

## CITIZEN SCIENCE TOOLBOX

### Background

There is a growing number of communities and individuals interested in collecting environmental data. The recent availability of new, lower-cost air monitoring devices is bringing them closer to achieving this goal.

Many of these motivated citizen scientists, however, lack the resources necessary to identify and obtain suitable monitoring instrumentation, and the technical training to use them. Despite the availability of new, lower-cost air sensor technology, these limitations can thwart community-initiated environmental monitoring, and may produce data that is less than adequate for its intended purpose.

The Ironbound community in Newark, NJ, is an example of a community committed to improving air quality for the thousands of residents who suffer from the cumulative impacts of multiple pollution sources. Until now, the Ironbound community has lacked the capacity to collect its own environmental data, relying instead on partnerships with local agencies and academic institutions to investigate the impact of local pollution sources.

EPA is partnering with Newark's Ironbound Community Corporation (ICC) to design, develop, and pilot a *Citizen Science Toolbox* that will enable communities like Ironbound to collect their own environmental data and increase their ability to understand local environmental conditions.



Residents of Newark's Ironbound community received an EPA Community Action for Renewed Environment (CARE) grant in 2009 to address concerns about air quality. Local sources of air pollution include: NJ's largest incinerator and 34 other waste related facilities, the Ports of Newark and Elizabeth (responsible for approximately 7,000 truck trips daily), and the heavily trafficked highways and rail lines that surround the community. As a result of these and other sources, 25 percent of Newark children suffer from asthma, three times the state average, and asthma is the leading cause of absenteeism for Newark's school age children. The community identified actions to target its poor air quality, which included increasing air monitoring capabilities, educating the community about air quality issues, advocating for the enforcement of existing laws, and adopting new laws as appropriate.

### Approach

EPA's *Citizen Science Toolbox* is intended to provide communities with the components needed to initiate and support a community-based, participatory environmental monitoring study.

*Toolbox* components will include:

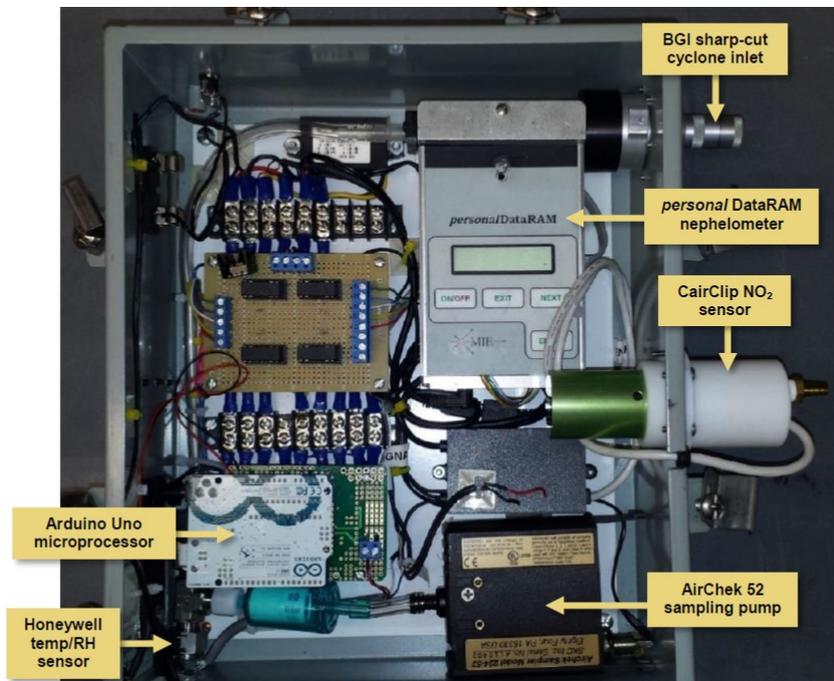
- Several stationary air sensor monitors, built by EPA researchers for community volunteers, to collect data on two common air pollutants: nitrogen dioxide and fine particle pollution (PM<sub>2.5</sub>);
- Detailed guidance on instrument siting and operation;
- Software for data recovery,

processing, visualization and interpretation; and,

- A template and guidance manual for developing a quality assurance plan to ensure that the data collected is meaningful and appropriate for its intended use.

### Anticipated Results

EPA supports citizen participation in projects that promote environmental education, awareness, and stewardship and that incorporate advanced sensor technologies to provide better data on pollution in their neighborhoods.



EPA's *Citizen Science Toolbox* for the Ironbound community includes monitoring equipment and associated guidance for community members to collect and evaluate pollution data for nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM), two air pollutants that can have significant adverse health effects. As part of this toolbox, members from Newark's Ironbound community will use a bundled sensor device called the Citizen Science Air Monitor (CSAM), which was designed and constructed by EPA researchers specifically for use by citizen volunteers. The CSAM unit can collect data for seven days on a single battery charge and includes a [sensor](#) for measuring real-time gas concentration of NO<sub>2</sub> in parts per billion (ppb); and a DataRAM nephelometer for measuring particulate matter less than 2.5 micrometers in diameter (PM<sub>2.5</sub>) in units of micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ).

The Ironbound Community and the EPA will both benefit from this collaborative project. Ironbound residents will be able to investigate pollutants of concern and learn about pollution sources. The project is also expected to increase community awareness about air quality issues and provide the scientific information needed to advocate for improved air quality. The effort will further EPA's goal of building community capacity for environmental monitoring through the development of citizen science tools. These tools can then be shared with communities that have similar air quality concerns.

After the deployment of these tools within the Ironbound community, EPA's Region 2 will use these monitors and other components of the *Toolbox* to expand its existing Citizen Science Equipment Loan Program in the region. By creating a central equipment repository, EPA plans to increase access to these advanced technologies and improve the ability to compare data collected by different communities.

The project will also serve as a model for other communities across the country to learn about using next generation

air monitoring equipment and conducting citizen science projects.

Visit EPA's Air Sensor Toolbox for Citizen Scientists at <http://www.epa.gov/head/airsensortoolbox/>

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