

Community-led science uncovers high air pollution from fracking in Ohio county

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Volunteer scientist Yuri Gorby with one of the low-cost air-pollution sensors used to create a more accurate picture in Belmont County, Ohio. Credit: Leatra Harper/Freshwater Accountability Project

Some residents of Belmont County in eastern Ohio have long suffered from headaches, fatigue, nausea and burning sensations in their throats and noses. They suspected these symptoms were the result of air pollution from fracking facilities that dominate the area, but regulators dismissed and downplayed their concerns.

With the technical assistance of volunteer scientists at Columbia University's Lamont-Doherty Earth Observatory, MIT and the American Geophysical Union's Thriving Earth Exchange, local advocacy groups set up their own network of low-cost sensors. They found that the region's three EPA sensors were not providing an accurate picture: The sensors revealed concerning levels of air pollution, and correlations between local spikes and health impacts.

The results are published today in the journal *Environmental Research Letters*.

Nestled in an Appalachian valley, Belmont has been booming with new infrastructure to extract and process natural gas. Fracking is known to emit pollutants including particulate matter and volatile organic compounds such as benzene, toluene and ethylbenzene, which have been linked to respiratory and cardiovascular health problems. Lung and bronchus cancer have become the leading cause of cancer deaths in Ohio. A 2017 [Yale Public Health analysis](#) confirmed the need for additional monitoring and regulation for chemicals associated with unconventional oil and gas development.

Concerned about the fumes in certain areas of the community and the lack of information and transparency, two activist groups, Concerned Ohio River Residents and the Freshwater Accountability Project, wanted to set up a high-density monitoring network. After submitting their proposal to the Thriving Earth Exchange, which enables collaborations between [community groups](#) and volunteer scientists, they were paired with Garima Raheja, a Ph.D. candidate who studies air pollution at Lamont-Doherty.

"We realized that the Thriving Earth Exchange program would give us valuable aid to validate the complaints we often receive from those living near pollution sources in a way that would provide credible and

actionable data to improve air quality in the region," said Lea Harper, managing director of Freshwater Accountability Project.

With advice from Raheja and other scientists, the community members bought 60 low-cost sensors to monitor particulate matter and [volatile organic compounds](#) in the air. Then they identified areas of highest concern, and recruited residents to install and maintain the sensors in backyards, churches and schools in those areas.

The new study presents the first two years of data from the sensor network. The team found that many sites frequently experienced days when air pollution exceeded levels recommended by the World Health Organization. For example, in the city of Martins Ferry, where a sensor took measurements for 336 days, it measured unsafe levels of air pollution on 50 of those days.

"It is kind of wild," said Raheja, "considering that it's generally a clean area. I think any number of days above WHO guidelines is really concerning for an area like this."

She sees a clear link to the area's fossil fuel development. "If there wasn't fracking in this area, there would be no reason for bad air pollution. It's not an urban area. There's not a lot of cars or rush hour or anything like that which usually causes air pollution."

The study compares the daily averages collected from the citizen sensors with the EPA's three nearby sensors. The correlation between the two was low—less than 55 percent.

"It just goes to show that the EPA monitors might be getting broad trends correctly, like annual or seasonal amounts," said Raheja. "But in terms of daily averages, which is what affects human health, the EPA sensors are not always capturing the heterogeneous exposure that people

in this area experience."

That's because the EPA sensors are too few and too widely spaced to capture a detailed picture of the air pollution levels, she said. EPA relies on high-grade monitors that cost hundreds of thousands of dollars apiece, which helps explain why the network is so sparse. In contrast, the citizen scientists' sensors cost only a few hundred dollars each, so they were able to set up a denser network.

In another aspect of the study, residents picked up air pollution spikes on their monitors and wanted to know where they came from. So the volunteer scientists helped to model local wind patterns to key in on which fracking facilities could be responsible for spikes in specific sensors on specific days.

"There are a lot of different sources in the area, and sometimes community activists have to pick which battles to fight first," said Raheja. So far, residents say they are particularly concerned about the area's Williams Compressor Station and the Dominion Compressor Station.

The data have allowed [community leaders](#) to submit targeted public records requests about these operations and their compliance with air quality standards, the paper notes. Information from the [air quality](#) sensors also has helped residents know when to close their windows, wear masks or update indoor air purification systems.

Community members also saw correlations between air pollution spikes and their headaches and nausea. For example, some noticed bad smells and more severe symptoms in mid December 2020. At the same time, the air pollution data shows several spikes in emissions.

The paper quotes community member Kevin Young: "Before, [there]

was no one to help us. None of the Ohio regulators would come to witness the extreme [air pollution](#) events that made my wife and me very sick." He added, "Now that we have data to substantiate the harmful amounts of the air pollutants, it seems the regulators are taking us more seriously."

The paper notes that the data offered a shared language that [community members](#) could use to articulate their complaints to the EPA, Ohio Department of Natural Resources, and the Ohio Department of Health. Regulators are starting to take notice; local activist Jill Hunkler was invited to [testify](#) in April 2021 before the U.S. House of Representatives Subcommittee on the Environment.

The scientists and community groups hope to continue working together. They are currently applying for grants to scale up their sensor network, and networking with other concerned community groups, some as far away as Louisiana's infamous [Cancer Alley](#), who want to learn more about how to get started on similar programs.

"Community-led science and community activism, especially when working with academic scientists, can be really powerful in terms of doing what regulatory agencies cannot do," said Raheja.

More information: Garima Raheja et al, Community-based participatory research for low-cost air pollution monitoring in the wake of unconventional oil and gas development in the Ohio River Valley: Empowering impacted residents through community science, *Environmental Research Letters* (2022). [DOI: 10.1088/1748-9326/ac6ad6](https://doi.org/10.1088/1748-9326/ac6ad6)

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