitrogen dioxide, ozone, carbon monoxide, sulphur dioxide, lead and ammonia. Respirer's work begins by sensing each of these independently and ends by stitching them into a single, decision-ready picture.

Respirer designs its own monitoring devices, integrating two kinds of sensors: laser-based sensors to measure particulate matter, and electrochemical sensors to track toxic gases. While the sensors themselves are imported, the equipment or the monitoring device is manufactured in India, at the company's Pune facility.

Once deployed, the devices stream data continuously to Respirer's online platform.

THE BUSINESS

Respirer monetizes the need for such data through a flexible hardware-

mixed land use, air quality can change drastically within a few hundred metres," she said.

For instance, Sutaria noted that in Mumbai, neighbourhoods such as BKC showed persistently high pollution levels, while some less obvious pockets recorded surprisingly clean air.

industries. This flexibility has helped the company build three core revenue streams: industrial and occupational safety monitoring; government-led city or state air-quality networks; and clean-air mitigation solutions for buildings and enclosed spaces.

The company's largest deployment includes over 700 devices in Uttar Pradesh and Bihar with IIT Kanpur, covering both rural and urban locations. Respirer is also disseminating its data to citizens via Google Maps—last year, the tech giant launched Google Air View+ to offer hyperlocal air quality information, in collaboration with Respirer and another climate-tech company, Aurassure.

Regulation has emerged as a demand driver. In cities such as Mumbai, where construction dust monitoring is mandatory, the startup is an approved vendor and has received hundreds of thousands of enquiries.

Until fiscal year 2024 (FY24), around 80% of its work came from research-led projects. By FY25-26, commercial and industrial customers are expected to account for nearly 70%. The customer base has expanded from 30-40 users two years ago to about 600 today. Key clients include Godrej, Chaitanya Group and the Sanghvi Group of companies.

Beyond monitoring, Respirer is increasingly moving into mitigation. Through its energy recovery ventilation and filtration systems, it helps reduce particulate levels by 70-80% in buses, textile units, schools and other enclosed environments.

THE CHALLENGE

For Respirer, resistance has been part of the journey. In 2019, it faced significant pushback from government agencies already operating on tight budgets.

country, about 40 are concentrated in Delhi alone, according to data from the CPCB air quality monitoring portal.

While some of the challenges Respirer faces are institutional, others are structural. Air-quality monitoring, especially for gases, is not a one-time installation. Gas sensors degrade over time, typically after 18 months, and need periodic replacement. This recurring cost often becomes a sticking point for public agencies already operating on tight budgets.

Experts warn that scaling hyperlocal monitoring beyond major metros will be difficult, but also necessary. "Key barriers include limited municipal budgets, lack of technical capacity to interpret data, absence of maintenance frameworks, and low political prioritization of air-quality management," said Deepthi Yaparla, a former research scientist at the Centre for Sustainable Environment and Education.

THE ROAD AHEAD

Respirer, for now, remains a business-to-business company.

Publishing hyperlocal data to the public, Sutaria says, comes with regulatory and political complexities. "If we report that a neighbourhood is highly polluted, the first question is: 'Who authorized you to say this?' You're immediately up against local authorities who may deny the problem," he said, explaining why Respirer has chosen to remain a back-end infrastructure provider rather than a public-facing entity.

Experts believe such systems will eventually become unavoidable. "Hyperlocal air-quality sensing will become as routine as CCTV cameras or automated weather stations," said Yaparla. "As sensors become more reliable and affordable, these networks will be indispensable for

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