



Clearing the Air Together

Pathways for Integrating Citizen Science in Air Quality Management Initiatives

August 2025



About this document

Citizen science—also called participatory science, public science, or people science—is a way for the public to actively contribute to research and monitoring efforts. Typically led by professional researchers or institutions, this approach brings citizens and scientists together to tackle complex challenges. By involving non-professionals, citizen science fosters shared ownership, participation, and real-world impact.¹

While this guide focuses on air quality, citizen science has proven effective in many fields—from public health to water safety and disaster risk reduction. *Clearing the Air Together: Pathways for Integrating Citizen Science in Air Quality Management Initiatives* shows how researchers and organizations can successfully incorporate citizen science into air quality management projects. It highlights ways to combine scientific rigor with public engagement for greater impact. The strategies presented in this guide can easily be adapted to different issues and settings, making it a useful resource across sectors.²

This guide focuses on four key areas:



Finding opportunities where citizen science strengthens air quality efforts.



Designing projects that are scientifically sound and public-driven.



Supporting and enhancing the capacity of citizen scientists for long-term engagement.



Using data to inform decisions, shape policy, and spark collective action.

Whether you're just starting out or expanding existing work, this guide offers practical, flexible approaches. You don't need big budgets or high tech—many successful citizen science efforts begin small, with simple tools and strong public buy-in. We highlight low-cost and scalable options throughout, so you can build at your own pace.

¹ Definition compiled from the [Oxford English Dictionary](#), [CitizenScience.gov](#), the [European Citizen Science Association](#), and the [Australian Citizen Science Association](#).

² These insights are drawn from the U.S. government-funded USAID Clean Air project which operated in 2021-2025.

About FHI 360

FHI 360 is a global organization that mobilizes research, resources and relationships so people everywhere have access to the opportunities they need to lead full and healthy lives. With collaborations in over 60 countries, we work directly with local leaders to advance economic resilience, improve health and well-being, respond to humanitarian crises. We share data-driven insights and scalable tools so the public can effectively address complex challenges, respond to shocks and achieve thriving futures.

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WHY CITIZEN SCIENCE MATTERS

Imagine a group of concerned citizens in Kathmandu, Nepal, carrying low-cost air quality sensors as they spread across the city to measure air quality in their neighborhoods. They share their findings online, sparking a citywide conversation about the urgent need for cleaner air. This was the beginning of Drishti, a citizen science initiative launched in 2016—at a time when Nepal had no functioning government air quality monitoring stations.

Now picture a waste worker using a mobile app to report illegal dumping and burning, providing real-time data that helps local authorities prioritize cleanups and enforce regulations. This is the Nepal Waste Map, a tool developed by Clean up Nepal—another powerful example of citizen science in action.

These stories illustrate how citizen science can bridge the gap between science, policy, and public action. By involving the public in air quality monitoring and mitigation, organizations and researchers can:



Raise awareness and build public understanding of air quality issues.



Enable the public to take action and promote change.



Support public-led solutions tailored to local contexts.



Generate local, real-time data to fill gaps in official monitoring systems.



Strengthen collaboration between citizens, researchers, and decision-makers.

That said, not everyone is convinced. Some researchers, policymakers, or organizations may question the accuracy and reliability of data collected by volunteers, especially when low-tech tools are used. These concerns are often tied to perceived gaps in training, data quality control, or scientific rigor.



But experience shows that these challenges can be overcome. With thoughtful project design, basic training, and simple validation processes, citizen-generated data can complement official efforts—and sometimes fill critical gaps.

In the sections ahead, this guide will walk you through how to integrate citizen science into your air quality management work. We'll explore how to spot the right opportunities, design effective projects, meaningfully engage the public, and use the data to drive action. We'll also offer practical tips for ensuring data quality and building trust in citizen-generated evidence.

Together, we can clear the air. **Let's explore how.**



STOP AIR POLLUTION

CLEAN AIR. CLEAN FUTURE



Anjali Sai Chalise - network coordinator with the Nepalese Youth for Climate Action-participates in an awareness-raising activity on the International Day of Clean Air for Blue Skies in Lalitpur, Nepal. To draw attention to the city's poor air quality and encourage immediate action, Chalise wore an oxygen mask, drawing air from a plant enclosed in a container. Through partnerships with young climate actor and youth organizations like Nepalese Youth for Climate Action, Clean Air raised the issue of air pollution and promoted clean air solutions for all. Photo Credit: Pramin Manandhar for FHI 360

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BREATHE PATHWAYS

Integrating citizen science into air quality management initiatives can deepen understanding and drive more effective responses to this critical public health challenge. To help you make the most of citizen science, this guide introduces BREATHE—a flexible framework designed to support thoughtful, public-centered engagement.

Each letter in BREATHE represents a key pathway:

- B** Begin exploration
- R** Recruit citizen scientists & Refine research methodologies
- E** Experiment & Engage
- A** Analyze collected data
- T** Transform insights to action
- H** Highlight results
- E** Evolve & adapt

BREATHE is not meant to be a rigid, linear process. These pathways can be followed in different sequences, explored simultaneously, and revisited as your work grows and changes.

Throughout the guide, we'll bring each BREATHE pathway to life with examples from the Clean Air project in Nepal. This five-year initiative improved air quality in Kathmandu Valley by supporting government-led planning, encouraging citizen and civil society engagement, and increasing private sector investment. The project provides valuable insights into how citizen science can be integrated into air quality management strategies—from early design to sustained action.





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THE CLEAN AIR PROJECT SPOTLIGHT

The Clean Air project, set out to improve air quality in Nepal's Kathmandu Valley—aiming to create healthier citizens and better learning environments. Led by FHI 360, in partnership with four consortium organizations, the project supported the Government of Nepal to implement the Kathmandu Valley Air Quality Management Plan.

The project had three key objectives:



Strengthen government capacity to create and carry out evidence-based air quality policies.



Expand private sector participation and investment in air quality solutions.

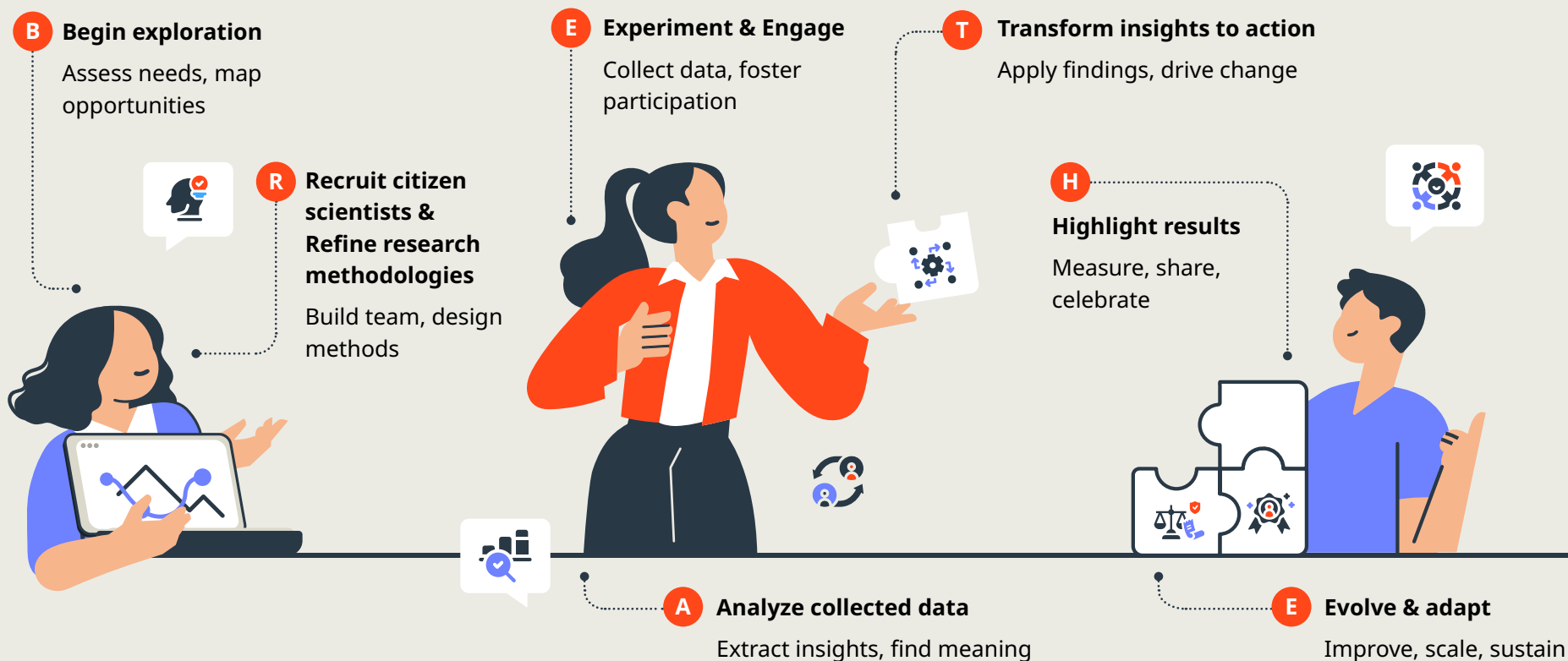


Increase public awareness and public engagement around air quality issues.

Using an implementation science approach, Clean Air brought together government, civil society, and private sector actors to identify, test, and scale practical, local solutions to air quality issues. This collaborative and adaptive process—anchored in continuous learning—reflected the core principles of the project's BREATHE framework.

As we walk through each element of the BREATHE framework in this guide, we'll share lessons and real-world examples from the Clean Air project—showing how citizen science can be woven into effective, long-term air quality management.

Let's explore BREATHE Pathways!



Actors

Project Coordinators
Citizen Scientists

Data Managers
Public liaisons

Technical Support Team
Scientific Advisors

Education and
Outreach Coordinators

Quality Assurance
Officers

BBREATHE

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B - BEGIN EXPLORATION

Before launching a citizen science initiative, take time to explore your current landscape. This early step lays the ground work for designing meaningful, locally relevant and impactful, and context-appropriate activities.

Use [Annex 1: Begin Exploration Worksheet](#)  to guide you through each of the Begin Exploration steps.

■ Assess Existing Efforts



Start by mapping out what's already happening in your target area. Work with local researchers, government agencies, and local leaders to answer questions such as:

- What air quality monitoring programs are already in place? What types of data are being collected, and by whom?
- Are there recent emissions inventories or modeling efforts? Who's leading them, and how might they inform your work?
- What policies, regulations, or public awareness campaigns are active? Are there synergies or opportunities to amplify impact?

Where are the gaps? Think in terms of geography, pollutant sources, or levels of public participation.

■ Identify Opportunities for Citizen Science



Citizen science can complement existing efforts by filling gaps and expanding reach. Look for areas where public participation could add the most value:

Hyperlocal data: Public monitoring generates neighborhood-level data that complements official systems, revealing local air quality patterns and hotspots.



Real-time monitoring: Low-cost sensors and mobile tools enable timely tracking of air quality events and personal exposure.

Source identification: Citizen observations help identify air quality hotspots—like open burning or construction—that may be missed by traditional monitoring.

Behavior change: Involving people in data collection builds awareness, ownership, and motivates individual and collective action.

Program design: Public insights can shape stronger, more relevant air quality programs, including school or municipal initiatives.

Policy influence: Citizen data can support campaigning, build accountability, and strengthen the case for clean air policies and enforcement.

■ Understand the Local Context



To design a citizen science initiative that truly works, you need to ground it in the reality of your local context. Tailor your approach to fit the environment, people, and systems around you. Consider:

- What local networks already exist that could help drive engagement?
- How available are smartphones, internet, or digital tools for the people you want to involve?
- What are the local beliefs, values, or perceptions about air quality and health?
- Who is being represented and who might be left out? Think about age, demographic background, income, education, and other social factors.
- Is there public sector buy-in or institutional backing for citizen participation in environmental issues?
- What resources do you have on hand: both people and funding?

These factors will shape not only how you design your initiative, but also how well it can grow, adapt, and last over time.



THE POWER OF LOCAL KNOWLEDGE



"The heart of successful citizen science lies not in fancy tools or devices, but in meaningful public engagement. The most powerful insights often come from citizens who deeply understand their neighborhoods and daily experiences with air quality. While the public may not see themselves as experts in the traditional sense, they hold invaluable knowledge about their locality that no external researcher could match. The key to successful citizen science initiatives is helping people recognize and utilize this unique expertise - their lived experience matters more than any sophisticated monitoring device." Clean Air Project

■ Engage Stakeholders Early



Start building partnerships from the beginning. Collaborating with a different range of stakeholders helps ensure your initiative is relevant, credible, and widely supported. This may include:

- Government officials and policymakers who can help align your work with regulations and policy goals
- Local universities and researchers to strengthen your methodology and data credibility
- Youth and local groups that can energize outreach and participation
- Healthcare providers who can connect air quality data to real health impacts
- Private sector actors with resources, tools, or local reach
- Organizations representing affected populations to ensure broad participation and fairness.





■ Choose an Engagement Approach

Citizen science can take different forms. Select the model that best fits your goals, timeline, and level of public involvement:


Contributory: Citizens collect or analyze data but aren't involved in design or management.

Collaborative: Citizens help shape the project by contributing to design, data collection, and/or sharing results.

Co-creation: Citizens and project partners work together across all stages—from design to implementation and decision-making.



■ Begin Planning

With your foundations in place, it's time to start shaping your citizen science initiative. Use the [Begin Exploration Worksheet in Annex 1](#)  to guide your thinking. It will help you:

- Map out your local air quality landscape
- Clarify your project's goals and purpose
- Spot gaps and opportunities for action

Use it as a starting point—and revisit it often as your project evolves and new insights emerge.

See also [Annex 2: Roles and Responsibilities](#)  for an overview of key roles typically involved in citizen science, from project leads and data managers to public liaisons and outreach specialists.



BREATH

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R - RECRUIT CITIZEN SCIENTISTS & REFINE RESEARCH METHODOLOGIES

The “R” in the BREATHE framework emphasizes two vital components of a successful citizen science initiative: bringing together broad ranging, representative group of citizen scientists and refining your research design. These processes are iterative and interconnected—strong recruitment strategies benefit from a clear project design, and vice versa.



■ Recruit citizen scientists

Get the word out. To recruit broad ranging participants across age, demographic background, income, and education levels, consider:

- Teaming up with local institutions (schools, faith-based organizations, CSOs)
- Using different outreach channels (flyers, local radio, social media)
- Hosting local-based events at convenient venues
- Offering clear incentives and benefits, including skill-building or stipends
- Removing participation challenges (e.g., language, technology, transportation)

Prioritize broad ranging participation and contextual sensitivity. Design your recruitment strategy to reflect and respect the people you aim to serve.

- Value local knowledge and ensure materials are contextually relevant, available, and offered in appropriate languages and formats.
- Co-create outreach efforts with a different group of stakeholders in shaping outreach efforts, and foster trust through open, responsive communication.
- Set clear goals for participant variety, geographic reach, and sustained engagement over time.



Keep improving: Regularly assess your recruitment efforts and adapt your strategies based on feedback and results.



■ Design Your Project

Define clear objectives. Collaborate with your citizen scientists, local health professionals, educators, and local leaders to co-create clear, meaningful goals. Focus on real-world impacts of air quality, such as:

- **Health outcomes:** Track respiratory and cardiovascular issues, especially among affected population like children and the elderly.
- **Economic impacts:** Monitor lost workdays and absenteeism trends linked to poor air quality.
- **Educational impacts:** Explore how air quality affect school attendance, and student performance.
- **Quality of life:** Examine how air quality influences people's ability to be outdoor, socialize, or move around their local proximity.
- **Healthcare burden:** Collaborate with local clinics and hospitals to monitor air quality-related admissions and system strain.
- **Environmental justice:** Identify variations in exposure and health outcomes across different groups of people.
- **Policy effectiveness:** Evaluate the impact of specific emission sources and the outcomes of clean air initiatives.



CYCLING FOR SCIENCE



When nine cyclists geared up for the Kora Cycling Challenge in Kathmandu, they carried more than just water bottles and energy bars. Equipped with portable air quality sensors and trained through the Clean Air project, they became mobile citizen scientists, gathering real-time air quality data across 50, 75, and 100-kilometer routes.



Their journey mapped Kathmandu's air quality in motion: Air quality worsened at busy intersections and gradually eased toward the city's outskirts. But beyond the data, the ride sparked something more—curiosity and conversation. In post-ride discussions, the cyclists shared how other participants and spectators eagerly asked about the sensors and the air quality findings. People wanted to know more about the air they breathe and how it varies across the valley.



This initiative showed how citizen science can be seamlessly embedded into existing local events—turning a cycling challenge into a platform for environmental awareness and action. The enthusiastic response from both riders and onlookers highlighted the potential for creative, participatory approaches to make air quality science visible, personal, and powerful.

◀ *Karuna, a citizen scientist, embarks on her 50-km ride with a low-cost air quality sensor strapped to her bicycle. Photo Credit: Pramin Manandhar for FHI 360*



Determine the project scope. Make sure everyone understands the boundaries of the project. Clarify:

- Geographic coverage
- Duration (short-term vs. long-term)
- Key pollutants or environmental indicators to monitor

Select appropriate methodologies. Select methods that align with your goals, context, and participants' capacities. Strive for a balance between scientific rigor and ease of use—simpler approaches can often be more participatory and effective. Consider technical complexity, data validation needs, and available resources to ensure your approach is both practical and impactful. A mixed-methods strategy can help generate a fuller understanding of air quality issues.

Tips for selecting methods:



- Use both qualitative and quantitative approaches for a fuller picture.
- Think about how often you'll collect data, how widespread your coverage will be, and how easy it is for participants to take part.

Allow room for flexibility and creativity and encourage citizen scientists to ask their own questions or explore their own interests.

Choose appropriate tools. Citizen science projects can draw from a wide range of tools depending on their objectives, available budget, and participant skills. These can include everything from simple visual checklists and symptom diaries to mobile apps and advanced sensor systems. As outlined in Box 1, the tools you choose should align with your project's goals, local context, and the capabilities of your participants. Consider factors like simplicity, cost, technical complexity, and scalability when selecting tools.



Box 1. Data collection methods for collecting air quality data through citizen science initiatives

1. Direct Sensing Methods

- Low-cost sensors: Portable sensors that detect air quality levels such as PM2.5, PM10, NO2, or CO2. Ideal for personal exposure monitoring and hotspot identification.
- Mobile monitoring: Sensors mounted on bicycles, vehicles, or carried by individuals to collect data over a wide area. (See textbox on Kora Cycling Challenge for an example.)
- Fixed-point monitoring: Public-installed devices at static locations to monitor temporal changes in air quality.

2. Observational Methods

- Visual logs: Citizens note visible emissions, smoke, dust, or odors from local sources (e.g., open burning, industrial discharge).
- Traffic monitoring: Manual counting or app-based recording of vehicle types and volumes at specific intersections. (See textbox on traffic mapping in Hadigaun.)
- Environmental condition tracking: Observations of haze, weather conditions, or vegetation discoloration as indicators of air quality levels.

3. Survey-Based Data Collection

- Household or street surveys: Structured questionnaires administered by citizen scientists to understand awareness, exposure, and protective behaviors.
- Digital surveys: Conducted via mobile apps or online platforms to collect broader public insights.

4. Participatory Mapping

- Local context mapping: Residents identify air quality hotspots, clean air zones, or sensitive sites (e.g., schools, hospitals).
- Digital mapping platforms: Tools such as OpenStreetMap or Google My Maps can be used to geotag observations and track spatial trends. (See example of youth-led waste mapping initiative.)

5. Photographic and Video Documentation

- Photo diaries: Citizens document air quality events over time.
- Before-and-after documentation: Useful for evaluating changes post-intervention.



Blending Tools for Greater Impact.

The most effective projects often combine low-, mid-, and high-tech tools to collect different types of data and engage collaborators with different skills and interests. This layered approach enhances broad engagement, strengthens local participation, and creates opportunities to complement and extend government-led monitoring, awareness-raising efforts, and policy change.

Box 2. Air quality monitoring/management data collection tools

Low-Tech Tools

Low-tech options are accessible, affordable, and great for engaging diverse participants. These include:

- Visual observations of smoke, haze, or emission sources.
- Symptom and smell diaries tracking health effects or unusual odors.
- Passive samplers like diffusion tubes to monitor air quality levels over time.
- Biological indicators (e.g., lichens) sensitive to air quality.
- Citizen reporters sharing personal stories, photos, or videos to humanize air quality impacts.

Though less precise, these tools generate meaningful, public-driven data and are ideal entry points for deeper engagement.

Mid-Tech Tools

Mid-tech options strike a balance between simplicity and data quality. These include:

- Hand-held air pumps for analog PM sampling with lab analysis.
- Mobile apps for structured data input and sharing.
- Low-cost single-pollutant sensors, often linked to mobile devices for basic real-time monitoring.

These tools increase functionality while remaining relatively affordable and usable with light training.

High-Tech Tools

High-tech tools offer robust capabilities but require more investment and expertise. They include:

- Multi-pollutant sensor packages that monitor various pollutants and conditions.
- AI-powered platforms that analyze large datasets in real time, identify trends, and produce predictive insights.

These tools deliver high-resolution data but may not suit all groups or project stages.



SIMPLE TOOLS, POWERFUL IMPACT



Think citizen science requires expensive equipment? Think again. In Nepal, the Clean Air project found that some of the most valuable insights came from citizen scientists equipped with just notebooks, pens, and basic smartphone apps.

At busy intersections across Kathmandu, youth volunteers observed traffic flow, recorded vehicle types, and noted visible signs of air quality issues. Their observations—though simple—revealed key patterns in urban congestion and air quality.

The impact was real. Data collected by volunteers in Hadigaun was used by Kathmandu Metropolitan City to design a vehicle-free zone, rerouting traffic to improve air quality and pedestrian safety.

“We learned that citizen science isn’t about complicated devices - it’s about engaging people’s natural curiosity and local knowledge,” reflects the Clean Air team. “Sometimes, the simplest approaches yield the most meaningful results.”

◀ *Local youth volunteers graph traffic flow and traffic patterns in Hadigaun. This data was utilised by Kathmandu Metropolitan City to plan for vehicle-free Hadigaun by identifying alternative traffic routes. Photo Credit: Pramin Manandhar for FHI 360*





■ Develop Research Protocols

Once your approach and tools are selected, the next step is to develop detailed research protocols. These protocols ensure that citizen science efforts generate consistent, high-quality data aligned with your project goals. In air quality monitoring, where measurements can be complex and variable, clear and easy-to-follow protocols are essential.

A strong protocol begins with defining the roles and responsibilities of your collaborators. Clarity in who does what fosters accountability and smooth operations. For example, citizen scientists might collect air quality data using portable sensors, while project staff validate entries and liaise with local stakeholders. Where shared equipment is involved, responsibilities for calibration and maintenance should be clearly assigned.

Next, outline step-by-step data collection procedures. Protocols should:

- Standardize when, where, and how measurements are taken
- Specify timing and frequency of data collection
- Include instructions for logging, submitting, and troubleshooting data
- Account for environmental variables like weather or location
- Provide safety guidelines for field-based data collection
- Incorporate metadata collection and quality control steps
- Include visuals to demonstrate correct equipment setup and use

If your project uses specialized equipment, include guidance on:

- Setup and installation of tools and sensors
- Calibration schedules and techniques
- Cleaning, storage, and basic maintenance
- Troubleshooting common issues and identifying faulty data





CO-CREATION IN ACTION

When Clean Air launched a waste mapping initiative in Nepal, youth and the public weren't just invited to participate—they helped shape the project from the very beginning.

Their contributions proved invaluable. Local knowledge guided the selection of study areas, improved data collection methods, and ensured the project reflected on-the-ground realities. What might have been a standard mapping effort evolved into a local context-driven initiative grounded in lived experience.

"The deep understanding of our citizen scientists," reflected Clean Air team, "transformed our approach and ultimately led to more meaningful results."

Clear communication is also vital. Establish how participants will:

- Receive updates and protocol changes
- Submit data and receive confirmations
- Access technical support or report urgent issues
- Provide feedback through regular check-ins or short surveys

Data quality and ethical integrity should be embedded throughout. Support reliability by:

- Tailoring protocols and training to participants' technical skills
- Offering tiered training programs (basic and advanced)
- Pairing newcomers with experienced mentors
- Using apps or web forms with built-in data validation
- Encouraging overlapping observations for cross-verification
- Sharing feedback and tips for improving data quality






■ Embed Ethics and Safeguards from the Start

Ethical practices are not an afterthought, they're a foundation. Build them into your project from day one to protect participants and build trust.

- Use participatory, multilingual consent processes that clearly explain the project's purpose, activities, and what participation involves.
- Clarify who owns the data, how it will be used, and how results will be shared, transparency builds confidence and accountability.
- Take extra steps to protect affected populations, such as youth, elders, or those living in high-risk or disadvantaged environments.
- Make sure everyone involved understands the potential risks and benefits of participating. Informed consent is essential and must be obtained before any data collection begins.

For practical tools and examples, see [Annex 3: Consent Forms and Guidance](#),  which includes templates, verbal consent scripts, and tips for adapting materials for low-literacy or multilingual contexts.



■ Navigate Legal and Regulatory Requirements

Don't let legal roadblocks catch you off guard, be proactive.

- Depending on your location and the type of data you collect, you may need ethical clearance from an institutional review board (IRB) or equivalent authority.
- Stay aware of data privacy laws, liability risks, and any local restrictions on air quality monitoring or sensor use.
- Partnering with a university, research institute, or government agency can help you navigate these complexities—and boost your project's legitimacy.

Ethical integrity isn't just about compliance; it's about showing respect and care for the people you're working with.



Box 3. Legal and Ethical Tips

- Obtain ethical clearance from a relevant institutional or government review board before starting your project.
- Design consent forms in multiple formats—written, visual, audio—for better accessibility.
- Explain clearly how data will be used, who owns it, and how results might affect public perception or policy.
- Take special care with children and youth participants—ensure parental consent and minimize exposure to potential harm.
- Disclose all sources of funding, especially if they could influence findings or interpretations.
- Establish a data governance framework that includes public oversight and safeguards privacy.
- Know the laws around environmental data collection in your country—some areas may have restrictions on air monitoring.
- Consult legal experts or institutional partners to help you address regulatory requirements.



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E – EXPERIMENT & ENGAGE

The “Experiment & Engage” phase is where your citizen science project truly begins. You’ll implement your protocols, activate your team, and collect real-world data—transforming planning into action. This phase is not just about gathering data; it’s about building ownership, sustaining motivation, and creating shared purpose.



■ Structure your citizen science team


A well-organized team is essential. Clearly defining roles ensures smooth operations and high-quality data. Depending on the scale of your project, some individuals may take on multiple roles, or a single role may be shared among several people.

- **Citizen scientists** – Collect air quality data, follow protocols, document observations.
- **Project coordinators** – Train participants, oversee data quality, troubleshoot.
- **Local liaisons** – Communicate with stakeholders and mobilize local support.
- **Technical leads** – Manage equipment use, calibration, and data systems.

See [Annex 2: Roles and responsibilities](#)  for more details.



■ Deliver Targeted Training & Resources

Training must be easy-to-understand, practical, and adaptable to different learning styles. Effective training builds confidence, encourages participation, and sets your project up for success. See Box 4 and [Annex 4: Sample Agendas, Evaluation Templates, and Feedback Forms](#).  Consider the following tips to be sure your training is participatory and user-friendly:



- Use plain language and visuals to explain complex ideas (e.g., infographics, diagrams).
- Translate materials into relevant languages used by participants to ensure everyone can engage.
- Design with low-literacy and different ability needs in mind, using simple layouts, audio options, and user-friendly formats.
- Keep content modular and easily updatable, so it can be updated or adapted for different groups and settings.

Box 4. Tips for Effective Training

- Use a variety of formats: discussions, awareness-raising and hands-on activities.
- Tailor examples to the local context for better relevance.
- Encourage active participation and problem-solving.
- Provide plenty of time to practice with real equipment and scenarios.
- Use visuals, infographics, and storytelling to enhance retention.



■ Facilitate Capacity Strengthening and Provide Ongoing Support

Capacity strengthening is not a one-time activity—it's a continuous process that supports data quality, sustained engagement, and participant confidence. A well-designed training program includes initial workshops, ongoing development, and peer learning opportunities.

1. Initial Training Workshops. Start with in-person or virtual sessions to welcome and equip your team. Make the experience engaging, practical, and local context-focused:

- Introduce the project's goals and explain why it matters to their lives and local areas.
- Cover basic air quality science and common pollutants.
- Provide hands-on practice with monitoring tools and sensors, letting participants practice and ask questions.
- Demonstrate data collection protocols and submission procedures.
- Address safety, troubleshooting, and common challenges.
- Incorporate team-building activities to foster trust, collaboration and sense of shared vision.



2. Ongoing Skill Development Sessions. Keep momentum strong by offering regular opportunities to refresh, expand, and apply new knowledge:

- Schedule refresher trainings to reinforce core protocols and ensure consistency.
- Offer advanced topics such as interpreting data, communicating findings or using evidence for awareness-raising activities.
- Invite guest speakers to share emerging tools, technologies or real-world case studies.
- Organize field visits to local monitoring sites, labs or environmental hotspots to connect theory with practice.

3. Peer-to-Peer Learning Opportunities. Create a supportive, collaborative space where participants learn from each other—not just from trainers:

- Pair experienced participants with newcomers to build mentorship and confidence.
- Host informal meetups or learning circles to share tips and experiences.
- Encourage participants to co-lead workshops or present what they've learned in their own voice.
- Organize “data collection days” where teams collect and analyze data together in the field i.e. learning by doing.



■ Support Citizen-Led Data Collection

Empowering citizen scientists to lead their own data collection not only expands your project's reach but also builds ownership and strengthens the local connection to environmental issues.

The key? Equip participants with tools and methods that are scientifically sound yet simple, intuitive, and tailored to their real-world contexts. Citizen-led data collection helps uncover hyperlocal insights that traditional systems often miss—and builds a sense of pride and purpose among participants.

This section briefly describes how to choose and implement user-friendly tools that enhance both data quality and participant engagement.



When choosing tools, consider:



Ease of use

Intuitive interface • Minimal training required • User-friendly to broad ranging user groups



Data quality

Accuracy and precision of measurements • Consistency across users • Built-in data validation



Cost

Initial purchase price • Ongoing maintenance costs • Scalability for larger projects



Durability

Weather-resistance for outdoor use • Battery life for portable devices • Longevity of passive samplers



Data integration

Compatibility with project database • API availability for data export • Integration with other tools such as mobile apps or visualization platforms.

Ensure Equipment Calibration and Maintenance. Establish a calibration schedule, train users in maintenance, and keep logs. Compare readings to reference devices periodically and develop clear reporting systems for malfunctions.


Implement Quality Control Checks. Combine automated validation, manual reviews, and cross-validation strategies to uphold scientific integrity.

Box 5. Evaluating Training Effectiveness

To ensure your training program meets its goals:

- Use pre- and post-training quizzes or surveys to assess knowledge gains.
- Observe participants during data collection to spot skill gaps.
- Track early data submissions for completeness and accuracy.
- Monitor participant retention over time as a proxy for engagement.
- Adjust content and delivery based on regular feedback.



Encourage Observation Note-Taking. Observation notes add vital context to data. Encourage entries on weather, smells, local activity, and equipment issues using checklists, mobile features, or voice-to-text tools. See [Annex 5: Observation Log Templates](#). 

Facilitate Collaborative Data Collection Events. The goal of these collaborative efforts is to create a shared sense of purpose and empowerment. When citizens come together to monitor their air, they take the first step towards collectively improving it.

- **Seasonal campaigns** focus on monitoring during specific seasonal conditions. They aim to help understand how air quality patterns change throughout the year, capturing the unique characteristics of each season.
- **Coordinated data collection activities** involve intensive, coordinated data collection across the entire study area. The goal is to create a comprehensive snapshot of air quality, providing a detailed picture of conditions at a specific time.
- **Local context mapping** engages participants in participatory mapping of local emission sources and concerns.
- **Collaborative sensory walks** involve coordinated routes through neighborhoods with portable monitors or low-tech tools. Participants identify air quality hotspots and gain insights into spatial variations in air quality, creating a detailed map of local air quality patterns.

Box 6. Data quality assurance strategies

Data validation processes

- Perform range checks to flag outliers
- Review data for logical consistency and format compliance
- Identify and address missing or incomplete fields

Regular data audits

- Review a sample of data points for accuracy
- Verify consistent application of protocols
- Evaluate metadata completeness and equipment performance

Establish a recurring audit schedule

- Weekly: Quick checks of incoming data
- Monthly: Trend and pattern reviews
- Quarterly: Field visits and equipment spot-checks
- Annually: Full project data quality assessment



YOUTH AS ENVIRONMENTAL INVESTIGATORS




In a unique initiative that transformed students into environmental researchers, Clean Air partnered with Kathmandu Metropolitan City to empower students from 16 public schools to become citizen scientists in their own classrooms. These young investigators didn't just observe their environment — they analyzed it, documented key issues, and proposed actionable solutions.

Using structured assessment tools, students evaluated various aspects of their school environment, including air quality, waste management, and sanitation. Their findings and recommendations were presented directly to city officials, providing decision-makers with fresh insights into environmental challenges — as seen and experienced by the city's youth.

Maintain Data Integrity and Consistency. Maintaining data integrity is foundational to the credibility and success of your citizen science air quality project. Ensuring consistent, accurate, and complete data allows your findings to be trusted by the scientific network, policymakers, and the public. While citizen-led approaches bring valuable insights, structured validation and quality assurance systems are essential to uphold data standards.


Ensure Effective Data Storage and Management. Protecting and efficiently managing your data is crucial for maintaining trust, complying with privacy regulations, and ensuring the long-term success of your citizen science project. Implement a comprehensive data management plan that addresses both security and organizational aspects. Utilize encrypted, cloud-based storage solutions to safeguard your data from unauthorized access or loss. Strengthen this protection with robust access controls and multi-factor authentication for all users. Regularly backup your data to prevent loss due to technical failures or cyber incidents.

Provide Ongoing Feedback on Data Quality. Send monthly scorecards, create group dashboards, and host peer-learning sessions. Recognize high-quality contributions to sustain motivation. See [Annex 4: Sample Agendas, Evaluation Templates](#), 





■ Facilitate Collaborative Events

While ongoing feedback is crucial for maintaining data quality and participant engagement, it's just one part of fostering long-term commitment. Sustained engagement requires more than training and data collection—it requires public commitment, recognition, and learning. Deepening participants' connection to the project strengthens both their motivation and the impact of their contributions. See [Annex 6: Collaborative Event Planning Tools](#)  for templates to support the design and conduct of collaborative events throughout the project lifecycle.

Build a sense of connection. A connected team is a motivated team. Make space for people to bond, learn from each other and feel seen.

- Host regular meetups and social events to foster trust and relationships.
- Facilitate peer-to-peer learning and informal mentoring.
- Create online forums or chat groups where people can ask questions, share tips and stay connected.
- Use social media to share updates, stories, celebrate milestones and highlight local impact.

SUSTAINING CITIZEN SCIENCE SPIRIT IN CLEAN AIR PROJECT

"We discovered that passion for clean air, while essential, isn't always enough," reflects Clean Air team. "Successful projects need to align with participants' personal goals, schedules, and motivations. Sometimes this means rethinking what engagement looks like - perhaps it's not about having the same people involved every day, but rather creating flexible opportunities that work with people's lives." - Clean Air Project



Recognize and reward contributions. Public and personal recognition fuel motivation and makes people feel valued:

- Highlight a “Citizen Scientist of the Month” on your website or newsletter.
- Use digital badges to mark milestones (e.g., 100 observations submitted).
- Host annual events to celebrate achievements, such as an “Air Quality Champions” award.
- Share impact stories to show how citizen contributions drive real change.

Offer ongoing learning opportunities. Keep your participants inspired with new knowledge and opportunities to grow:

- Invite air quality experts to give talks or webinars.
- Organize field visits to labs, government monitoring stations, or air quality hotspots.
- Sponsor conference attendance or learning exchanges.

Did You Know? A study by West & Pateman (2016) found that continued education and skill development was a key factor in encouraging long-term participation in environmental volunteering and citizen science initiatives.



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A – ANALYZE COLLECTED DATA

As we progress through our BREATHE framework, we now reach a pivotal stage: transforming the rich stream of citizen-generated data into powerful, actionable insights. This is where information becomes impact, where public observations evolve into knowledge that can drive decisions, inspire action, and shape better outcomes.

This section outlines a structured approach to analyzing citizen science data that ensures both scientific rigor and practical relevance across four stages:



Analyze and interpret citizen science data



Integrate Different Data Sources & Triangulate for Greater Impact



Apply robust analytical techniques



Ensure scientific rigor in analysis

Citizen science data, when carefully analyzed and contextualized, can inform planning, support awareness-raising activities, and strengthen policy responses. Empowering the public to interpret their own data transforms analysis from a technical task into a catalyst for change.



■ Analyze and Interpret Citizen Science Data

We'll begin by diving into the raw data, employing exploratory techniques to uncover patterns and trends that might not be immediately apparent.

**Remember, the goal is not just to analyze data, but to empower citizen scientists to collaborate with researchers and scientists to meaningfully engage with the information they've collected. By providing the right combination of tools, resources, and support, you can enhance both the quality of your project's outputs and the depth of participant engagement in the scientific process.*



- **Visualize data distributions:** • Create histograms and box plots for key pollutants • Generate time series plots to identify temporal patterns • Develop spatial heat maps to visualize geographic variations
- **Calculate summary statistics:** • Compute means, medians, and standard deviations for pollutant levels • Determine data ranges and identify potential outliers • Assess data completeness and coverage
- **Explore relationships between variables:** • Generate scatter plots to visualize correlations between pollutants • Create correlation matrices to quantify relationships • Consider creating pair plots for multivariate exploration.



■ Apply Robust Analytical Techniques

Build on initial insights using more advanced methods to quantify relationships and generate deeper findings:

- Use regression, time-series, or geostatistical models.
- Develop simple predictive models if relevant.
- Conduct hypothesis testing for key trends.
- Validate results using comparative datasets.

See [Annex 7: Robust Analytical Techniques](#)  for a listing of analytical methods suitable for citizen science air quality data.

Box 7. Addressing Data Quality



Flag data outside expected ranges or with gaps.



Compare findings across sensors and locations.



Use imputation only when necessary and transparently.



BRIDGING CITIZEN DATA AND SCIENTIFIC EXPERTISE

Achieving scientific rigor in citizen science requires a careful balance. While citizen scientists offer invaluable local knowledge and lived experience, Clean Air found that producing reliable, actionable data hinges on strong collaboration between the public and technical experts.

“It’s not about questioning citizen-collected data,” reflects the team, “but rather about creating partnerships that enhance its value. When technical experts work alongside citizen scientists, public observations gain scientific weight, while technical analysis benefits from real-world context.”



■ Integrate Different Data Sources & Triangulate for Greater Impact

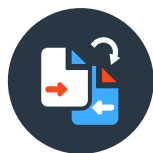
Citizen science data is most powerful when used alongside complementary data. Integration helps broaden understanding and uncover complex relationships.

- Combine with satellite, meteorological, or traffic data.
- Include qualitative sources such as local surveys and social media.

Using multiple data sources or methods to examine the same issue—known as triangulation—increases the credibility, validity, and depth of your findings. Here are some of the ways triangulation can help:

- Confirm findings: If different types of data (e.g., sensor readings, local reports, satellite imagery) point to the same trend, you can be more confident in the result.
- Explain anomalies: Public observations or qualitative data can provide context for unusual spikes or patterns in quantitative data.
- Strengthen awareness-raising activities: Combining personal stories with hard data makes evidence more compelling for decision-makers.
- Highlight complexity: Triangulation can reveal connections between environmental, social, and policy factors that might be missed with a single method.





■ Types of data that can be integrated

Quantitative data sources

- Air quality monitoring stations
- Pollutant concentrations (PM2.5, PM10, NO2, O3, etc.)
- Air Quality Index values
- Meteorological data
- Temperature, humidity, wind speed and direction
- Precipitation levels
- Satellite data
- Aerosol Optical Depth
- NO2 column densities
- Traffic data
- Vehicle counts
- Traffic speed and congestion levels
- Energy consumption data
- Electricity usage
- Fuel consumption statistics

Qualitative data sources

- Local surveys and interviews
- Perceived air quality
- Health symptoms related to air quality
- Social media data
- Public sentiment about air quality
- Reported air quality events or odors
- Policy and regulatory information
- Local air quality regulations
- Enforcement actions and compliance reports
- News and media reports
- Coverage of air quality events
- Public awareness campaigns
- Historical and local context knowledge
- Traditional ecological knowledge
- Local history of industrial activities



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■ Uphold Scientific Rigor

Throughout your analysis:

- Ensure methodological transparency by clearly documenting decisions and justifying each analytical decision. This allows others to understand your process and potentially reproduce your results.
- Use appropriate statistical techniques suited to the data's nature.
- Provide contextual interpretation, especially where variability exists. Consider how factors like varying sensor quality or inconsistent sampling times might influence your findings.
- Pursue peer review from experts in both citizen science and air quality research. Their insights can help identify potential oversights or assumptions in your analysis.
- Respect ethical considerations, including privacy and local impact. Be mindful of potential socio-economic or regulatory implications of your findings.

By adhering to these principles, you demonstrate that citizen science, when rigorously analyzed, can provide valuable insights complementing traditional scientific approaches.



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T – TRANSFORM INSIGHTS INTO ACTION

The “Transform” stage marks the evolution where data becomes a force of change. This is the moment when local insights turn into action, informing policies, sparking public awareness, and rallying collective efforts for cleaner, healthier air. Most importantly, it’s when citizen scientists shift from being data collectors to becoming storytellers, champions, and agents of change.

This section defines how to:



Craft compelling narratives



Celebrate citizen scientist contributions



Communicate findings to influence policy and practice



Amplify your message through media and outreach

For further guidance and templates to support you in implementing the Transform stage, see [Annex 8: Decision-Maker Briefing Tools](#), [Annex 9: Recognition and Awareness Raising Tools](#), and [Annex 10: Strategic Communications Toolkit](#).





■ Craft Compelling Narratives

Data alone rarely moves people to act. Stories do. By weaving evidence with lived experience, you can create powerful narratives that resonate across audiences—from the public to decision-makers. Transforming data into stories helps connect with audiences on both emotional and intellectual levels. Strong narratives drive action.

Citizen scientists should be at the center of these stories so they can ground data in reality and bring meaning to the data.

Key elements of effective narratives:



Clear central message: A simple, memorable takeaway.



Local context: Connect findings to lived local realities.



Call to action: Clearly state what needs to change.



Human element: Personal experiences bring data to life.



Visual storytelling: Use maps, graphs, and infographics.

Citizen stories can be surfaced and shared through various creative approaches. Host **storytelling workshops** to create space for people to reflect on their participation and share meaningful experiences. Use **local context mapping**—either physical or digital—to visually connect lived stories with specific air quality data points. Support the development of **citizen-led case studies** that document neighborhood-level challenges and successes in participants' own words. Together, these efforts weave a shared narrative that resonates across different groups of people and institutions alike.



■ Communicate Findings to Influence Policy and Practice

Effectively sharing project findings is key to turning data into action. Policymakers and practitioners are more likely to respond when insights are presented clearly—backed by credible data and enriched by the voices of those who collected it.



- **Why Citizen Perspectives Matter.** Citizen scientists bring a unique and persuasive perspective. Their stories lend urgency to the data, and their involvement builds trust and accountability. The most successful communication strategies are those that combine technical accuracy with emotional resonance, using local narratives to complement the evidence and connect with decision-makers.
- **Tailor Your Communication.** Understanding your audience is critical. Whether it's a local council member or a national policymaker, align messaging with their priorities. Simplify complex findings into clear, actionable summaries using compelling visuals to highlight trends or hotspots. Provide context by linking your results to public health goals, policy frameworks, or upcoming legislation. And always conclude with specific, feasible recommendations they can act on.
- **Integrate Citizen Voices.** Integrating citizen perspectives is just as important. Testimonials and localized reports offer a grounded, personal lens. Participatory policy workshops and public dialogues ensure the insights and priorities of citizen scientists are reflected in awareness raising efforts.
- **Identify Opportunities to Influence.** To influence change, scan for relevant policy windows—such as planned reviews or draft laws—and engage early. Build coalitions with civil society, researchers, and municipal authorities to strengthen your position. Participate in public consultations and organize outreach meetings that pair human stories with compelling data.
- **Support Locally-Led Action.** Supporting locally-led responses can further extend the reach of your findings. Organize action planning workshops using the project data to co-design local clean air plans. Launch green initiatives like tree planting or traffic interventions based on hotspot analysis. Finally, spark innovation through local challenges where the public develop their own solutions.

Box 8. Tips for Engaging Policymakers



Schedule brief, focused meetings with key officials.



Frame discussions around health and economic impacts.



Provide takeaway materials with key visuals.



MAKING CITIZEN SCIENCE COUNT

In Chandragiri Municipality, Clean Air turned a basic monitoring task into a catalyst for change. When the municipality distributed electric cookstoves to 45 marginalized households, trained members of the local civil society network assessed the program's effectiveness. Their findings were illuminating: 65% of households adopted the stoves successfully, but 35% faced barriers—including incompatible cookware and inadequate electrical supply.

This citizen-generated data went beyond documentation. It empowered civil society networks to engage local officials in informed discussions about improving e-cooking initiatives. Their evidence prompted practical conversations on upgrading electrical infrastructure and ensuring cookware compatibility—turning monitoring into momentum for real-world improvements.

“Every piece of citizen science should have a clear pathway to impact,” notes Clean Air team. “Whether it’s informing city planning, raising community awareness, or driving policy change, citizen-collected data becomes powerful when it’s part of a larger strategy for change.”



■ Celebrate and Reinforce Citizen Scientist Contributions

Recognition at the “Transform” stage is about more than gratitude—it reinforces the value of citizen science, builds credibility with decision-makers, and sustains long-term motivation. By celebrating contributions now, you not only acknowledge the time and effort of participants but also showcase the real-world impact they’ve made. This reinforces the idea that citizen scientists are not just helpers, but vital agents of change whose work drives policy, influences practice, and inspires public action.

Recognition strategies:

- Impact storytelling: Create a series showcasing how citizen-collected data led to change.
- Citizen-policy engagement training: Prepare participants to engage in policy discussions.
- Awards and accolades: Recognize those who made measurable contributions to cleaner air.



- Public symposiums: Celebrate milestones and share lessons with the broader public.
- Legacy initiatives: Support citizen-led projects that extend beyond the original program.
- Media ambassador program: Train citizen scientists as media representatives.
- Citizen science fellowships: Place participants in local government roles.
- Sponsorship opportunities: Enable participation in national or global events.



■ Amplify Your Message Through Media and Outreach

Strategic media engagement helps scale your impact and inspire broader participation.

- **Develop a media plan:** Craft clear, compelling messages in collaboration with citizen scientists. Identify a mix of media outlets—from local radio to online environmental platforms—and time your outreach around key dates, policy windows, or project milestones.
- **Support citizen scientists in outreach:** Provide media training, designate spokespersons, and develop media kits with visuals and bios to make interviews and coverage easier.
- **Use a mix of your media formats:** Write articles or opinion pieces, create social media campaigns, and launch podcasts or video blogs. Share behind-the-scenes views of monitoring, analysis, and local engagement.
- **Engage the public directly:** Host booths at science fairs, organize public engagement meetings, and develop school-based programs. These in-person interactions deepen public understanding and reinforce your project's credibility.

The “Transform” stage marks the evolution from data to action. It’s about empowering the public with the tools, confidence, and platforms to turn insight into impact. By elevating citizen voices, strategically engaging policymakers, and communicating across channels, citizen science becomes more than a method—it becomes a movement.

Next up: how to evaluate and share results for sustained impact.



Box 9. Measure & Adapt Your Media Impact

Strategic media engagement doesn't end with publication or broadcast—it evolves with reflection.



Track coverage: Monitor where and how your project is mentioned across platforms—from news outlets to podcasts to social media.



Assess reception: Analyze public sentiment and gather feedback from both audiences and your own citizen scientists.



Refine strategy: Use what you learn to adjust your messaging, improve timing, and elevate the voices that resonate most.



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H – HIGHLIGHT RESULTS

The ‘Highlight Results’ phase focuses on capturing the impact your citizen science initiative is making, both in science and in society. By tracking key indicators, evaluating outcomes and reflecting on your progress, you can celebrate success, learn what works, and build a powerful case for continued support and future investment. This phase turns your data and efforts into evidence; proof that locally-led science drives real change.



■ Identify and Track Key Performance Indicators (KPIs)

Choosing the right key performance indicators (KPIs) helps you measure what truly matters. They should reflect both the scientific integrity and the local impact of your project.

Define Your KPIs Together

Involve citizen scientists when selecting KPIs to ensure they reflect both technical goals and local values. KPIs typically fall into four categories as detailed in Table 1.

Table 1. Sample Indicators

Category	Indicator	Description
Scientific Impact	Data Quality Score	Comparison of citizen-collected data to reference monitors or accepted scientific standards.
	Spatial Coverage	Number of distinct geographic areas or zones with active data collection.



Category	Indicator	Description
	Temporal Coverage	Frequency and duration of data collection over time.
	Hotspots Identified	Number of air quality hotspots or clean air zones discovered.
	Validation Activities Conducted	Number of data validation checks or comparisons completed.
	Active Participants	Total number of citizen scientists engaged during the project cycle.
	Retention Rate	Percentage of participants who continue from initial recruitment through project completion.
Public Engagement	Training Completion Rate	Percentage of citizen scientists who completed all required trainings.
	Public Awareness Index	Change in air quality awareness measured through pre- and post-project surveys.
	Volunteer Hours Contributed	Total time invested by local participants.
	Demographic Variety	Age, demographic background, and geographic variety of participants.
Project Reach	Partnerships Formed	Number and type of institutions collaborating in the project.
	Media Mentions	Number of news stories, social media mentions, or public recognitions.
	Educational Events Held	Number of workshops, school visits, or training sessions.



Category	Indicator	Description
Policy & Practice Influence	Policy Citations	Number of times project findings are referenced in local or national policies.
	Meetings with Decision Makers	Formal engagements between citizen scientists/project team and policymakers.
	Adopted Recommendations	Number of project recommendations taken up by authorities.
	Public Hearings Participated	Number of public consultations or hearings attended with project data.

These indicators can be adapted to suit the scope and scale of your project. Teams are encouraged to use a combination of quantitative and qualitative methods and to involve citizen scientists in tracking and interpreting indicator data wherever feasible.

Track KPIs Consistently

Once your KPIs are selected, establish routines and systems for collecting and using the data:

- Create a dashboard to display progress.
- Automate tracking where possible (e.g., syncing data tools).
- Schedule monthly or quarterly check-ins.
- Assign tracking roles across your team.
- Pair numbers with citizen scientist reflections to provide context.



Tip: Combine hard data with human stories when tracking impact. Quotes and reflections help explain why your metrics matter.



Tip: Celebrate Milestones. When KPIs are met, acknowledge and celebrate progress publicly. Use the moment to thank participants and reinforce purpose.





Evaluate Impact

What changed because of your project? Who made different decisions? What did your group do differently?

Evaluation tells the story of your project's value and effectiveness. It's not just about measuring outputs—it's about capturing outcomes that matter. A strong evaluation answers three key questions: Has air quality improved? Has public awareness and engagement grown? And has your work influenced policy or practice? By grounding your evaluation in these guiding questions, you can show how citizen science leads to real-world change. See Box 10.

Box 10. Methods for answering evaluation questions

1. Has Air Quality Improved?

- Use trend analysis to examine long-term changes in pollutant levels.
- Monitor air quality changes at known hotspots.
- Track air quality shifts following specific local or policy interventions.

2. Has Public Awareness Grown?

- Conduct surveys to assess knowledge and attitudes about air quality.
- Observe shifts in behavior (e.g., reduced open burning, cleaner transport choices).
- Measure civic engagement (e.g., attendance at public events or complaints filed).

3. Has Policy or Practice Changed?

- Note new policies that cite or build on your data.
- Track enforcement improvements or new regulatory guidelines.
- Count invitations to speak with policymakers or contribute to hearings.





■ Use Results to Strengthen Your Case

Documenting results builds credibility, attracts new partners, and informs future efforts. Whether you're applying for funding, seeking media coverage, or trying to scale your model, your results help demonstrate value and potential.

Include both numbers and stories. Pair graphs with quotes. Use dashboards, case studies, and infographics to create a full picture of your progress.



■ Looking Ahead

As you complete this stage, you're equipped with proof of what you've accomplished. But impact doesn't stop here. Next, we turn to how you can evolve and adapt—leveraging what you've learned to ensure sustainability, resilience, and growth.

The final step of the BREATHE framework awaits: Evolve & Adapt.



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E – EVOLVE & ADAPT

The final phase of the BREATHE framework focuses on ensuring that your citizen science initiative continues to grow, improve, and inspire. “Evolve & Adapt” is about building systems that support continuous learning, strengthen local ownership, and lay the groundwork for long-term sustainability, replication, and scale.



■ Cultivate a Culture of Continuous Improvement

In air quality monitoring, adaptability is essential. Regular reflection and iteration help your project stay responsive to changing local needs and emerging science.

Embed improvement in your process:

- Reflect together: Hold regular review sessions with citizen scientists and stakeholders—after each campaign or quarterly—to discuss what’s working and what could be better.
- Co-create solutions: Use participatory evaluation to gather different feedback and turn challenges into innovations.
- Form an innovation group: Invite a rotating team of citizen scientists to test new tools, methods, or outreach strategies.
- Stay current: Assign “science scouts” to monitor new research, technologies, or policy shifts and share insights with your group.
- Learn with others: Connect with peer projects through networks, exchanges, or learning partnerships.
- Adapt as you go: Use an adaptive management approach that allows you to revise your design, tools, or focus in real time.





■ Identify Opportunities to Replicate or Scale

When done thoughtfully, expanding your project's reach can multiply its impact—while maintaining the locally-driven values at its core.

Plan for purposeful growth:

- Build a knowledge sharing model: Support local hubs that replicate your initiative while tailoring it to their context.
- Use digital platforms: Develop tools for data collection, collaboration, and storytelling that scale easily across locations.
- Partner locally: Collaborate with schools, faith-based groups, and local institutions to embed your model into trusted networks.
- Share your roadmap: Use resources like replication planning templates to guide others.



■ Secure Support for Long-Term Sustainability

To endure, your initiative needs more than enthusiasm—it needs resources. Align your goals with the interests of donors, government agencies, and local stakeholders.

Build a strong support base:

- Broaden funding sources: Combine small grants, CSR funds, in-kind support, and local donations. Explore crowdfunding or locally-based financing like local bonds.
- Make your case compelling: Use data and stories to show your project's impact on air quality, health, and policy.
- Create partnerships with purpose: Collaborate with institutions that benefit from your data—like universities, health departments, or environmental agencies.



■ Keep Growing, Keep Learning

As your project evolves, your ability to adapt will determine its long-term success. By embedding systems for reflection, creating pathways for scale, and securing sustainable support, you're not just sustaining a project—you're advancing a movement for cleaner air and stronger populations.



CLEARING THE AIR TOGETHER


As we conclude this guide, we hope you've gained valuable insights into how citizen science can strengthen air quality management efforts. *Clearing the Air Together* is more than just a title—it's a call to action and a practical roadmap for engaging the public in the fight for cleaner air.

READ MORE



Throughout this resource, we've walked through the BREATHE pathways:

- B** Begin exploration
- R** Recruit citizen scientists & Refine research methodologies
- E** Experiment & Engage
- A** Analyze collected data
- T** Transform insights to action
- H** Highlight results
- E** Evolve & adapt

For an easy-to-reference summary of these steps, see [Annex 11: BREATHE Implementation Checklists](#)  which offers a clear and practical guide to help plan and carry out your activities.

Together, these pathways offer a flexible yet comprehensive framework for designing, implementing, and sustaining citizen science initiatives. From the earliest stages of project design to ongoing reflection and scaling, each step reinforces a collaborative, data-driven approach to air quality management.

The power of citizen science lies not only in expanding the reach of data collection, but also in building public awareness, strengthening local ownership, and translating insights into meaningful action. By involving people directly in the scientific process, we unlock local knowledge, foster scientific literacy, and create shared accountability for environmental health.

As you embark on your own citizen science journey, remember: even small projects can contribute to lasting change. We hope this guide provides the tools, strategies, and inspiration you need to integrate citizen science into your efforts to improve air quality and advance healthier, more resilient populations.

Together, we can clear the air.



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Annex 1.

Begin-Exploration-Worksheet

Use this worksheet to guide your initial exploration of integrating citizen science into your air quality reduction initiatives.

1. Current Initiatives Assessment

List your organization's current air quality management efforts:

- ☐ Monitoring programs: _____
- ☐ Emissions inventories: _____
- ☐ Air quality modeling: _____
- ☐ Public awareness campaigns: _____
- ☐ Policy engagement: _____
- ☐ Other: _____

Identify strengths and limitations of these efforts:

Strengths: _____

Limitations: _____



2. Opportunity Identification

Where could citizen science make the biggest impact? Check all that apply and briefly explain why:

- ☐ Hyperlocal air quality data: _____
- ☐ Real-time monitoring: _____
- ☐ Source identification: _____
- ☐ Social and behavior change: _____
- ☐ Policy support: _____
- ☐ Other: _____

3. Context Analysis

Assess your local context:

- Local networks that could be partners: _____
- Access to technology (e.g., smartphones, internet): _____
- Collective attitudes towards air quality issues: _____
- Potential representation considerations: _____
- Political/institutional support for citizen science: _____
- Available resources (financial, human): _____



4. Stakeholder Mapping

List key stakeholders to engage:

1. _____
2. _____
3. _____
4. _____
5. _____

For each stakeholder, note:

Their potential role: _____

Their interests/concerns: _____

Engagement strategy: _____

5. Next Steps

Based on your responses, outline 3-5 concrete next steps

1. _____
2. _____
3. _____
4. _____
5. _____



Annex 2.

Roles and Responsibilities



Project Coordinators

- Develop and maintain the overall project plan and timeline
- Manage project resources (budget, equipment)
- Coordinate with partner organizations and stakeholder
- Oversee recruitment and engagement of citizen scientists
- Ensure compliance with ethical guidelines and data protection regulations
- Report project progress to funders and stakeholders



Citizen Scientists

- Follow data collection protocols accurately and consistently
- Properly use and maintain monitoring equipment
- Submit collected data in a timely manner
- Participate in training sessions and skill development activities
- Report issues or unusual observations to project coordinators
- Engage with the public to raise awareness about the project



Data Managers

- Design and maintain the data management system
- Implement data quality control and validation procedures
- Ensure proper data storage and backup
- Manage data access and sharing in compliance with project policies
- Prepare data for analysis and visualization
- Document data collection methods and changes in protocols





Public Liaisons

- Build and maintain relationships with local organizations and leaders
- Organize neighborhood events and information sessions
- Gather and communicate local feedback to the project team
- Recruit and retain citizen scientists from diverse backgrounds
- Assist in disseminating project findings to local stakeholders



Technical Support Team

- Provide technical training on monitoring equipment and tools
- Troubleshoot equipment issues and perform repairs
- Manage digital infrastructure (websites, mobile apps)
- Stay updated on relevant technologies
- Advise on equipment upgrades or replacements as needed



Scientific Advisors

- Advise on research design and methodology
- Assist in data interpretation
- Guide data analysis techniques
- Identify trends and patterns in air quality data
- Contribute to scientific publications or reports
- Ensure alignment with current air quality research and policy



Education and Outreach Coordinators

- Develop educational materials about air quality and project goals
- Organize workshops and training sessions
- Create content for public engagement (blogs, social media)
- Coordinate with educational institutions for collaborations
- Design activities to promote environmental awareness



Quality Assurance Officers

- Develop and implement Quality Assurance Project Plans
- Conduct regular audits of data collection and quality
- Provide feedback on data quality
- Coordinate with data managers on validation procedures
- Ensure compliance with regulatory or funding requirements for data quality



Annex 3.

Consent Forms and Guidance

This annex provides templates and guidance for obtaining informed consent from participants involved in citizen science air quality projects. Informed consent is a fundamental ethical requirement that ensures participants understand the purpose of the project, what is expected of them, how their data will be used, and their right to withdraw at any time. This annex includes sample consent forms, verbal consent scripts, and key considerations for translation and low-literacy contexts.

Quick Reference: Types of Consent Forms

Type of Consent Form	Type of Consent Form	Notes
Adult Participant Consent	General participation in data collection	Can be adapted for paper or digital use
Guardian Consent for Minor	Participation of individuals under 18	Requires signature of parent/guardian
Media Release Consent	Use of photos, videos, and quotes	Optional but encouraged for storytelling
Verbal Consent Script	Contexts with low literacy or informal participation	Use when written consent isn't feasible



Guidance for Ethical and Practical Implementation

- Ensure all consent materials are available in participants' preferred languages.
- Use plain, non-technical language. Avoid jargon.
- Allow time for participants to ask questions.
- Provide a verbal consent option when appropriate (see script below).
- Align your consent process with relevant data protection laws (e.g., GDPR, local policies).

Sample Verbal Consent Script

"Hello, my name is [Your Name], and I'm part of the [Project Name] team. We are working on a project to better understand air quality in our surroundings. Your participation would involve [brief description of activities]. Your participation is completely voluntary. You may stop at any time. Do you agree to participate?"

Facilitator Checklist for Obtaining Consent

- ☐ Explained the project in simple terms
- ☐ Provided opportunity for questions
- ☐ Confirmed participant understood they can withdraw at any time
- ☐ Collected written or verbal consent

Sample Adult Participant Consent Form

Project Title: [Insert Project Name]

Participant Name: _____

I understand that I am volunteering to participate in a citizen science project about air quality.

I understand the activities involved and how the data I provide will be used.

I understand I can withdraw from the project at any time without any consequences.

Signature: _____ Date: _____

Project Representative: _____



Annex 4.

Sample Agendas, Evaluation Templates, and Feedback Forms

Section 1: Sample Agenda

Below is a sample agenda for a one-day citizen science air quality workshop.

Sample Workshop Agenda:

08:30 – 09:00	Registration and Coffee
09:00 – 09:30	Welcome and Introduction to Citizen Science
09:30 – 10:30	Understanding Air Quality: Basics and Local Context
10:30 – 10:45	Break
10:45 – 12:00	Hands-On Sensor Training and Observation Methods
12:00 – 13:00	Lunch
13:00 – 14:30	Local context Mapping and Data Collection Practice
14:30 – 15:30	Data Interpretation Techniques
15:30 – 16:00	Group Reflection and Storytelling
16:00 – 16:30	Next Steps and Project Roles



Section 2: Evaluation Template

Use the following template to gather participant feedback on training or event effectiveness.

Training Evaluation Form (Likert Scale 1–5)

1. The training objectives were clearly defined.
2. The content was relevant and useful.
3. The facilitators were knowledgeable and engaging.
4. I feel more confident using air quality monitoring tools.
5. I would recommend this training to others.

Open-ended Questions:

- What was the most valuable part of today's session?
- What improvements would you suggest?
- What topics would you like more training on?

Section 3: Feedback Form

Use this form at the end of meetings or events to gather quick feedback from participants.

Event Feedback Form:

1. What did you like most about the event?
2. Was there anything that could be improved?
3. How will you use what you learned today?
4. Any additional comments or suggestions?



Annex 5.

Observation Log Templates

Observation logs are essential tools for citizen scientists to record real-time data and personal observations during air quality monitoring activities. Below are example templates that can be adapted for different types of citizen science projects.

Template 1: Daily Observation Log

Date	Time	Location	AQI/Sensor Reading	Weather Conditions	Personal Observations/Notes

Template 2: Sensory Walk Log

Date	Time	Route/Area	Smells	Sounds	Visual Observations

These templates should be customized according to your project's specific needs and can be distributed as printable forms or incorporated into digital data collection platforms.



Annex 6.

Collaborative Event Planning Tools

This annex provides tools and templates to support collaborative events throughout the citizen science air quality monitoring project lifecycle. These events range from initial public co-design sessions to public forums, data interpretation workshops, and policy dialogues.

1. Types of Collaborative Events

Event Type	Purpose & Description
Co-Creation Workshops	Engage the public early to shape project goals, data collection strategies, and research questions.
Storytelling Sessions	Enable citizen scientists to share personal narratives related to air quality and health.
Locally-Led Action Planning Workshops	Collaboratively develop localized air quality improvement plans.
Data Interpretation Events	Engage participants in analyzing findings and exploring patterns.
Science Fairs & Public Exhibitions	Share project progress and results with a broader audience.
Citizen-Decision Maker Dialogues	Create opportunities for direct interaction between citizens and policymakers.
Training & Education Workshops	Build participant skills in data collection, analysis, and advocacy.



2. Event Planning Checklist

- ☐ Define event objectives and desired outcomes
- ☐ Identify and invite relevant stakeholders
- ☐ Select accessible and inclusive venues
- ☐ Prepare materials (agendas, maps, data summaries, etc.)
- ☐ Assign facilitation roles (moderators, note-takers, etc.)
- ☐ Incorporate interactive elements (polls, group work, open mic)
- ☐ Capture feedback and evaluate event effectiveness

3. Sample Event Agenda Template

Time | Session | Lead | Notes

09:00 - 09:30	Registration & Welcome	Coordinator	
09:30 - 10:00	Introduction to the Project	Project Lead	Overview and objectives
10:00 - 11:00	Interactive Session	Facilitator	Small group discussions
11:00 - 11:15	Break		
11:15 - 12:15	Data Sharing or Planning Activity	Analyst / Participants	Hands-on mapping or action planning
12:15 - 12:45	Summary and Reflections	Group Leads	Reporting back
13:00 - 14:30	Closing Remarks	Host	Thank you & next steps

4. Facilitation Tips

- Use open-ended questions to prompt discussion
- Validate all contributions and ensure equal participation
- Prepare visual aids (charts, maps, infographics) to support comprehension
- Foster a respectful and safe environment for dialogue



Annex 7.

Robust Analytical Techniques

Implement advanced statistical methods

1. Conduct time series analysis: Apply decomposition techniques to separate trend, seasonal, and residual components • Use autoregressive integrated moving average (ARIMA) models to forecast air quality trends • Implement change point detection to identify significant shifts in air quality over time
2. Perform spatial statistics: Utilize spatial autocorrelation measures to quantify spatial patterns • Apply kriging or other interpolation methods to estimate air quality levels in unmonitored areas • Use geographically weighted regression to explore spatially varying relationships
3. Employ multivariate analysis techniques: Conduct principal component analysis to identify main drivers of air quality variation • Use factor analysis to uncover latent variables influencing air quality levels • Apply cluster analysis to identify groups of locations with similar air quality profiles

Develop and apply predictive models

1. Build regression models: Utilize multiple linear regression to quantify relationships between air quality levels and predictors • Apply generalized additive models to capture non-linear relationships • Use mixed-effects models to account for hierarchical data structures
2. Implement machine learning approaches: Use random forests or gradient boosting machines for high-dimensional air quality prediction • Apply support vector machines for classification of air quality levels • Explore deep learning techniques for complex spatial-temporal air quality modeling
3. Validate and refine models: Implement cross-validation techniques to assess model performance • Use bootstrapping to quantify uncertainty in model predictions • Regularly update and retrain models as new data becomes available



Conduct hypothesis testing

1. Formulate and test specific hypotheses: Use t-tests or other methods to compare air quality between different groups or time periods • Apply chi-square tests to analyze categorical air quality data • Implement non-parametric tests when data doesn't meet normality assumptions
2. Assess intervention effects: Use interrupted time series analysis to evaluate the impact of air quality interventions • Apply difference-in-differences methods to compare intervention effects across locations • Conduct Bayesian analysis to quantify the probability of intervention effectiveness
3. Investigate complex relationships: Use structural equation modeling to explore causal pathways in air quality dynamics • Apply network analysis to understand the interconnections between different air quality factors • Implement Granger causality tests to explore temporal relationships between variables

Ensure robustness and reliability

1. Conduct sensitivity analyses: Assess the impact of different data preprocessing choices on your results • Explore how model assumptions affect your conclusions • Investigate the influence of outliers or influential observations on your findings
2. Implement ensemble methods: Combine predictions from multiple models to improve overall accuracy • Use techniques like bagging or boosting to create robust predictive models • Apply Bayesian model averaging to account for model uncertainty
3. Validate results: Use hold-out datasets to test the generalizability of your findings • Compare results across different subsets of your data to ensure consistency • Seek external validation by comparing your results with other studies or official data sources



Annex 8.

Decision-Maker Briefing Tools

This annex provides ready-to-use templates and formats for briefing policymakers and decision-makers. These tools are intended to help citizen science project teams translate findings into actionable insights.

1. Policy Brief Template

Title: [Clear, concise summary of the issue]

Executive Summary: [3–4 bullet points summarizing the main findings and recommendations]

Background: [Context on air quality issues and citizen science project]

Key Findings: [Concise presentation of data insights]

Policy Recommendations: [Actionable and specific recommendations]

Conclusion: [Reinforce urgency and call to action]

Contact Information: [For follow-up or additional information]

2. One-Pager Template

Heading: [Compelling statement or question]

Overview: [Brief project description and goals]

Key Data: [Visual snapshot or bullet points of findings]

What Needs to Be Done: [List of actionable points or decisions required]

Who We Are: [Brief intro to the project team or community group]



3. Decision-Maker Presentation Outline

Slide 1: Title and Introduction

Slide 2: Air Quality Issue and Why It Matters

Slide 3: Project Overview and Citizen Science Role

Slide 4: Key Data Findings (with visuals)

Slide 5: Local Voices or Testimonials

Slide 6: Policy Opportunities

Slide 7: Recommendations and Next Steps

Slide 8: Contact and Follow-up Information

4. Meeting Planning Checklist

- ☐ Identify the right audience and tailor messaging
- ☐ Prepare visual aids and handouts
- ☐ Schedule meetings around key policy windows or public hearings
- ☐ Involve citizen scientists in presentations where appropriate
- ☐ Practice a short, compelling pitch
- ☐ Follow up with thank-you notes and documentation



Annex 9.

Recognition and Awareness Raising Tools

This annex provides tools and strategies to help citizen science project teams recognize the contributions of volunteers and promote policy and behavioral change.

Section 1: Recognition Tools

1. Impact Story Templates:

Use short templates to capture how specific contributions led to change.

Template:

- Contributor Name: _____
- Activity: _____
- Result/Outcome: _____
- Quote/Testimonial: _____

2. Public Recognition Certificate:

Create printable certificates for key milestones (e.g., data collection, awareness raising).

Include: Name, Date, Project Title, Contribution Summary, Signature

3. Media Spotlight Guidelines:

Prepare citizen scientists for media features.

Checklist:

- What story to tell
- Practice questions
- Photos with consent
- Suggested hashtags or campaigns

4. Annual Awards Framework:

Host local awards with categories like:

- Most Data Collected
- Strongest Advocate
- Innovation Champion

Section 2: Awareness Raising Tools

1. Citizen Science Advocacy Brief Template:

A 1-pager structure for citizen-led awareness raising activities:

- Title: “Cleaner Air for [Location]”
- Key Finding: (e.g., PM2.5 levels above safe limits)
- Local Impact: (Health, schools, roads, etc.)
- Recommendation: (e.g., traffic-free zones)
- Contact Info: Citizen scientist spokesperson

2. Policy Engagement Plan:

Guide to help teams plan decision-maker outreach.

Steps:

- Identify relevant policies or laws
- Map key decision-makers
- Align data with policy gaps
- Propose recommendations in collaboration with citizens

3. Testimony Coaching Guidelines:

Prepare citizen scientists to speak in policy forums.

Include:

- Key message distillation
- Speaking time practice
- Handling opposing views

4. Public Engagement Data Showcase Kit:

Materials to host a public or policy-focused event:

- Large-format posters with local data
- Photo exhibits from monitoring activities
- Interactive map of monitoring locations
- Handouts with QR code to project results

These tools support the “Transform” stage of the BREATHE framework and help elevate citizen scientists as recognized contributors and effective promoters for clean air.

Annex 10.

Strategic Communications Toolkit

Section 1: Key Messages Framework

Use this template to define and prioritize core messages for outreach.

Audience	Core Message	Supporting Evidence	Call to Action
General Public	Poor air quality impacts health and daily life	Local sensor data showing PM2.5 spikes	Use public transport; plant trees
Policymakers	Citizen science adds data for informed decisions	Local stakeholder generated hotspot maps	Integrate findings into clean air plans
Media	Citizens are leading clean air innovations	Stories of local volunteers and events	Cover citizen-led solutions



Section 2: Outreach Planning Checklist

- ☐ Use this to structure communications activities around your project milestones.
- ☐ Identify target audiences (public, media, government, etc.)
- ☐ Define specific communications goals (awareness, policy influence, behavior change)
- ☐ Develop key messages and storytelling angles
- ☐ Select appropriate channels (social media, radio, posters, etc.)
- ☐ Train citizen scientist spokespersons
- ☐ Develop visual content (photos, infographics, maps)
- ☐ Schedule media outreach around key events and data releases
- ☐ Monitor engagement and adjust strategy

Section 3: Sample Media Kit Contents

- Project overview (brief)
- Recent findings and visuals (charts, maps, infographics)
- Quotes from citizen scientists and researchers
- Photos/videos from the field
- Contact information for interviews



Section 4: Social Media Content Calendar Template

Date	Platform	Message	Visual	Link/CTA
Sep 7	Facebook	What does the air in your neighborhood look like?	Photo from Sensory Walk	Learn more at [URL]
Sep 14	Instagram	New data shows air quality improves on weekends. Why?	Line graph	#CleanAirNepal

Section 5: Event & Engagement Tools

Community Awareness Poster Template:

- **Headline:** “Breathe Easy: Help Monitor Kathmandu’s Air”
- **Body:** Brief info about the project and how to join
- **Visual:** Map of sensor locations and photos of local volunteers
- **Contact:** Phone/email/QR code to sign up

Press Release Template:

FOR IMMEDIATE RELEASE

Local Volunteers Map Air Quality Across Kathmandu

Kathmandu, Nepal – [Date] – Over [#] volunteers took to the streets to measure air quality as part of the Clean Air citizen science initiative. Their findings reveal critical air quality hotspots, sparking new conversations about clean air solutions.

Contact: [Name, Phone, Email]

Section 6: Tips for Effective Storytelling

- Use local voices to highlight personal connections to air quality
- Pair data visualizations with human stories
- Frame messages around shared values (health, family, children)
- Keep calls to action clear and realistic
- Involve citizen scientists as co-authors and speakers wherever possible



Annex 11.

BREATHE Implementation Checklists



B - Begin Exploration Checklist

- ☐ **Assess current air quality initiatives**
 - ☐ Map existing monitoring programs
 - ☐ Document recent studies and modeling efforts
 - ☐ List current policies and management practices
 - ☐ Inventory public awareness initiatives
- ☐ **Identify citizen science opportunities**
 - ☐ Note gaps in current monitoring coverage
 - ☐ List potential areas for public involvement
 - ☐ Assess available resources and constraints
- ☐ **Analyze local context**
 - ☐ Map existing local networks
 - ☐ Evaluate technology access and limitations
 - ☐ Document contextual considerations
 - ☐ Assess public-sector support
- ☐ **Engage stakeholders**
 - ☐ Identify key stakeholders
 - ☐ Hold initial consultations
 - ☐ Document stakeholder interests and concerns
 - ☐ Establish communication channels





R - Recruit & Refine Checklist

- ☐ **Develop recruitment strategy**
 - ☐ Create outreach materials
 - ☐ Identify target groups
 - ☐ Plan recruitment events
 - ☐ Set recruitment goals
- ☐ **Design inclusive process**
 - ☐ Address potential challenges to participation
 - ☐ Create multilingual materials if needed
 - ☐ Plan for broad ranging participation needs
 - ☐ Establish support systems
- ☐ **Refine methodology**
 - ☐ Select appropriate tools and methods
 - ☐ Design data collection protocols
 - ☐ Create quality control procedures
 - ☐ Plan for data management
- ☐ **Prepare training materials**
 - ☐ Develop basic training modules
 - ☐ Create reference guides
 - ☐ Plan hands-on practice sessions
 - ☐ Design assessment tools



E - Experiment & Engage Checklist

- ☐ **Launch data collection**
 - ☐ Distribute equipment/materials
 - ☐ Conduct initial training
 - ☐ Set up support systems
 - ☐ Begin pilot phase
- ☐ **Monitor and support**
 - ☐ Schedule regular check-ins
 - ☐ Provide ongoing assistance
 - ☐ Address emerging issues
 - ☐ Document lessons learned
- ☐ **Maintain engagement**
 - ☐ Plan regular local events
 - ☐ Share initial findings
 - ☐ Celebrate early successes
 - ☐ Foster peer support
- ☐ **Ensure data quality**
 - ☐ Implement quality checks
 - ☐ Provide feedback on data
 - ☐ Address systematic issues
 - ☐ Adjust protocols as needed





A - Analyze Checklist

- ☐ **Prepare data**
 - ☐ Clean and organize data
 - ☐ Check for completeness
 - ☐ Document data limitations
 - ☐ Format for analysis
- ☐ **Conduct analysis**
 - ☐ Run initial data exploration
 - ☐ Identify patterns and trends
 - ☐ Test hypotheses
 - ☐ Document methods used
- ☐ **Involve citizen scientists**
 - ☐ Share preliminary findings
 - ☐ Gather local insights
 - ☐ Incorporate feedback
 - ☐ Plan collaborative interpretation
- ☐ **Validate findings**
 - ☐ Cross-reference with other data
 - ☐ Check statistical significance
 - ☐ Review with experts
 - ☐ Document uncertainties



T - Transform Checklist

- ☐ **Prepare communications**
 - ☐ Identify key messages
 - ☐ Create visual materials
 - ☐ Draft policy briefs
 - ☐ Plan presentation strategy
- ☐ **Engage decision makers**
 - ☐ Map key influencers
 - ☐ Schedule presentations
 - ☐ Prepare citizen speakers
 - ☐ Follow up on commitments
- ☐ **Support public action**
 - ☐ Plan local initiatives
 - ☐ Provide resources
 - ☐ Monitor progress
 - ☐ Document impacts
- ☐ **Amplify message**
 - ☐ Engage media
 - ☐ Use social platforms
 - ☐ Share success stories
 - ☐ Build public support





H - Highlight Checklist

- ☐ **Track key metrics**
 - ☐ Set up tracking systems
 - ☐ Collect regular data
 - ☐ Monitor progress
 - ☐ Adjust targets as needed
- ☐ **Document impacts**
 - ☐ Gather quantitative data
 - ☐ Collect testimonials
 - ☐ Take photos/videos
 - ☐ Create case studies
- ☐ **Share results**
 - ☐ Prepare reports
 - ☐ Present to stakeholders
 - ☐ Update the public
 - ☐ Publish findings
- ☐ **Celebrate achievements**
 - ☐ Plan recognition events
 - ☐ Award certificates
 - ☐ Share success stories
 - ☐ Thank participants



E - Evolve & Adapt Checklist

- ☐ **Review and reflect**
 - ☐ Assess project impact
 - ☐ Identify challenges
 - ☐ Document lessons
 - ☐ Gather feedback
- ☐ **Plan improvements**
 - ☐ Update methods
 - ☐ Enhance training
 - ☐ Strengthen support
 - ☐ Expand reach
- ☐ **Ensure sustainability**
 - ☐ Secure resources
 - ☐ Build partnerships
 - ☐ Plan succession
 - ☐ Document procedures
- ☐ **Scale impact**
 - ☐ Identify opportunities
 - ☐ Plan expansion
 - ☐ Share model
 - ☐ Support replication





Clearing the Air Together

Pathways for Integrating Citizen Science in Air
Quality Management Initiatives

August 2025