State, Tribal, Local Citizen Science Forwards Environmental Protection

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A new ELI report highlights the important role that citizen science can play in state, tribal, and local environmental protection programs. Data collection by the public for use in scientific tasks has proliferated in recent years, supported by NGOs, universities, and government at all levels.

The information includes observations about environmental conditions and natural resources — and ranges from water and air quality monitoring to bird counts to coyote scat samplings (to determine what urban coyotes eat). And, the volume of data is impressive — Cornell University's e-Bird project receives more than 100 million bird sighting reports from citizens annually.

The ELI study, prepared for EPA, is the first effort to look at subnational and tribal governments' citizen science initiatives. The research examines 15 pollution control projects to discern key features and best practices.

Ordinary people collect data on air and water quality and wetlands health

ELI researchers Kasantha Moodley and George Wyeth explain that the surge in citizen science is driven in part by the proliferation of phone apps and online systems, as well as the availability of low-cost air pollution monitors, which taken together facilitate people's ability to collect and report data. Moodley notes that not only the emergence of new technologies but the public's "new and increased interest" in how the data can be used is "prompting a new level of engagement among community and tribal members with their local authorities."

Several additional factors are driving subnational and tribal governments' embrace of citizen science. The report points to budget constraints and data gaps, as well as practical limits on agencies' capacity to monitor "dispersed and hyperlocal" environmental problems such as cyanobacteria blooms. Citizens also can provide agencies with community-level data that identify disproportionate impacts.

Laws and regulations also are factors in states such as Virginia and California that authorize certain citizen science programs. Virginia's statute aims "to encourage citizen water quality monitoring so that 3,000 steam miles are monitored by volunteer citizens" and authorizes both grants and technical assistance. California's law requires the establishment of community-based networks to supplement official monitoring.

ELI's research finds that in some cases agencies take the lead, but in others they partner with entities that co-lead or play a substantial implementation role in the citizen science project. But some agency initiatives simply provide support and assistance to private entities. ELI's analysis further indicates that citizen science projects typically focus on air, surface water, groundwater, and wetlands. The researchers flagged for further study why drinking water and indoor air receive less attention.

Subnational and tribal governments use citizen science in myriad ways that include, but are not limited to, informing research agendas, monitoring air and water quality, raising awareness, and implementing enforcement and compliance programs. Moodley notes that some agencies have been particularly innovative in their use of citizen data, citing the Puget Sound Sensor Map — an interactive tool that allows the public to compare citizen-collected and government data on regional air quality.

As the use of citizen science gains traction, however, concerns about data accuracy percolate. The Association of Air Pollution Control Agencies has outlined a variety of "data limitations" associated with personal air sensors. And academics such as Stanford Fellow Annie Brett have concluded that "major concerns" about data accuracy are "supported."

But AAPCA and Brett also recognize that data accuracy concerns should not preclude use of citizen data. Brett emphasizes that citizen science has a "particularly important triage role to play in the initial identification of potential environmental risks for further agency analysis," and AAPCA recognizes that personal air sensor data can inform siting of more accurate agency monitors. Wyeth reasons that air agencies should not get distracted by concerns about collection devices and miss an opportunity to obtain reasonably reliable information that is more targeted than the data they typically collect.

States are also addressing concerns by incorporating rigorous scientific protocols, training requirements, and certifications into their programs, according to the ELI researchers. Furthermore, the same state laws that encourage citizen science projects may also require participants to follow certain processes and monitoring methods. Virginia takes it a step further and bars the use of citizen data as evidence in enforcement actions.

These and other efforts to ensure data accuracy — taken together with the variety of ways citizen data can be used to advance environmental protection — make it likely that the uptick in state, local, and tribal citizen science projects will continue.