Mission Sustainable:
Fostering an enabling environment for sustainable Citizen Observatories

Executive Summary

Citizen Observatories are initiatives that engage citizens and other stakeholders in community-based environmental monitoring. They address major issues such as global warming, biodiversity decline, and natural disasters by providing valuable data that are often not available from conventional sources. They are uniquely placed to engage stakeholders across the Quadruple Helix (science, policy, industry, and society) to address societal challenges. However, Citizen Observatories face a number of challenges unique to their particular characteristics, such as the longer period of time over which an engaged community of participants is built, and the use of innovative data collection tools and technologies. **European policy makers and funders can improve the conditions that allow Citizen Observatories to thrive and sustain their activities.** Based on a range of inputs from practitioners, this policy brief makes four specific recommendations to European and national funding bodies and policy makers for fostering an enabling environment that can contribute to the generation, execution and sustainability of Citizen Observatories and therefore maximise their impact.

Summary of recommendations for policy makers & funders

1. Provide greater flexibility within funding schemes for co-design of Citizen Observatories.

2. Encourage the use of open source software, shared code bases, and sustainable hardware, and support ongoing technology development via iterative user feedback.

3. Explicitly include Citizen Observatories in mission-driven research funding schemes as a means for stakeholder engagement.

4. Provide longer term funding support for Citizen Observatories.

Introduction

Citizen Observatories for environmental monitoring have emerged as a specific form of Citizen Science; they are often transdisciplinary, and engage citizens and other stakeholders in one or more steps of the research lifecycle. They can have a direct impact on policy. For example, Curieuze Neuzen [1] put the topic of air quality higher on the national political agenda and is now mentioned in the Flemish Air Policy Plan 2030. They can also change the shape of public spaces. For example, Making Sense Barcelona [2] resulted in changes to the layout of a local square, its cleaning schedule and the licensing of local restaurants. Citizen Observatories can also shape environmental governance measures and complement the EU's Earth Observation monitoring efforts by increasing the availability of ground-based observations for all 17 Sustainable Development Goals [3]. For example, Open Litter Map [4] delivers data towards SDG 14.1.1 to measure floating plastic litter as a global indicator of marine pollution.

Citizen Observatories have been gaining momentum starting with the European Commission's Seventh Framework Program, to Horizon 2020, and beyond with Horizon Europe, the next research and innovation framework program. Vast opportunities exist to carry forward the work of pioneering Citizen Observatories, with the potential to deliver on the aims of the European Green Deal and the missions of Horizon Europe.

Sustainability Challenges

The main challenges facing Citizen Observatories stem from their unique characteristics, close links with policy, and the fact that they can reshape public participation and governance of the commons. Significant time and effort are required to build an engaged community of participants and to ensure it delivers value for participants.

The longer term ambition of Citizen Observatories means that operational and maintenance costs can extend beyond the end of defined project funding, especially when an engaged community of participants wishes to continue to monitor an important local issue. A central community manager is needed to support ongoing engagement, maintain two-way communication and thus keep motivation high / also beyond the end of the project funding. Community members often lose their main source of support when project consortia move on to new projects, and do not typically have other sources of funding to turn to. Similarly, tools such as mobile applications and data platforms require long-term maintenance and further development based on user experience, and new features to respond to monitoring needs. User needs left unaddressed will eventually lower motivation and lead to an unnecessarily premature end of the initiative.

Successful Citizen Observatories become embedded within a community when key stakeholders take ownership of the activities and their outcomes, carefully balancing the values and expectations of science, policy, and societal actors without compromising the purpose of the initiative. This trust can be eroded when science partners end their involvement due to the end of funding, and it may discourage citizens from engaging in such initiatives in the future.

Additional challenges can emerge during the lifetime of a Citizen Observatory due to its organic co-creative nature. It may be necessary to develop an app, sensor or a data platform from scratch when suitable supportive technology or recyclable parts are unavailable. Also, the loss of a commercial partner may occur if the values of the initiative do not align with those of commercial exploitation, which can clash with the ethos of Citizen Science. Similarly, if project resources do not allow for effective transfer of technology, resources, and knowledge when a key partner leaves, the Citizen Observatory can be left unable to function.

Learning from practice

The WeObserve consortium includes four sister Citizen Observatory projects funded under the same "Citizen Observatories for Environmental Monitoring" programme of Horizon 2020. Through a series of workshop events, interviews, and Community of Practice collaborations, WeObserve has been gathering their experience of the enabling environment needed for Citizen Observatories to achieve their full potential in recognition of their unique characteristics. Some of the concrete actions that Citizen Observatory projects can take themselves are featured on page 3.

Several challenges for the sustainability of Citizen Observatories, however, need to be addressed on a different level, namely at the level of the policy and funding frameworks that set the conditions for Citizen Observatories to function and sustain their activities. They create the enabling environment for the generation and execution of successful Citizen Observatories.

Sustainability-related lessons learned from Citizen Observatories

Scent

The two SCENT Citizen Observatories for monitoring land cover/use, and assessing flood risks and patterns addressed sustainability by focusing on making Citizen Observatories easily replicable and scalable, while also generating economic value and social capital. This involved (i) developing the ICT tools and technology needed to collect and annotate citizen-generated data; and (ii) developing supportive materials that describe the methods, techniques and tools needed to ensure citizen participation and adapt to different contexts. **Lessons Learned:** The capacity to run and manage such initiatives is as important as the availability of the tools - engagement in the pilots spiked when communication and dissemination activities were frequent, and fell in the intervals. Local authorities do not typically have sufficient infrastructure for data preservation, quality and interoperability to sustain and scale Citizen Observatories, nor is funding readily available for this. Policy measures are required that encourage and support the formation of small stakeholder partnerships.

Ground Truth 2.0

The sustainability of the Citizen Observatories that were set up by the Ground Truth 2.0 project in six countries (four in Europe and two in Africa, addressing natural resources management, biodiversity conservation, water quality management, climate change, and the quality of life in urban areas) was addressed 'by design': its co-design process started with people and their needs; it brought together relevant actors, guided them towards a shared understanding and purpose of their observatory and helped them grow into a community; and it tailored digital innovations to enable them to actively collaborate in the collection, exchange and use of information and knowledge. **Lessons Learned:** Co-design of objectives and technologies strengthens the sustainability of Citizen Observatories but implies uncertainties for the project consortium. The precise composition, required partner expertise and resources, and their contribution can differ (substantially) between proposal and implementation phase, in terms of what is actually required for the project to deliver on the demands of the community of members - and hence the basis of the sustainability of their Citizen Observatory.

GROW Observatory

In the GROW Observatory, 24 communities across 13 European countries installed and monitored thousands of soil sensors. Each of these GROW Places had very different concerns from farmers monitoring water use and desertification, to permaculture growers and forestry commission staff conducting assessment of practices relating to climate change - but all shared an interest in food growing, healthy soils and sustainability. The co-design process that underpinned all activities, including shared governance and decision-making, was key to fostering both resilience and sustainability. **Lessons Learned:** Open data and resources (strengthened by open education and training) have been taken up, and empowered these communities to continue to collect data, share resources, results, use data and equipment beyond the end of the project. However, whilst engagement with policy makers was achieved in some places, it would have had greater impact across all communities if it had taken place once locations had been selected and GROW Places established, by involving local authorities and relevant policy makers from the area.

LandSense

The LandSense project is building and aggregating innovative technologies to support Citizen Observatories for land use and land cover monitoring, via six demonstration cases in seven countries, within the themes of urban landscape dynamics, agricultural land use, and forest and habitat monitoring. LandSense promotes sustainability by extending successful prototypes from past EU-funded projects (COBWEB), using community supported open-source platforms such as OpenStreetMap, integrating developed technologies to extend GEOSS and Copernicus capacities, and by advancing commercial business models to boost uptake of its services and tools. **Lessons Learned:** Lack of sustainability can erode both trust and credibility. Long term commitment is valued by participants, other users of the data, and key stakeholders such as policy makers and mapping agencies; however, the means to achieve long term commitment from stakeholders is not always in place. Policy makers can be sceptical and unwilling to engage with innovative projects if they have seen too many ideas come and go over the years. Additionally, if Citizen Observatories are not supported with permanent staffing or other structural forms of support, it can give the impression that the effort is not serious.

Recommendations for Policy Makers & Funders

1 **Provide greater flexibility within funding schemes for co-design of Citizen Observatories.**

2 **Encourage the use of open source software, shared code bases, and sustainable hardware, and support ongoing technology development via iterative user feedback.**

3 **Explicitly include Citizen Observatories in mission-driven research funding schemes as a means for citizen and stakeholder engagement.**

4 **Provide longer term funding support for Citizen Observatories.**

The sustainability of Citizen Observatories is highly dependent on matching the needs of the stakeholders (citizens, decision makers, scientists, industry) with the enabling technologies (e.g. mobile applications and data platforms) that project teams can help build, tailor and enhance. While this match can be delivered via co-design and co-creation approaches, this is often at odds with funder requirements to specify partners, resources and deliverables in detail up front.

Fundings schemes should:
- *Provide adequate flexibility* to allow stakeholder needs to be identified via co-design processes after the launch of the funded Citizen Observatory project.
- *Find ways to trust* in the "yet to be defined" outcomes of proposals based on co-design in order not to bias funding towards the 'safe bets'.
- *Provide appropriate financial support* for core scientific research, outreach and engagement activities, and the iterative development of underlying technology such as mobile applications and data platforms.

Funders allowing projects to respond to the needs that emerge from iterative co-design will strengthen the ability of Citizen Observatories to act as catalysts for change in real world contexts.

In the past, projects have felt pressure to build their own supportive software, applications, platforms and hardware from scratch, resulting in products left lying on the shelf at the end of the project and not developed further. In other projects, budget pressures lead to technology development being underfunded, leaving the project unable to respond to participant feedback during the life of the project.

Funding schemes should:
- *Encourage re-use* and further development of existing technologies, so that development efforts are focused on responding to user feedback, and iteratively improving supportive technology.
- *Prioritise open source technologies* where available, or require open access, so that all developed code is shared and many (community) initiatives can be supported through the availability of a richer set of features and functionalities that can be applied in other contexts.
- *Encourage use, reuse, repair and adequate disposal and recycling* of sustainable hardware for any sensing technology, both in terms of the environmental sustainability of the product and packaging, and in terms of the ongoing support and development of the hardware. Repairing activities with participants can provide further engagement and learning opportunities and outcomes for projects.
- *Require sufficient budget allocation* by projects to enable agile development cycles based on user feedback during the project, thus vastly improving the technology and platform effectiveness and usability.

Encouraging open and collaborative tool development through Citizen Observatories will accelerate Open Science and responsible technology practices.

Citizen Observatories have thus far been funded in specific 'corners' such as Earth Observation calls, sensor development and the "Science with and for Society" programme. This bears the risk of *not* using their potential to provide sound forms of stakeholder engagement in other disciplinary areas of research, where Citizen Science and Citizen Observatories could make a huge contribution to science, policy and practice overall, and particularly to mission-driven research tackling societal challenges. This also creates the risk that the Citizen Observatory approach is reinvented time and again, in disconnected ways.

Funding schemes should:
- *Identify Citizen Observatories* as a formally recognised approach to stakeholder engagement in mission-driven research funding schemes, in order to clarify their relevance for applicants as well as evaluators.
- *Drive for quality Citizen Observatories* that do not reinvent the wheel but instead build on best practice by implementing sustainable Citizen Observatories, and collaboration and partnerships across the Quadruple Helix of stakeholders.

Embracing the Citizen Observatory approach will strengthen Europe's ability to tackle society's greatest challenges.

Citizen Observatories are often set up and intended for the long run (five-ten years or more), yet funding is provided only for relatively short periods (three-four years). Communities take time to build up: at the three year mark, they are just hitting their stride. Pilot projects are not as well trusted, and decision makers want and need long-term data; one-off data collection efforts are not enough. Also, it takes longer to build up trust in citizen generated data.

Funding schemes should:
- *Provide alternative funding models* that recognise the longer time periods over which Citizen Observatories operate.
- *Scale proven approaches* in order to move beyond (dispersed) piloting.
- *Make follow-on or alternative sources of funding* available to projects that hit key performance indicators, in order to fully maximise the potential for societal and environmental impact.

Lengthening the time period and providing innovative mechanisms for funding will enable Citizen Observatories to achieve greater impact.

WeObserve

What project teams can do to foster sustainability

In order to foster sustainability of Citizen Observatories, there are a range of actions that project teams can take.

Stakeholder engagement takes time. Academic players do not always have the outreach and communication skills required for effective community building across the diverse range of stakeholders.

Project teams can:

- Involve and reach out to community organisations (CSOs, NGOs and others) to help nurture community champions and local ambassadors.
- Ensure that sufficient communication planning and leadership is in place to enable strong two-way communications amongst all actors, building up trust and alignment.

Local authorities and decision makers are often at the 'receiving end' of Citizen Observatories, requested to include citizen-generated-data in policy making and environmental management decision making without any prior involvement.

Project teams can:

- Engage with decision makers from an early stage, even before funding is sought and ideally via a co-design approach, in order to embed the citizen generated data into the decision making cycle.
- Use impact stories to strengthen knowledge and awareness amongst decision makers of the value of citizen generated data in policy making and environmental management.

References

1. Curieuze Neuzen https://curieuzeneuzen.be/
2. Making Sense Barcelona http://making-sense.eu/campaigns/placa-del-sol/
3. Fraisl, D., Campbell, J., See, L. et al. Mapping citizen science contributions to the UN sustainable development goals. Sustain Sci (2020). doi.org/10.1007/s11625-020-00833-7
4. Open Litter Map https://openlittermap.com

Colofon

WeObserve - An Ecosystem of Citizen Observatories for Environmental Monitoring
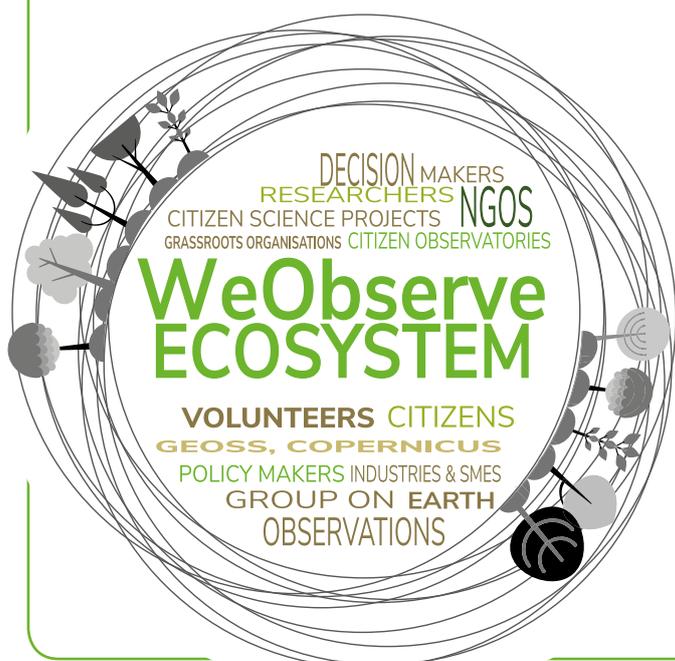
WeObserve is a three year project funded by the European Union's Horizon 2020 research and innovation programme. As a Coordination and Support Action, WeObserve is delivering the first European-wide Citizen Observatories knowledge platform to share best practices and to identify and address challenges to inform practitioners, policy makers and funders of (future) Citizen Observatories. The ultimate objective is to create a sustainable ecosystem of Citizen Observatories that can systematically address these identified challenges and help to move Citizen Science into the mainstream. In order to create the conditions for a sustainable ecosystem of Citizen Observatories that can tackle the challenges of awareness, acceptability and sustainability, the WeObserve project developed Communities of Practice to consolidate the current Citizen Observatory knowledge base and strengthen it to tackle future environmental challenges. WeObserve is coordinated by IIASA (Project Coordinator: Dr. Steffen Fritz) and runs from 2017 to 2021.