Field Notes

Citizen Science and Agency Activities

By Kasantha Moodley
Manager, ELI Innovation Lab

Smell something toxic in the air or see a harmful cyanobacteria bloom? Now you can pull out your smartphone, download an app, and share your observations. Advancements in technology and the growing technical confidence of the public have upped the game of citizen science, expanding its long-standing role in water monitoring to other environmental concerns. New strategies such as crowdsourcing pollution events and establishing community-level sensor networks offer a plethora of opportunities to obtain real-time information on environmental conditions at varied scales.

This has great significance for the work carried out by environmental agencies. At a minimum, citizen science can be a valuable tool for programs that are limited in their capacity to obtain the data needed to inform environmental decisions (such as statewide water monitoring programs).

As we scratch the surface, citizen science and its applications have deeper implications for the respective roles of agencies and the public, particularly in the case of gathering data to highlight the environmental burdens of communities. We might think back to the Tonawanda Coke Plant in western New York, where community-generated data helped the state agency identify and shut down a major polluter. Community science has the potential to transform conventional forms of environmental governance. This undoubtedly places environmental agencies in a new role — one that requires balancing the agency's key priorities with the expectations of an environmentally adept public.

As environmental agencies wrestle with these new roles and expectations, the Environmental Protection Agency is assessing how best to support the use of citizen science in environmental decisionmaking. EPA's Office of Research and Development commissioned ELI's Innovation Lab to identify and describe current and new uses of citizen science at state, tribal, and local environmental agencies. At the outset, it became abundantly clear that there was great diversity in the application, data use, and agency role and engagement strategy of citizen science programs.

The research team cast a wide net for model programs representing the variety of efforts across the United States. Fifteen models were identified across a spectrum of environmental applications. The most well known use of citizen science has been among state water monitoring programs. It is estimated that at least half of the states rely on volunteer monitoring, and in some of these states, citizen scientists generate over 20 percent of the data in the official integrated reports on water quality. Other emerging citizen science efforts in water programs include training volunteers to undertake wetland health evaluations and crowdsourcing observations of harmful cyanobacteria blooms and fish kills.

Air programs revealed many community science efforts that leverage low-cost sensor technologies, as communities work to understand hyper-local air quality trends and identify pollution hotspots. In these cases, community residents often take the initiative.

In California, residents of Imperial County worked with technical experts to establish an air-monitoring network that became a model for state legislation, AB 617. Under that law, residents of West Oakland who had been monitoring air quality for many years co-led the development of a comprehensive community action plan.

In Mecklenburg County, North Carolina, and Puget Sound, Washington, local agencies are using physical sensor testing stations and digital platforms to help members of the public understand how data from their own personal devices compare to data generated by regulatory monitors.

Other programs such as Smell Pittsburgh and the Idling Enforcement Program in New York City and Washington, D.C., have developed digital apps that allow air quality observations or noncompliances to be reported directly to local authorities for investigation or follow-up action.

These recent and innovative developments still face barriers — most notably, data quality concerns and underfunding. In water programs, some agencies require the use of strict data-gathering protocols to ensure that data are usable. For instance, Virginia has established a tiered set of data quality standards, ranging from highly stringent requirements for data to be used in formal reporting under the Clean Water Act, to more flexible standards for data to be used as a general guide for prioritizing the agency's own monitoring, or to be used in general public education.

Air programs still wrestle with how to use data from low-cost devices that are not as precise as data gathered by monitors approved for regulatory use. An added complication is that agencies often do not have the budget to operate citizen science programs, which are often undertaken as activities tangential to core program work.

The ultimate goal is for citizen science to form the core of agency programs, creating shared value for the public and for the work of agencies. To meet this goal, programs need to generate data fit for purpose, build collaborative networks, and secure long-term institutional commitment.

In the short to medium term, it is anticipated that the experiences of these programs and other models will inch us forward to further defining, assessing, and realizing the environmental governance opportunities of citizen science. In the long term, if we follow this promising trajectory, it is anticipated that these efforts will permanently reshape our system of environmental protection.