

**Environmental Protection for the 21st Century:
Putting Equity at the Top of the Agenda
Community Air Monitoring Network Case Study**



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Air Alliance Houston is a non-profit organization that works to ensure all communities have access to clean air by focusing on reducing public health impacts of air pollution through advocacy, education, and applied research.

Environmental Issue: Air Pollution

Location: Houston, TX

Agency, Project: [Air Alliance Houston](#), [Community Air Monitoring Network](#)

Technology Use: Air Quality Monitors, Community-Based Participatory Mapping

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Introduction

For the past 50 years, air pollution in the United States has been regulated by the Clean Air Act (CAA).¹ The CAA has successfully lowered air pollution nationally through a top-down approach. The CAA establishes air quality standards for six criteria pollutants,² and state agencies monitor air pollution levels in coordination with the EPA to ensure standards are attained. Should an area not attain levels within the standards, state agencies are required to establish a plan to control pollution to levels “within attainment.” Designations are generally made at a regional or city level; however, the scale of the designation does not necessarily reflect the conditions at a neighborhood or street level. Thus, when thinking about community-level air pollution or neighborhood conditions, this scale of monitoring may be insufficient.

This case study describes a project being deployed by Air Alliance Houston (AAH), a non-profit advocacy organization located in Houston, TX, that focuses on reducing pollution, advancing environmental justice, and educating the general citizenry on air quality issues. The program utilizes community science both to educate citizens and to collect and analyze air quality data. AAH organizes and manages this with an eye towards air pollution at sub-regional levels using

¹ 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618.

² Ozone, particulate matter, carbon monoxide, lead, nitrogen dioxide, sulfur dioxide.

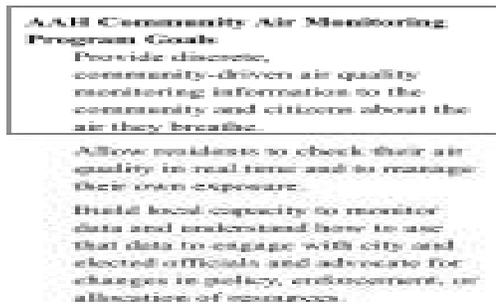
an “Air Ambassadors Network,” to educate community members about interpreting and understanding data and advocating for change when necessary.

Problem Statement

Houston is home to nearly 300 facilities that produce harmful air pollutants.³ Because of a lack of zoning, many residents, including children and vulnerable populations, live close to air pollution sources. However, data about pollution levels at the neighborhood level are generally not available.

As the prevalence of wildfires, daily news coverage of pollution levels, and accessibility of personal monitoring equipment have raised the public’s awareness of air pollution issues, some controversy has arisen about the best ways to monitor, analyze, and use local air quality data. George Wyeth (2020) examines community-based, bottom-up programs that can effectively produce plans to address the full range of air quality concerns in a locality.⁴ He uses a real-world model: California’s A.B. 617, which directs the California Air Resources Board (CARB) to deploy community air monitoring systems in locations excessively burdened with air pollution.⁵

The CARB maintains air monitoring systems, but it relies on input from citizens to place and operate them. The bill includes a plan to develop a statewide strategy for reducing pollutants, especially in areas with high exposure burdens. Importantly, the systems utilize data from federal monitors as well as local monitoring data. The law allocates funds from California’s cap-and-trade program towards community-based organizations to engage stakeholders. Although the AAH project was not based on the bill, its structure and successes to date partly influenced the organization.



Community Air Monitoring Program

AAH’s Community Air Monitoring Program aims to establish a network of air monitors and ambassadors to engage and empower communities to collect and use their own data. Instead of relying on government-provided air data, communities are provided with monitors in “hot spots” of their choosing (selected through a geospatial mapping process with community members) to gather data, learn about risks and potential solutions, and educate government officials and the

³ <https://airalliancehouston.org/our-advocacy/our-campaigns/>

⁴ George Wyeth, *A Framework for Community-Based Action on Air Quality*, 50 ELR 10808-10817 (Oct. 2020)

⁵ A.B. 617, ch. 136, 2017-2018 Leg. Sess. (Cal. 2017), available at https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=20172018AB617

general community about air quality. Thus, the focus is to educate the community members and then use research to empower citizens with tools and data.

This project arose as part of AAH's mission and relationships with two communities: Pasadena and Galena Park-Jacinto City (GPJC). AAH added three additional communities — Gulfton, Kashmere Gardens, and Northside — that it selected through an application process used by Houston's "Complete Communities" mayoral initiative.⁶ Once the five communities were confirmed, communities convened meetings and mapping sessions to decide collectively which types of air monitors to purchase and identify the locations for each monitor based on emission sources, meteorological data, and locations of residents and sensitive populations. The monitors were then installed, and data was collected for educational purposes and use by ambassadors and the public.

Community Ambassadors: The ambassadors are an integral part of this project. They have multiple roles and are largely in charge of overseeing the "citizen science" aspect of the initiative through the collection and dissemination of the data. AAH recruited ambassadors in a variety of ways throughout the study communities, including by nomination by other community members. To date, the ambassadors have been integral in identifying locations for air monitors once the mapping processes are finalized. They also promote both the community meetings and the program at large throughout the neighborhoods. Future work will involve attendance at the Air Quality Institute to be hosted by AAH, providing ambassador training on pollution, air quality, health, and monitoring data. They will then be tasked with bringing this information to their respective communities and educating their neighbors on what they have learned and how best to understand and manage risks based on the data collected.

Geospatial Mapping: An important step in the process was community mapping workshops with Dr. David Padgett, Associate Professor of Geography and Director of the Geographic Information Sciences Laboratory at Tennessee State University. In these sessions, Padgett led the community in identifying potential "hot spots" of pollution, meteorological data, and locations of vulnerable populations, schools, and childcare centers to determine ideal sites for air monitors. Following the mapping sessions, communities convened meetings to confirm monitor location sites.

After AAH installed the air quality monitors, planning began for the Air Quality Institute (AQI), a series of trainings for the Air Quality Network Ambassadors to learn more about the data and how they can be used to identify and communicate risks to the public and local government leaders.

⁶ <https://www.houstoncc.org/>

Air Quality Institute (AQI): At the time of publication writing, the AQI was well underway. Within the last few months of 2021, all five of the communities will have air monitors installed, and ambassadors will be equipped to analyze the data using AQI techniques. The curriculum will focus on pollution itself, the risks it poses, the specific risks in Houston and its surrounding areas, and then move to the air monitors and data.

Promising Practices

Important questions arise with a project like this – including, but not limited to – what would make the project “work” best? What resources or new technology would improve the project or plan? Would governmental intervention help or hinder success?

One strength of this project’s key to success in any future iterations elsewhere is a focus on adaptation. Understanding that communities are different in terms of barriers and definition of success has been important to AAH’s success in forming an enduring Air Monitoring Network.

In this case, understanding certain community differences has been critical. Knowing which communities will be harder to organize or engage is important, as is awareness of which communities need frequent check-ins. There have also been struggles in finding a specific route for implementing monitors in different communities. For example, early enthusiasm to put monitors in or near schools dwindled and then disappeared completely as the leadership of one local government changed its approach.

Barriers

One major barrier has already been overcome – APIS (one of the two air monitor providers for this initiative⁷) has agreed to integrate data from Purple Air (the smaller, less costly air monitor provider⁸) into their mapping efforts, so all data can be shown on one map for ease of access and use by community members. While this barrier has been overcome in this particular case, future projects will likely have to work with manufacturers on data integration.

Other barriers include a lack of awareness among community members. It is hard to encourage participation in monitoring efforts when citizens are not fully aware of the risks around them. For this purpose, AAH’s program is an example of how to engage and educate while also promoting monitoring. Stable connections within the government and the support of local leaders are a strength of AAH’s program. For example, the AAH team utilized the mayor’s “Complete Communities” as a pool of potential community participants and highlighted the absence of air

⁷ <https://charts.apis-aq.com/air-alliance-houston/d/5KaloNYMz/aqi-map?orgId=1&refresh=5m>

⁸ <https://www.purpleair.com/map?opt=1/mAQI/a10/cC0#12.6/29.76333/-95.4089>

*see maps from both brands in the appendix

quality in the Complete Communities program to recruit additional communities to join the Air Monitoring Network.

Other barriers include limited resources. While funding is available for this project, future funds will be needed to ensure the long-term participation of and support for participating communities. Further, additional resources will be needed for a post-implementation evaluation to determine the program's long-term successes.

COVID-19 restrictions have also limited opportunities to work directly with some schools. Last, in some cases, local officials have backed out of the program, thereby stymying one of the community's plans.

Lessons Learned

AAH has made great progress in the citizen-science arena of air quality monitoring. They are effectively educating community members, enhancing their ability to understand and access data, and expanding their capacity for engagement with both governments and polluters. Once the data has been collected, they plan to track pollution to its source to understand whether and what kind of action is needed. They have made great strides in addressing some of the aforementioned barriers. Further, the use of community mapping has helped neighborhoods think critically about health and safety within their communities.

There remain opportunities for improvement, both for AAH and the air quality monitoring community at large. The air monitoring community would benefit from consensus-based standard operating procedures and quality assurance project plans to standardize the quality and reliability of community air monitoring data. This could help facilitate the recognition and use of such data by regulators.

APPENDIX 1. Cities

Pasadena The oldest community, and most involved in the project, had planned to include both the city and schools. The original plan was to put monitoring equipment at the schools and for students to use backpack sensors to map their walks to school. However, the project went in a different direction because the city abruptly ended its involvement. Therefore, AAH adjusted its approach and engaged the community members directly. To date, there are 3 APIS monitors in Pasadena – one at a church and two at private homes. They are currently in the process of deploying Purple Air monitors as well. Pasadena’s population is predominantly White with a significant Hispanic population.

Galena Park/Jacinto City: There are 4 Purple Air monitors in Galena Park and one APIS monitor in Jacinto City. COVID has been a barrier here – there was a project in development to work with the schools, but COVID effectively ended that project. Galena Park has an environmental non-profit with money dedicated to this project, so there are more air monitors on the way (Environmental Advocates of Galena Park). Galena Park sits on the north bank of the Houston ship channel, and Jacinto City lies along a rail line and abuts several highways.

Near Northside: This neighborhood is primarily Hispanic and is part of the city’s Main Street Revitalization Corridor. Railyards comprise the southern and eastern ends of the neighborhood, limiting access and connectivity. Progress has been relatively slow.

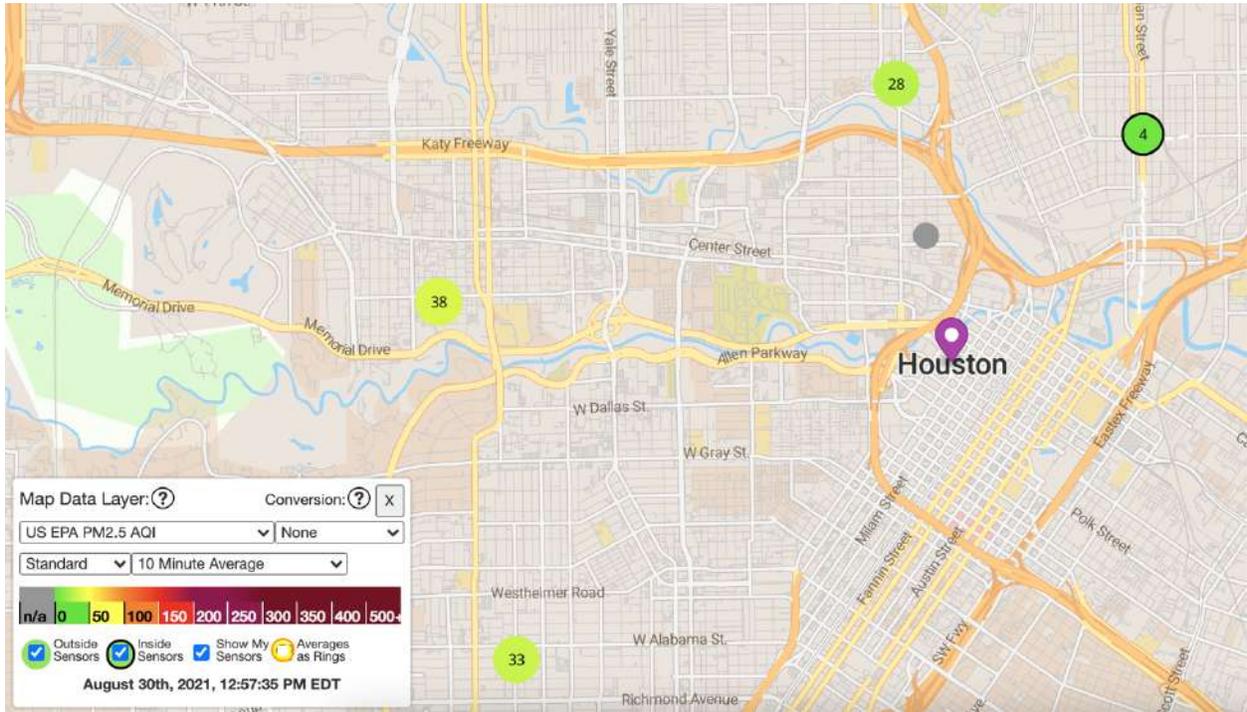
Kashmere Gardens: This neighborhood abuts a major rail yard and rail corridor on its western boundary and warehouses and light industry to its east. It is progressing rapidly in its partnership with AAH and faster than the other two Houston Complete Communities. They are currently identifying locations and planning installation. Kashmere Gardens is primarily an African American community, with its population at about 75% Black and ~25% Hispanic.

Gulfton: In Southwest Houston, known to have the most apartment complexes anywhere in Houston, the population is very transient, and it has been challenging to establish relationships with community members, creating a relatively slow process. This is the location AAH has had to be most creative in, in coming up with retention schemes for the ambassadors. A large percentage of residents are recent immigrants from Mexico and Latin America.

*** These three have finished mapping and planning and should all have monitors in place soon.*

Appendix 2. Maps

Purple Air



APIS

