

## CITIZEN SCIENCE OPPORTUNITIES FOR MONITORING AIR QUALITY

### What is Citizen Science?

Citizen science includes public participation in scientific research and many other activities designed to improve the public's understanding of their environment, including local air quality. The U.S. Environmental Protection Agency develops, supports and participates in citizen science projects and conducts research to support citizen science activities.

### Citizen Science and Air Quality Monitoring

Air quality in the United States is tracked using a network of national monitors located across the country. The monitors use established technologies that provide regional data on air quality for implementing the nation's air quality standards, enforcement and research.

The monitoring network, while critical to protecting air quality, has limited use for direct personal or local air quality information. EPA is evaluating and developing new air measurement technologies, including sensors, to increase the ability of individuals and communities to learn about their local air quality.



Equipment at a typical regulatory monitoring site.

A wide variety of small, portable and lower-cost monitoring devices are being developed by industry, universities and individuals to potentially enhance air quality monitoring capabilities. EPA scientists are collaborating with other federal, state and non-governmental institutions to encourage the development of new sensor and app technologies for measuring air quality and are evaluating the performance of these new technologies.

The Next Generation Air Monitors (NGAM) are:

- Less expensive (\$100 to \$5,000)
- Highly portable and easy to operate (often mobile)
- Require minimal training to start collecting data
- Inexpensive to operate



The AirCasting App and Air Monitor enable users to record, map and share health and environmental data using their Smartphone and the portable air monitor. This example and the one below represent types of new technologies available for citizen science activities. EPA encourages new technology development, but does not endorse any products.



The CairClip air sensor fits in the palm of a hand and collects data on ozone and nitrogen dioxide in the air.

### Air Sensor Toolbox for Citizen Scientists



EPA's online Air Sensor Toolbox for Citizen Scientists supports air monitoring initiatives in communities. The Toolbox provides resources and tools for air quality monitoring and includes:

- Sampling methodologies;
- Generalized calibration/validation approaches;
- Measurement method options;
- Data interpretation guidelines;
- Education and outreach;
- Low cost sensor performance information

<http://www.epa.gov/air-sensor-toolbox>

### Other Tools for Citizen Scientists

#### RETIGO

EPA's Real-Time Geospatial Data Viewer or "RETIGO," is a free, web-based tool that allows users to visualize air quality data from monitoring technologies. RETIGO puts the power of analysis in the user's hands with its interactive platform and easy-to-navigate interface.

The user simply uploads air quality data to the online tool system to visualize and interact with small to large data sets over space and time. Data collected while driving, riding a bicycle or walking along a planned route can be explored on a map interface and also shown on several other graphs.

<http://www.epa.gov/hesc/real-time-geospatial-data-viewer>

#### C-FERST

EPA developed the Community-Focused Exposure and Risk Screening Tool (C-FERST) — a web-based decision support tool to assist communities with the challenge of identifying environmental issues, making decisions about environmental exposures and risks within their community and identifying potential solutions.

Citizen scientists can use C-FERST to map the air quality data they collect and compare these with sources, models and other data layers.

<https://www.epa.gov/c-ferst>

#### EnviroAtlas

EPA's EnviroAtlas is a web-based mapping tool that allows communities to explore the potential benefits and costs of decisions related to community planning and development, including social equity.

EnviroAtlas helps community leaders assess services of urban green spaces, such as air pollutant removal and heat reduction, and their estimated health impacts. Citizen science can be used to refine these measures through participatory research and increased awareness of green infrastructure benefits.

<http://www.epa.gov/enviroatlas>

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