EPA, State & Tribal Use of Community/Citizen Science

Association of Air Pollution Control Agencies

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If you had 1,000 people to help you with your work, what would you do?
Community/Citizen Science is . . .

- The involvement of the public in scientific research often in collaboration with professional scientists and scientific institutions.

- A transformational approach to environmental protection that engages volunteers, allowing large numbers people to contribute to science.
Example of Citizen Science Impact
Flanders Environment Agency

Volunteers helped validate air quality models for nitrogen dioxide in Belgium

• Volunteers helped test a computer model of air quality
• 20,000 people paid €10 to join
• Participants installed NO\textsubscript{2} samplers (using a standard set-up)
• Initial findings, e.g., some buildings concentrate traffic exhaust in “street canyons” which the model underestimated

For more information: https://curieuzeneuzen.be/in-english/
Smoke Sense

EPA mobile app to increase awareness of health effects from exposure to wildfire smoke and further advance scientific understanding of:

- Subclinical health impacts
- How people protect their health during smoke exposure
- Communication strategies for health risks from smoke exposure
Another Example: Virginia Water Quality Monitoring

- Virginia DEQ began working with volunteer monitoring organizations in 2004
- **State Law** authorizes a Citizen Water Quality Monitoring Program
- Data sent to EPA -- Clean Water Act requirement to identify impaired water bodies
- **Citizen monitored areas in 2016**
  - ✓ 3,800 stream miles
  - ✓ 90 square miles of estuaries
  - ✓ 15,000 acres of lakes and reservoirs
- Growth in technical capacity of citizen monitoring
  - 2004: < 50 stations passed DEQ field or lab audit
  - 2016: > 1000 stations met the standard

**Results -- 2018 VA DEQ Survey**
- Over 140 monitoring groups; 81,000 hours annually
- Estimated value of volunteer monitoring = $3.2 million per year
Diversity of EPA Citizen Science Applications

Some recent EPA examples*
- Harmful algal blooms
- Drinking water
- Beach contamination
- Coastal acidification
- Invasive species
- Water quality
- Wildfire smoke
- Air pollution

* Projects in the 2019 Report to Congress, prepared by the White House Office of Science and Technology Policy (OSTP)
Citizen science can contribute to all EPA work

**Community Engagement:**
- Awareness, partnership, development, stakeholder engagement, public outreach

**Case Studies:**
- Citizen Science in Great Smoky Mountains National Park
- Environmental Health Organizing in El Paso, Texas

**Condition Indicator:**
- Media campaign, cross-sector stakeholder involvement, request for further study or involvement by government agency and/or research institutions

**Case Studies:**
- Argentine/Turner Rail Yard Community Air Pollution Monitoring
- Southeast Alaska Tribal Toxins Partnership

**Management Decisions:**
- Remediation, restoration, community solution enactment

**Case Studies:**
- Canton Creek Snorkel Survey
- Composting Food Waste with Fermentation

**Regulatory Standard Setting:**
- New mandatory and voluntary standards, development of best practices, revision of prior standards, changes in methodologies for measuring compliance status

**Case Study:**
- The Dewey-Humboldt Arizona Garden Project

**Education:**
- Environmental and STEAM literacy, civic participation, stewardship

**Case Studies:**
- Ironbound Community Corporation Partnership
- Center in the Park's Senior Environment Corps

**Research:**
- Creating baseline datasets, identifying trends and hotspots in health and ecological change over time, filling gaps in datasets

**Case Studies:**
- Watershed Monitoring in the Mill (Otter) Creek Watershed
- Friends of the Shenandoah River

**Regulatory Decisions:**
- Permits, licenses, leases, environmental permits, zoning and rezoning, site plan approvals, mitigation requirements

**Case Study:**
- Aerial Imagery of the United Bulk Terminals in Plaquemines, Louisiana

**Enforcement:**
- Launching of inspections; investigations; prosecution of administrative, civil or criminal violations; imposition of new permit conditions; liability

**Case Study:**
- Tonawanda Coke Air Monitoring

*Environmental Protection Belongs to the Public: A Vision for Citizen Science at EPA (PDF)*
EPA Handbook for Citizen Science Quality Assurance and Documentation
Understanding the Use of Citizen Science in State, Tribal and Local Gov’t Environmental Programs

Assessment by the Environmental Law Institute

- 15 Case studies
- Best practices report
- Interactive webinars
- Final report and recommendations
Diversity of Program Design and Purpose

- Types of environmental issues
- Agency roles
- Uses of the data
- Strategies to support citizen science organizations
Water Quality Case Studies

**Alaska-Yukon Indigenous Observation Network**
Community-based monitoring tracks water quality across a vast area in Alaska & Canada

**Evaluating Wetland Health in MN**
Volunteers collect data for use by local gov’t and watershed groups in management programs

**Reporting Harmful Cyanobacteria Blooms in Idaho**
Public can identify toxic blooms, which identifies problem areas and allows state staff to alert the public about risks

**Tracking Cyanobacteria in Lake Champlain**
Volunteer monitoring data used to alert the public to risks and identify areas that are safe

**Southwest Wisconsin Groundwater/Geology Study**
Private well owners contribute water samples to help assess geographic extent of well contamination

**Oklahoma Fish Kill Response Management Program**
A telephone hotline to report fish kills and respond to these events

**Meta-analysis of State Water Quality Monitoring Programs**
Example: AZ Water Watch Program
Air Quality Case Studies

Puget Sound Air Quality Sensor Map
Complies data from local low-cost sensors and adjusts the data to the standard of agency monitors

Imperial County Community Air Monitoring Project
Community members help gather data in an air-monitoring network

West Oakland Community Action Plan
Collaboration with community activists helped create a long-term plan to reduce air pollution

New York State Community Air Screen Program
Community-based program in which volunteers can sample for toxic air pollutants

DC and NYC Anti-Idling Ordinances
App allows public to report violations

Smell Pittsburgh
Smartphone App crowdsources reports on offensive odors

Mecklenburg County Community Science Station
Allows the public to test accuracy of personal air sensors
Key Success Factors

Air Projects

- Trusted relationship w/ community organizations
- Formal legislative framework
- Technical assistance, equipment, guidance
- Creative use of technology
Best Practices of Successful Programs

01
Generate Valuable Data
(Fill a key data gap)

02
Create A Partnership Network
(To leverage $’s)

03
Demonstrate and Document Success
(Outcomes/Impacts)
“Citizen science is much more than collecting data. It provides a way to engage all parts of society in gaining a deeper understanding of human environments, build an informed population that can advocate successfully for environmental protection, and more effectively protect human health and the environment.”

Report from EPA’s National Advisory Council for Environmental Policy and Technology (2016)
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<td>Collaboration with other Federal agencies</td>
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<td>Cooperation with state and tribal governments</td>
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<td>Support for citizen science work done outside of government</td>
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Proposed future vision for citizen science at EPA

EPA envisions a future where the public is engaged and empowered to help advance scientific knowledge that informs environmental protection actions.

In this future vision, citizen science data are abundant, accessible and useful for environmental decision-making.
Why Invest in Citizen Science?

Fill data gaps
Improve public understanding of environmental issues
Create a stronger, more inclusive and collaborative network
Yield cost savings and efficiency
Proposed Principles to Guide Citizen Science at EPA

1. Design for scientific quality
2. Plan and document data quality
3. Maximize transparency and accessibility
4. Strengthen shared governance with states and tribes
5. Support collaborative partnership networks
6. Encourage a diversity of project approaches
7. Integrate into the full range of EPA’s work
8. Build capacity for place-based problem solving
9. Create equity in community projects
10. Use innovation, experimentation and evaluation
Action Areas

1. Implement an EPA data management strategy for citizen science
2. Increase staff skills and institutional capacity within EPA
3. Expand EPA cooperation with states and tribes
4. Strengthen collaborative partnerships and networks
5. Enhance private sector understanding and participation
6. Support community-driven citizen science
7. Incorporate citizen science results into EPA program strategies
8. Develop metrics to measure and evaluate projects
The Untapped Power of Citizen Science
“EPA must advance a positive, proactive agenda—to work in partnership with communities and state, territorial and tribal governments in ways that strengthen citizen science infrastructure and standardize citizen science methods.”

“One of the great benefits that citizen science offers EPA is the opportunity to leverage expertise, networks and resources of other parties.”

Report from EPA’s National Advisory Council for Environmental Policy and Technology (2018)