CitiObs

Policy Brief

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Cooperation with Citizen Observatories: addressing social and technological barriers

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INTRODUCTION

Citizen Observatories (COs) are participatory initiatives that engage citizens in community-based environmental monitoring. In principle, COs are partnerships where residents, community groups, city staff, and researchers together measure the local environment (often using low-cost sensors), make sense of the results and co-create solutions. COs can provide valuable data that is often not available from conventional sources, thereby helping to address major issues such as the impacts of climate change, air pollution, biodiversity decline, natural disasters, and – overall – the urban green transition.

To maximise the potential role of COs in environmental monitoring and policymaking, enabling governance frameworks and support structures are needed that can help overcome some of the social and technological barriers to cooperation between policymakers and COs, including data standards, shared infrastructure, spaces for co-creation and learning, as well as outreach efforts to ensure inclusivity and representativeness.

This policy brief highlights tools and good practices from CitiObs that aim to support government authorities on all levels cooperate with COs and presents three main recommendations for policymakers.

UNLOCKING THE VALUE OF CITIZEN OBSERVATORIES IN ENVIRONMENTAL POLICYMAKING

The EU has set an ambitious climate and green transition agenda, a large share of which rely on strong multi-level and participatory governance mechanisms to be achieved. With 70% of European Green Deal legislation to be implemented at the subnational level, cities are central actors in the transition to climate neutrality and sustainable living.

One example is the revised Ambient Air Quality Directive (EU) 2024/2881 that tightens 2030 limit air pollution values for health protection and strengthens public rights and enforcement - a lot of which will play out at city level. Another example of cities' role in the green transition is the EU mission to achieve 100 carbon neutral cities by 2030. In addition, cities and regions are where the promise of a "Europe closer to citizens" - a core Cohesion Policy Objective (2021-2027) - is being delivered.

As the governance level closest to citizens, cities play a crucial role in enabling the contribution of COs to environmental policymaking. However, without the support of national and EU levels, some of the barriers to cooperate with COs are unlikely to be overcome, like for example the need for shared data infrastructure and data validation support. While most the recommendations in this brief may be most relevant for cities, it targets policymakers on all three levels.

KEY MESSAGES

COs can provide valuable, complementary data for environmental monitoring and policymaking that are often not available from conventional sources, while increasing coverage, contextualisation and potential for citizen-led action.

The value that COs can bring to policymaking goes beyond monitoring for regulatory compliance; they bring diverse sources of data and perspectives for participatory knowledge production and decision-making.

Tested governance mechanisms and tools can be used to address technological and social barriers to cooperation with COs, including multi-disciplinary offices for citizen science, shared data infrastructures, as well as toolkits for data validation and inclusion.

CITIZEN OBSERVATORIES IN CITIOBS ENGAGED IN POLICYMAKING AND CITIZEN-LED ACTION

ROTTERDAM

The Luchtclub in Rotterdam, the Netherlands, had during its peak activity one of the most dense levels of citizen air quality sensor coverage in a European city. These were connected to national air quality monitoring data relied on by municipalities and provinces through the Samen Meten (Measure Together) platform, and thus contributed to compliance with the Dutch Clean Air Agreement [1].

BARCELONA

The TÀNIA project in Barcelona, Spain, identified noise pollution as a wellbeing and health issue for some local neighbourhoods in Barcelona. Through an interactive and creative intervention, the project fostered awareness and promoted respectful behavior around a vibrant local square [2].

KRISTIANSAND

In Kristiansand, Norway, the Fiskåtangen Citizen Observatory worked to monitor industrial pollution and improve dialogue between residents of Fiskåtangen, the municipality, and industry players [3].

ATHENS

In Athens, Greece, the Urban Heat Watch Citizen Observatory brought together residents, the Agricultural University of Athens, and the Region of Attica to monitor urban heat and green space quality across the city. The initiative builds a collaborative knowledge hub on urban heat islands and climate resilience, co-designing green infrastructure strategies with communities most exposed to extreme heat events [4].

Citizen Observatories can support sustainable transitions to a healthier living environment for all in three important ways:

Data coverage: Citizen-generated data can complement and expand the reach of official monitoring systems by adding finer spatial and temporal insights. When incorporated responsibly, such data helps governments act on environmental issues timelier and with more precision, designing fairer interventions, and building stronger public trust in environmental governance.

Contextualisation: Insights into when and where problems occur (e.g., school drop-off, maintenance work, weekends and nightlife) help to design tailored mitigation measures that can engage citizens through their everyday activities.

Citizen- or community-led action: COs can work as a tool to empower people from different backgrounds to take part in local interventions and solutions to protect the environment. They can help to translate existing passion and enthusiasm into effective and collective action.

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OVERCOMING BARRIERS TO COOPERATION

Despite promising examples of COs' contribution to both national and local monitoring and policymaking efforts, cooperation between government authorities and COs can be challenging. There are some common barriers that need to be overcome, both related to technological and social aspects of such cooperation.

Going beyond an "only monitoring" mindset

Over the past decade, the emergence of low-cost, user-friendly sensor technologies and mobile apps has enabled many citizens to monitor their environment. This has sometimes led to concerns about the quality of the data that citizen science initiatives can bring to environmental monitoring. While such concerns are valid and data validation and quality assurance are key to environmental monitoring (further addressed in the next section), COs can provide value to different stages of the policy cycle and can help to for instance develop better research questions relevant for policy.

COs are created through multi-stakeholder collaborations involving civil society, researchers, public institutions, and private actors. The diversity of partners helps to diversify sources of knowledge available to inform policies and facilitate meaningful uptake of citizen-generated data and insights in policy and collective action. As such, COs can open policy-making to other "ways of knowing" that can be developed collaboratively and bottom-up.

GOOD PRACTICE EXAMPLES

- In Barcelona, the municipality has set up a multidisciplinary Citizen Science Office that acknowledges the value of residents' knowledge and engagement of the public in locally relevant scientific research. It thus supports citizen science projects taking place in neighbourhoods, schools, and across the metropolitan area. Investing in such institutional structures helps to provide a clear mandate for Citizen Science and supports its sustainability [5].

- Enabling COs' contribution to policymaking sometimes comes down to adopting an open mindset and providing space for joint experimentation. This is the case in the Netherlands, where the national Samen Meten (Measure Together) platform encourages stakeholders to do measurements together, build communities, connect with each other, exchange information, and combine data to put these in a broader context. Running for 10 years, the platform has grown into a national infrastructure integrating over 3000 air quality sensors, including from COs. In addition, the National Institute for Public Health and the Environment (RIVM) that is behind the platform organises regular workshops and encounters for COs [6].

Overcoming the data quality barrier: data quality assurance is fundamental to credibility and impact

Reliable results depend on establishing clear goals and data collection and engagement protocols from the outset. The CitiObs' Knowledge Platform provides guidance and tools to ensure that citizen-generated data is robust, transparent, and fit for decision-making.

Data produced through COs' activities can then help authorities make better decisions regarding the design and implementation of actions to address for example air pollution.

GOOD PRACTICE EXAMPLE

The FILTER (Framework for Improving Low-cost Technology Effectiveness and Reliability) methodology, developed in the context of CitiObs, is a multi-step data pipeline designed to evaluate, flag, and correct crowdsourced data from Low-Cost Sensors to make the best use of citizen science data, without compromising on scientific integrity [7]. The FILTER methodology was developed – inter alia - using data from Sensor.Community, a global grassroots initiative that operates over 85000 air quality sensors worldwide, and Purple Air providing real-time data. The validated datasets are openly available and that the Norwegian Meteorological Agency is currently using them to validate the air quality models used at European level.

At the same time, it is important to recognize that citizen-generated data is complementary to official monitoring, and that use of citizen-generated data for policy applications requires transparency about data quality and uncertainty.

Ensuring interoperability and openness

Another important consideration for how the data generated by COs can be incorporated into government and / or shared platforms is interoperability and openness. Using open standards, such as STAplus, the Open Geospatial Consortium (OGC) SensorThings API extension PLUS, and consistent metadata standards, such as the community driven CSDIF, enable data from different sources to be analysed together.

Responsible sharing of citizen data with clear rights and credit enhances impact and legitimacy. The Measure Together infrastructure referred to above gives a good example of how a national government agency and COs can work together on data integration and collaborative monitoring efforts.

Overcoming the inclusion barrier: making sure that data collected is representative of all segments of society, leaving no one behind

FIt is often the most vulnerable groups, such as young children, the elderly, and people in poor health who are disproportionately exposed to issues like air pollution and the adverse impacts of climate change. This makes it vital to ensure that diverse groups and voices are represented in CO activities, be that through data collection, insight gathering or active dialogue.

Providing resources for communities, cultural partners, and local facilitators can help to reach diverse groups, sustain participation, and build social cohesion at the neighbourhood level.

GOOD PRACTICES AND TOOLS

- The Citizen Science for All (CitSci4All) project has developed guidance, training and tools for the inclusion and active participation of Deaf and Hard of Hearing (DHH) communities in climate action and advocacy as a means of active citizenship and participation in societal life

- In the TANIA project in Barcelona, working with the creative sector helped to boost engagement among local residents, increasing the reach of its awareness-raising campaign about noise pollution.

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01 RECOMMENDATION

Develop governance frameworks that enable all levels of government, especially local authorities, to collaborate with citizens and communities in environmental monitoring, planning processes and the implementation of mitigation strategies and actions

Promote collaboration and co-creation throughout. The value that COs can bring to policymaking go beyond regulatory compliance; they bring diverse sources of data and perspectives for participatory knowledge production and decision-making. Acknowledging this value, local, national and EU-level institutions can provide spaces for joint experimentation and co-creation. At the city level, cooperation should start by engaging in open dialogue with citizens to understand their concerns and help to define specific research questions that can help solve concrete problems. Goals should be agreed before planning actions, since this will determine the expertise, tools and resources needed. It is important to engage staff from across departments and government agencies, for example planning, environment, health and mobility, to embed insights into all relevant policy processes.

Build capacity and adopt an open mindset. Experiences show that adopting an open mindset to collaboration can bring fruitful results for both sides. Increased understanding and capacity to support the value created by COs will help to generate a more open mindset towards these alternative sources of knowledge that can help to better target policy measures.

Provide support for COs to become sustainable beyond project cycles. COs require long-term sustained effort to build trust, ownership, and relevance over time. Embedding COs in government budgets and procurement processes, setting up dedicated support, and including shared data in performance frameworks all help to safeguard their continuity beyond project cycles. Governments can also help COs to access funding opportunities by sharing information and / or jointly participating in open calls.

02 RECOMMENDATION

Provide shared infrastructures and data gathering support to citizens and communities interested in environmental monitoring

Establish clear monitoring protocols. Targeted efforts are needed for COs to be able to set up data collection activities that can be compatible with government systems. Government authorities can help by providing clear guidance on relevant monitoring protocols, such as:

- Appropriate measuring devices (e.g. sensors, passive samplers).
- Variables and metadata to be collected (based on community concerns).
- Data and metadata formats that the relevant government body can work with.

Support and guidance can take many forms, like a website or portal with guides, how-to videos, case studies, or training events. A list of curated resources, for example the CitiObs Knowledge Platform, the European Citizen Science Association portal or RIVM's Measure Together Portal can be useful starting points.

Provide a shared infrastructure for combining government and CO data. When feasible, governments can provide the digital infrastructure to integrate the data and complement them with official data (like in the example of Measure Together).

Encourage data standards that improve interoperability. Encourage COs to use data standards such as STAplus, the Open Geospatial Consortium (OGC) SensorThings API extension PLUS, and consistent metadata standards, such as the community driven CSDIF.

It is important to clarify from the outset where the data will be stored, who will have access, and under what license, and to acknowledge and credit citizen contributions appropriately.

Be aware and transparent about sensor limitations. All sensors have limitations. Ensure that both data collectors and users understand the accuracy and constraints of the tools used. Open and honest communication increases trust and usability. Create a list of tested devices with known data quality, and encourage the use of open-hardware and open-software sensors to improve transparency and control over data processing. In Europe, the CEN Technical Committee CEN TC 264 WG 42 provides specifications for the evaluation of the performance of low-cost sensors. At the time of writing this brief, as the specifications are still not widely adopted, results on performance can be mostly found in scientific peer-reviewed literature. Eurocities' Working Group on Air Quality supports CEN, and is preparing an opinion and how-to document on the use of sensors.

03 RECOMMENDATION

Ensure that citizen science initiatives are inclusive and maximise the reach of awareness campaigns, for example by engaging the creative sector.

Ensure accessibility and representation. Government authorities can support COs in their outreach efforts, for example by providing guidance on clear and inclusive communication, supporting translations, and by providing accessible community spaces for people to meet. Working with local community leaders and trusted organizations can help facilitate the participation of vulnerable groups. Dialogue should be fostered across cultures, disciplines, genders and ages to fully capture the diverse perspectives and experiences COs can bring to policymaking.

Facilitate engagement of the cultural sector, artist communities, and maker spaces in collaboration with COs. Experience shows that COs benefit from the creative spark, imagination and originality brought by the creative sector, inspiring unique perspectives and extending the reach of awareness-raising campaigns. Creative and artistic approaches further help to reduce barriers for people for whom scientific or technical language and sensor technologies may form a barrier.

AUTHORS, REFERENCES & TOOLKITS

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THE CITIOBS TOOLKITS

- The Leave-No-One-Behind (LNOB) Toolkit is designed to help COs think through diversity and inclusion in a way that's relevant to their specific locations and the issues they are working on.
- The Participation Dynamics Toolkit supports COs in building and sustaining strong stakeholder relationships. It offers practical resources to address conflicts, strengthen cooperation, and foster trust across the groups involved.
- The Citizen-Led Action Toolkit provides practical tools for residents and communities who are eager to make a difference in environmental protection.
- The Environmental Monitoring Toolkit offers practical support for implementing environmental monitoring through affordable sensing devices. It covers essentials like choosing the right sensor, managing data quality, and ensuring data interoperability and accessibility.

Discover all Toolkits:
https://citiobs.eu/toolkits/

CitiObs - Enhancing Citizen Observatories for healthy, sustainable, resilient and inclusive cities

CitiObs is a four-year project funded under Horizon Europe by the European Commission. Over its 48-month duration, CitiObs will collaborate with a total of 85 COs involving people from diverse backgrounds, authorities, scientists, and other stakeholders. Working with established COs, CitiObs strives to create, enhance, and scale up inclusive and diverse observatories, fostering citizen engagement in urban environmental monitoring. The project seeks to expand the deployment of COs as part of inclusive multi-stakeholder environmental governance, generating validated data for policy and research, contributing to GEOSS and GEO initiatives, and co-designing local actions to address urban challenges related to pollution and climate change as part of the European Green Deal transition.

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