An Ecosystem of Citizen Observatories for Environmental Monitoring

EU Citizen Observatories Landscape Report II: Addressing the Challenges of Awareness, Acceptability, and Sustainability

D2.4 Update: EU landscape of existing citizen observatory initiatives/projects, associations and networks

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Glossary of terms[1]

Term	Description
Citizen Observatory	Community-based environmental monitoring initiatives that invite the public to contribute observations, data and information in complement to authoritative, traditional in-situ and remote sensing Earth Observation data.
Community Based Monitoring	A process where concerned citizens, government agencies, industry, academia, community groups and local institutions collaborate to monitor, track and respond to issues of common community concern. Emphasis is placed on monitoring designed to promote sustainability, leadership of monitoring by the community rather than individual organizations and use of monitoring data to inform decision-making.

[1] See also: https://www.weobserve.eu/cops-glossary/

Abbreviations and acronyms

Abbreviation	Description
CO	Citizen Observatory
CoPs	Communities of Practice
EC	European Commission
ECSA	European Citizen Science Association
EO	Earth Observation
EU	European Union
FP7	Seventh Framework Program
H2020	Horizon 2020 Funding Program
PPSR	Public Participation in Scientific Research

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Executive Summary

Citizen Observatories (COs) are community-based environmental monitoring initiatives that invite the public to contribute observations, data and information in complement to authoritative, traditional in-situ and remote sensing Earth Observation data. COs can play an important role in crucial areas such as climate change, sustainable development, air monitoring, flood and drought monitoring, land cover or land-use change. They can also provide new data sources for policy-making, and can result in increased citizen participation in environmental management and governance at a large scale.

With the increasing prevalence of COs globally, there have been calls for a more integrated approach to handling their complexities, and to sharing knowledge for the design and management of stable, reliable and scalable CO programmes. Answering this challenge in the European context, the Horizon 2020-funded project WeObserve aims to improve coordination between existing COs and related European activities, while tackling three key challenges that inhibit the mainstreaming of citizen science, namely: *Awareness*, *Acceptability*, and *Sustainability*.

This D2.4 Landscape Report frames the second part of a dynamic exercise to examine the three core challenges faced by these COs, and to consolidate the experience of a range of stakeholders into a set of recommendations for strengthening the ecosystem around COs in Europe.

1 Introduction

1.1 Background

There are a growing number of COs, which have been supported via the European Union's Seventh Framework Program (FP7) and continue to be funded in Horizon 2020 (H2020). COs are community-based environmental monitoring initiatives, which invite individuals to collect data and share observations, typically via mobile phone or the web, and empower communities to monitor and report on local environmental issues in a way that enables governance decision making and policy making[2].

Under FP7, five COs were funded, covering a diverse range of environmental issues including biosphere monitoring (COBWEB), odour monitoring (OMNISCIENTIS), air pollution monitoring (CITI-SENSE), flood and drought monitoring (WeSenseIt) and coastal and marine water quality monitoring (Citclops). These projects aimed to develop "novel technologies and applications in the domain of Earth Observation, trying to exploit the capabilities offered by portable devices (smartphones, tablets or microsensors), to enable an effective participation by citizens in environmental stewardship based on broad stakeholder and user involvement in support of both community and policy priorities"[3].

Lessons learned in these projects[4] have been implemented in the most recent generation of COs funded by the H2020 Programme, such as Ground Truth 2.0, the GROW Observatory, LandSense, Scent, D-Noses and MONOCLE. The WeObserve project has been formed in order to support and consolidate these ongoing efforts.

1.2 Mission, goals and objectives of the WeObserve project

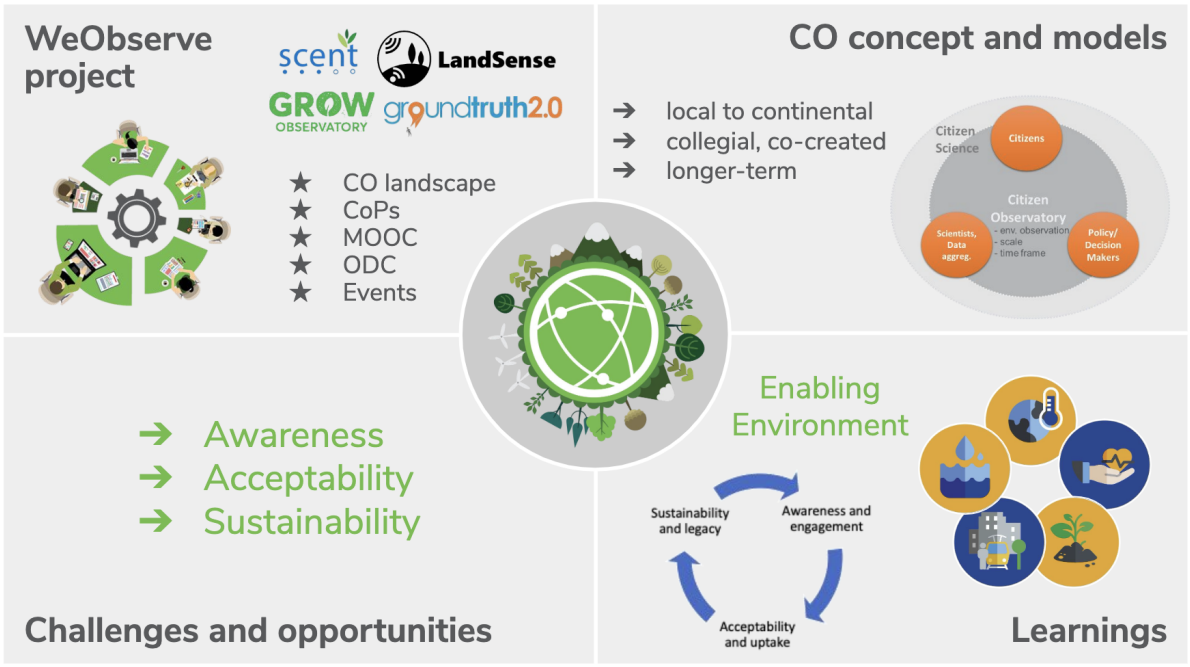
WeObserve is a Coordination and Support Action that tackles three key challenges that COs face: *Awareness*, *Acceptability* and *Sustainability*. The aim of the project has been to improve the coordination between existing COs and related regional, European and international activities by consolidating knowledge and promoting a sustainable enabling environment for COs that can systematically address these identified challenges and help to move citizen science into the mainstream, as illustrated in Figure 1.

[2] Rubio-Iglesias, J.M. 2013. Citizens' observatories for monitoring the environment: A commission perspective. In Proceedings of the Workshop on Citizen's Involvement in Environmental Governance, Arlon, Belgium, 7 October 2013; Directorate General Research and Innovation, European Commission: Brussels Belgium

[3] Horizon 2020 Open Conference *Citizens' Observatories: Empowering European Society*, Brussels December 4th, 2014 event description: https://ec.europa.eu/programmes/horizon2020/en/news/citizens%E2%80%99-observatories-empowering-european-society-open-conference

[4] European Commission. 2014. Citizens' Observatories. Empowering European Society Conference Report. Version 1.0, Brussels, Belgium, 4th December 2014. Climate Actions and Earth Observation Unit in DG Research and Innovation.

Figure 1: The WeObserve Coordination and Support Action in a nutshell (Hager 2020)[5]



The four core goals of the WeObserve project have been to:

1. Develop communities of practice around key topics to assess the current CO knowledge base and strengthen it to tackle future environmental challenges using CO-driven science,
2. Extend the geographical coverage of the CO knowledge base to new communities and support the implementation of best practices and standards across multiple sectors,
3. Demonstrate the added value of COs in environmental monitoring mechanisms within regional and global initiatives such as GEOSS, Copernicus and the UN Sustainable Development Goals, and
4. Promote the uptake of information from CO-powered activities across various sectors and foster new opportunities and innovation in the business of in-situ earth observation.

The tasks within the second work package of the project - 'WP2 *SUPPORT: Co-create And Strengthen The Citizen Observatories Knowledge Base*' - are designed to achieve the first project goal, to assess and strengthen the knowledge base.

1.3 The purpose of this report

This report is the second of two reports that are delivered in WP2 Task 1 to '*Map the EU landscape of existing citizen observatories initiatives, relevant communities and their interactions*'. This task has been addressing the first two stated objectives of WP2 to:

1. Enhance the baseline analysis of existing and emerging CO initiatives, related communities and their interactions, and

[5] Hager, G. (2020). Onto new horizons: Learnings from the WeObserve project to strengthen awareness, acceptability and sustainability of Citizen Observatories in Europe. Presentation at the ECSA 2020 conference. Zenodo. http://doi.org/10.5281/zenodo.4017257

2. Strengthen the knowledge base about COs, both from the perspective of the practitioner in terms of benchmarking existing initiatives as well as a social science perspective to reinforce the 'science of citizen observatories'.

The first report '*D2.1 - EU Citizen Observatories Landscape Report - Frameworks for mapping existing CO initiatives and their relevant communities and interactions' (*Gold 2018)[6] (the D2.1 Frameworks Report) set the foundations for the description and categorisation of COs in Europe by establishing a working definition of COs, and developing a framework to describe and benchmark them for comparative and evaluative purposes.

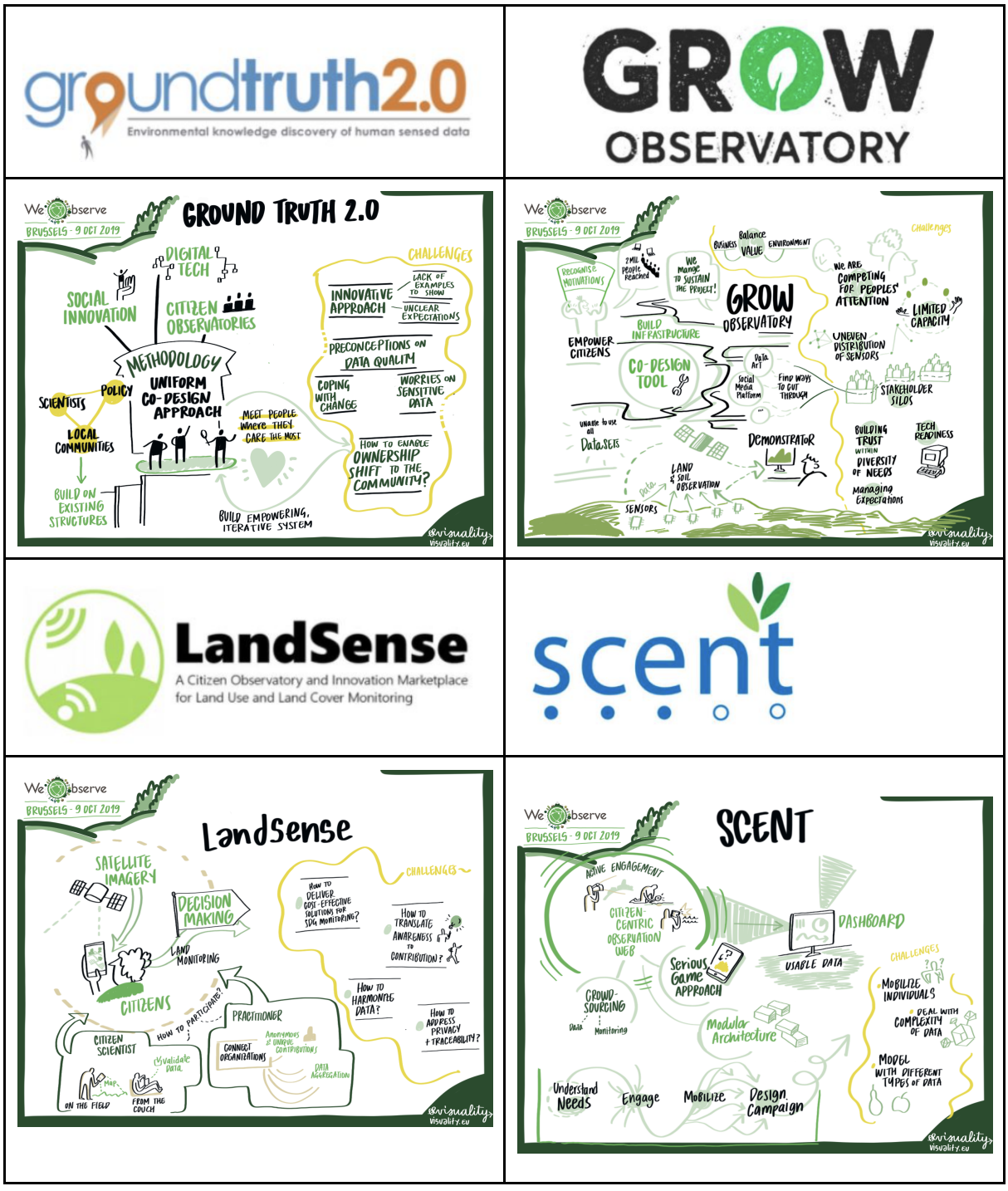
The purpose of this second '*D2.4 Final EU Citizen Observatories Landscape Report - Addressing the Challenges of Awareness, Acceptability, and Sustainability*' (D2.4) is to build further on the foundations of the first, examine the three core challenges faced by COs, and consolidate the experience of a range of stakeholders into a set of recommendations for strengthening the ecosystem and creating an enabling environment for COs over the long term.

[6]Gold, M. (2018). WeObserve D2.1 EU Citizen Observatories Landscape Report - Frameworks for mapping existing CO initiatives and their relevant communities and interactions. Zenodo. https://zenodo.org/record/3670895

1.4 The scope of this report

The WeObserve project had four sister COsprojects funded under the same "Citizen Observatories for Environmental Monitoring" programme of Horizon 2020 (namely Ground Truth 2.0, the GROW Observatory, LandSense, and Scent).

Table 1: The 4 COs that are 'sister' projects to WeObserve



Illustrations: Mara Callaert, Visuality.eu

2 The Three Core Challenge Areas for Citizen Observatories

COs have the potential to enable evidence-informed decision making at a local, national and European scale by addressing data gaps, and engaging local communities who can also benefit from the integration of new CO data and knowledge. Furthermore, COs can form an integral component of managing environmental challenges and empowering resilient communities. The WeObserve consortium has identified three key challenge areas that are hampering COs from fully reaching this potential, namely: Awareness, Acceptability, and Sustainability.

Figure 2: The 3 Core Challenges facing Citizen Observatories (Hager 2020)

2.1 Awareness

Much of the academic literature around awareness in citizen science relates to whether or not the general public know about specific environmental issues or areas of science, and the ability of citizen science approaches to raise awareness by engaging the public in researching those issues and questions (see for example Mahajan et al. 2020[7], and Locratini et al. 2019[8]).

However, within the WeObserve project we looked at awareness as the phenomenon of knowing about the existence of citizen science and CO approaches in general, both from a participant point of view (knowing that such opportunities to participate exist), and from a 'data user' point of view (knowing about the possibility of engaging residents in local issues and using the data and observations they help gather to inform environmental management and policy making decisions).

Citizens are often not aware of the opportunities that exist for them to address environmental issues affecting them via citizen science approaches. They might lack the understanding of what it means to volunteer their time or energy and how it contributes to environmental stewardship, or they simply may not have access to the channels through which such opportunities are communicated.

Similarly, key stakeholders in the outcomes of citizen science initiatives such as public authorities, SMEs and NGOs may not be aware of the potential of COs to support their decision making and to create business opportunities. Awareness of citizen science initiatives at the local policy making level

[7] Mahajan, Sachit, et al. "A citizen science approach for enhancing public understanding of air pollution." *Sustainable Cities and Society* 52 (2020): 101800.
[8] Locritani, Marina, S. Merlino, and M. Abbate. "Assessing the citizen science approach as a tool to increase awareness on the marine litter problem." *Marine pollution bulletin* 140 (2019): 320-329.

is often anecdotal and related to a single narrow example, rather than the broader potential to applycitizen science approaches to a range of topics and issues.

At the national level, citizen science is receiving increased attention, but a study conducted by the Citizen Science COST Action Working Group to 'Improve the society-science-policy interface'[9] found that of 31 European countries surveyed, only 5 indicated that they had a national citizen science strategy[10].

2.2 Acceptability

A major area of focus within the citizen science literature has been on the quality of citizen-generated data and how both task and protocol design can address these concerns to result in data that is often as good as expert data (see for example Roman et al. 2017[11] and Serret et al. 2019[12]), and certainly 'good enough' data for addressing the research question (see for example Gabrys et al. 2016[13]).

Citizen-based observations can be similarly challenged on whether they meet the required quality standards for informed decision making and environmental governance, and public authorities who are used to making decisions based on authoritative data sources may hesitate to trust or accept "scientific" data from citizen-science experiments to complement that data.

A recent study of 43 international policy documents (Hecker et al. 2019[14]) found that most mentioned citizen science approaches and their benefits to science, society, and policy, but they also highlighted a number of challenges that:

> "*... relate mainly to data quality and management, to organisational and governance issues, and to difficulties of the uptake of citizen science results into actual policy implementation due to a lack of citizen science alignment with current policy structures and agendas. Interestingly, documents largely fail to address the benefits and challenges of citizen science as a tool for policy development, i.e., citizen science is mainly perceived as only a science tool. Overall, policy documents seem to be influenced strongly by the citizen science discourse in the science sector, which indicates a joint advocacy for citizen science*." (ibid.)

But acceptability can also refer to how the participants in the CO view the legitimacy and trustworthiness of its approaches, how data is handled, how communications are handled, and how issues of ownership are addressed. Tensions can arise when there is a mismatch between the motivations of participants, scientists and policy makers, or between their expectations for the outcomes of the initiative (Wehn and Almomani, 2019[15]). Sometimes tradeoffs need to be made

[9] https://cs-eu.net/wgs/wg3
[10] https://cs-eu.net/news/cs-strategies-europe-event-report-cesis-latvia-june-4th-2019
[11] Roman, L. A., Scharenbroch, B. C., Östberg, J. P., Mueller, L. S., Henning, J. G., Koeser, A. K., ... & Jordan, R. C. (2017). Data quality in citizen science urban tree inventories. Urban Forestry & Urban Greening, 22, 124-135.
[12] Serret, H., Deguines, N., Jang, Y., Lois, G. and Julliard, R., 2019. Data Quality and Participant Engagement in Citizen Science: Comparing Two Approaches for Monitoring Pollinators in France and South Korea. Citizen Science: Theory and Practice, 4(1), p.22. DOI: http://doi.org/10.5334/cstp.200
[13] Gabrys, J., Pritchard, H., & Barratt, B. (2016). Just good enough data: Figuring data citizenships through air pollution sensing and data stories. Big Data & Society, 3(2), 2053951716679677.
[14] Hecker, S., Wicke, N., Haklay, M., & Bonn, A. (2019). How Does Policy Conceptualise Citizen Science? A Qualitative Content Analysis of International Policy Documents. Citizen Science: Theory and Practice, 4(1), 32. DOI: http://doi.org/10.5334/cstp.230
[15]Wehn, U. and Almomani, A. (2019), Incentives and barriers for participation in community-based environmental monitoring and information systems: a critical analysis and integration of the literature, Environmental Science & Policy, Special Issue on Shared Environmental Information System (SEIS), Volume 101, 341-357.

between data quality, privacy protection, resource security, transparency, and trust (see for example Anhalt-Depies et al, 2019[16]).

2.3 Sustainability

The term 'sustainability' in citizen science is most commonly associated with sustainable development or environmental and ecological sustainability to maintain a healthy environment and balanced ecosystem. The literature reflects this with many findings on the ways in which citizen science and CO initiatives can actively contribute towards environmental stewardship and the preservation of vital ecosystems for nature and ourselves (see for example Vohland et al. 2019[17]) and with recent investigations into the ways that citizen science can support the UN Sustainable Development Goals (see for example Fraisl et al. 2020[18]).

Within the context of the WeObserve project, we looked at the sustainability of the COs themselves, in terms of their ability to maintain financial support for ongoing operations and the continued engagement of participants over the longer term, and thus their ability to achieve their stated objectives. This includes looking at 'enabling environment' factors such as infrastructure, funding programmes, supportive measures, and legislation aimed at either sustaining or scaling-up current citizen science projects across various sectors, especially the private sector.

Limitations on this front, as well as deficiencies in systems and standards of data preservation and data interoperability across initiatives are hindering the long-term potential of citizen science and COs.

> *"Although some authorities embrace collaboration with the public, they do not have answers to many questions, such as how to handle CS data and feed them into existing information flows, or how to reconcile CS data with data from other sources."(*Hecker et al. 2019, pg. 9.)

The main sustainability challenges facing citizen observatories stem from their unique characteristics, especially their 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 the CO delivers value for participants. The longer term ambition of COs 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.

[16] Anhalt-Depies, C., Stenglein, J. L., Zuckerberg, B., Townsend, P. A., & Rissman, A. R. (2019). Tradeoffs and tools for data quality, privacy, transparency, and trust in citizen science. Biological Conservation, 238, 108195.
[17] Vohland, K., Sauermann, H., Antoniou, V., Balazs, B., Göbel, C., Karatzas, K., ... & Winter, S. (2019). Citizen Science and sustainability transitions. Available at SSRN 3511088.
[18] Fraisl, D., Campbell, J., See, L., Wehn, U., Wardlaw, J., Gold, M., ... & Masó, J. (2020). Mapping citizen science contributions to the UN sustainable development goals. Sustainability Science, 1-17

3. Methodological Approach

3.1 Describing Citizen Observatories

Systematically tackling the three main challenges facing COs first required the aggregating, building and strengthening of the CO knowledge base. The first step in doing so has been to map the EU landscape to identify the existing networks and their associated ecosystems and stakeholders, in order to gain insights into the development, operation and challenges facing Citizen Observatories in Europe.

In the D2.1 Frameworks Report (Gold 2018), we looked at the COs funded by the European Commission's FP7 programme, and the H2020 funded COs that are connected with the WeObserve project, as listed in Table 2 below.

Table 2: The Citizen Observatories selected for the D2.1 Frameworks Report

FP7 - funded COs	***Focus***	***Timeline***
COBWEB	Biosphere monitoring	2012 - 2016
OMNISCIENTIS	Odour monitoring	2012 - 2014
CITI-SENSE	Air pollution monitoring	2012 - 2016
WeSenseIt	Flood and drought monitoring	2012 - 2016
Citclops	Coastal and marine water quality monitoring	2012 - 2015
H2020 - funded COs		
GroundTruth 2.0	Flora and fauna, water availability, and water quality monitoring for land and natural resources management	2016 - 2019
GROW Observatory	Soil, land-use, crop planting, and water resources monitoring	2016 - 2019
LandSense	Land use, land cover, and land use change monitoring	2016 - 2020
Scent	Land cover, land use changes affecting flood risk, soil moisture, water level & surface velocity in rivers and water basins, pre-/during-/post-flood event reporting	2016 - 2019

In order to assess and compare these COs, we set out to categorise and describe them in a consistent fashion based on frameworks we identified in the literature. These frameworks led to the development of a CO Project Description Template, which was used to describe a number of the COs in the appendixes to the D2.1 Frameworks Report.

3.2. Further development of the project description template

In order to align and be fully interoperable with the H2020-funded EU-Citizen.Science[19] project, which has built a platform for resource and knowledge sharing amongst citizen science practitioners, we have updated this CO Project Description Template to incorporate the PPSR[20] Common Conceptual Model metadata standard and data sharing protocol (PPSR-Core[21]) and the EU-Citizen.Science metadata schema for describing citizen science projects on their platform.

PPSR-Core has been developed by citizen science practitioners within the U.S. Citizen Science Association (CSA) 'Data and Metadata' working group[22], the European Citizen Science Association (ECSA) 'Projects, Data, Tools, and Technology' working group[23], and the Citizen Science COST Action working group to 'Improve data standardization and interoperability'[24].

The latest changes and extensions to the PPSR-Core model were presented in 'the Geneva Declaration on Citizen Science Data and Metadata Standards'[25] as the outcome of the COST Action WG5 workshop held in Geneva in June 2018[26]. The canonical repository for PPSR - Core can be found on GitHub at https://citizen-science-association.github.io/ppsr-core.

Within the EU-Citizen.Science project, PPSR-Core formed the basis for developing a metadata schema for describing the citizen science projects profiled on the platform, but also for describing citizen science resources, and citizen science training courses and materials. This work is contributing to the further development of fixed vocabulary for describing citizen science projects, in collaboration with the global members of the CS Data and Metadata task force.

These developments have now been incorporated into the WeObserve Project Description Template, in order to ensure interoperability between the WeObserve Knowledge Hub, the EU-Citizen.Science platform, and other platforms that are built on PPSR-Core such as CitSci.org[27], SciStarter,[28] and the JRC Inventory of Citizen Science Projects[29].

An additional change to the description template has been to update the project model field from the typology for Public Participation in Scientific Research (PPSR) defined in the 2009 CAISE Inquiry Group report 'Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education'[30] (namely: Contributory projects, Collaborative projects, and Co-created projects) - to the typology described in Shirk et al. 2012[31], which built on the CAISE models and added Contractual projects (where communities ask professional researchers to conduct a specific scientific investigation and report on the results) and Collegial contributions (where non-credentialed individuals conduct research independently with varying degrees of expected recognition

[19] http://eu-citizen.science/#the-project
[20] PPSR stands for 'public participation in scientific research'
[21] https://citizen-science-association.github.io/ppsr-core
[22] https://www.citizenscience.org/get-involved/working-groups/data-and-metadata-working-group/
[23] https://ecsa.citizen-science.net/working-groups/projects-data-tools-and-technology
[24] https://cs-eu.net/wgs/wg5
[25] https://docs.google.com/document/d/1peRcL-UD0ZzDSIDl0TFR23p83sBi0AZoTeNaNHJfv-o/edit?usp=sharing
[26] https://cs-eu.net/sites/default/files/media/2018/06/COST-WG5-GenevaDeclaration-Report-2018.pdf
[27] https://www.citsci.org/CWIS438/Browse/Project/Project_List.php?WebSiteID=7
[28] https://scistarter.org/api
[29] https://data.jrc.ec.europa.eu/dataset/jrc-citsci-10004
[30] Bonney, R., Ballard, H., Jordan, R., McCallie, E., Phillips, T., Shirk, J., and Wilderman, C. C. 2009. Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. A CAISE Inquiry Group Report. Washington, D.C.: Center for Advancement of Informal Science Education (CAISE).
[31] Shirk, J. L., H. L. Ballard, C. C. Wilderman, T. Phillips, A. Wiggins, R. Jordan, E. McCallie, M. Minarchek, B. V. Lewenstein, M. E. Krasny, and R. Bonney. 2012. Public participation in scientific research: a framework for deliberate design. *Ecology and Society* 17(2): 29. http://dx.doi.org/10.5751/ES-04705-170229

by institutionalized science and/or professionals). Our project model field therefore now references 'Shirk's 5 Project Models'.

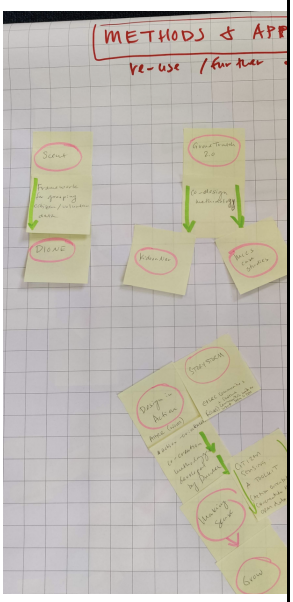
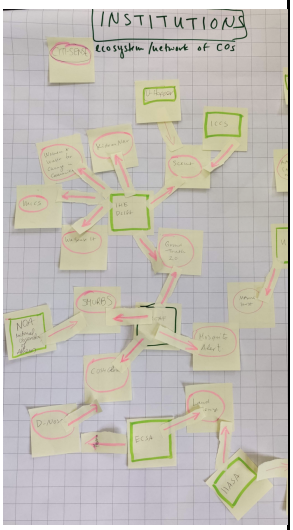
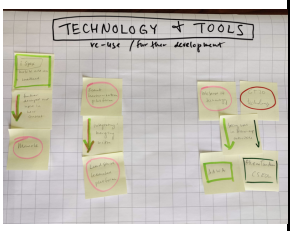
The updated WeObserve Project Description Template can be found in Appendix 1 of this report, and the CO descriptions captured using this template are contained in the appendices to this report. These will be shared online on both the WeObserve Knowledge Hub and the EU-Citizen.Science platform for citizen science and CO practitioners across Europe

3.3 Mapping the Landscape of the CO ecosystem

Based on the data thus gathered, we conducted a more detailed mapping exercise of the CO landscape, to identify a larger number of organisations and stakeholders who are in some way involved in supporting CO initiatives. This mapping was undertaken through consultation with the WeObserve partners and partner-COs, and through workshops with a wider range of stakeholders via the WeObserve CoPs.

An initial framework for this was developed during the Year 3 plenary meeting of the WeObserve consortium in January 2020, where the partners participated in a 'collaboration table' exercise to jointly create a visualisation of how the FP7 & H2020 COs have interlinked or built on each other in terms of partners, stakeholder partners, technology, tools, and methods. Throughout the two days of the plenary session, all partners added their inputs on dedicated flip charts using post-it notes, and moved these around as new connections were added, as shown in Table 4 below. These visualisations were then developed further using the data gathered through the CO description process, and are presented in Section 4 of this report.

Table 3: Outputs of the Visualisation Development Session

Methods & Approaches	Institutions	Data	Technology & Tools
			

3.4 Investigating the key challenges facing citizen observatories

The WeObserve project aims to help move citizen science into the mainstream by consolidating knowledge about the key elements for a sustainable ecosystem of COs and related activities, and enhancing the baseline analysis of existing and emerging CO initiatives, related communities and their interactions. In order to do so, we sought to understand more deeply what underlying factors may hold COs back from becoming more sustainable over the long term and achieving their intended impacts.

Through a series of workshop events, interviews, and Community of Practice collaborations, WeObserve has been gathering the experience of CO projects about how to create a more enabling environment for Citizen Observatories to achieve their full potential. The most in-depth insights have come from our interactions with the four sister CO projects (Ground Truth 2.0, the GROW Observatory, LandSense and Scent). To extend our understanding to a wider sample of COs in different contexts, we reached out to a range of other projects as well. Table 5 below indicates which insight gathering methods were used for each, and the outcomes reported in Section 4.

Table 4: The COs for which insights were gathered, and input-gathering methods

CO PROJECTS	Inter views	Desk Research	4 COs Workshop	Details
Ground Truth 2.0	0	☑	☑	co-authors of this report
GROW Observatory	2	☑	☑	2 different pilots
LandSense	4	☑	☑	4 different pilots within the project
Scent	1	☑	☑	2 methods for 2 different pilots
Making Sense	1	☑	☑	project with 9 co-creation campaigns
WeSenseIt	0	☑	☑	published material for 3 pilots
KidronNar	1	☑	☑	project in the middle east
IceWatchApp	1	☑	☑	CSEOL funded pilot
COs4Cloud	1	☑	☑	Co-designed CO Services for EOSC

3.4.1 Inputs from F2F Workshop Events

On the 9th of October, 2019, WeObserve organised an event in Brussels together with its four sister projects on "Observing the Environment: Challenges and Opportunities in Citizen Science" (The 4COs Workshop) to showcase their achievements, share best practices, and discuss their impact and sustainability beyond the project lifecycle. A range of project stakeholders and policymakers were also invited to participate in this event, which culminated in a 'fishbowl' discussion (illustrated in Figure 3 below) on the opportunities and challenges for the future of COs in Europe.

As well as exchanging ideas and lessons learned, the aim of this meeting was to gather inputs for this final landscape report on the obstacles experienced and the recommendations of the participants for future CO programs. These are reported on in Section 4 below. A number of additional workshops and face-to-face focus groups were planned within this task, which unfortunately could not take place due to the emergence of the Corona virus and Covid 19. The protocol that we developed for focus groups is nonetheless shared in Appendix 3.

Figure 3: Live illustration of the Fishbowl discussion at the 4COs Workshop

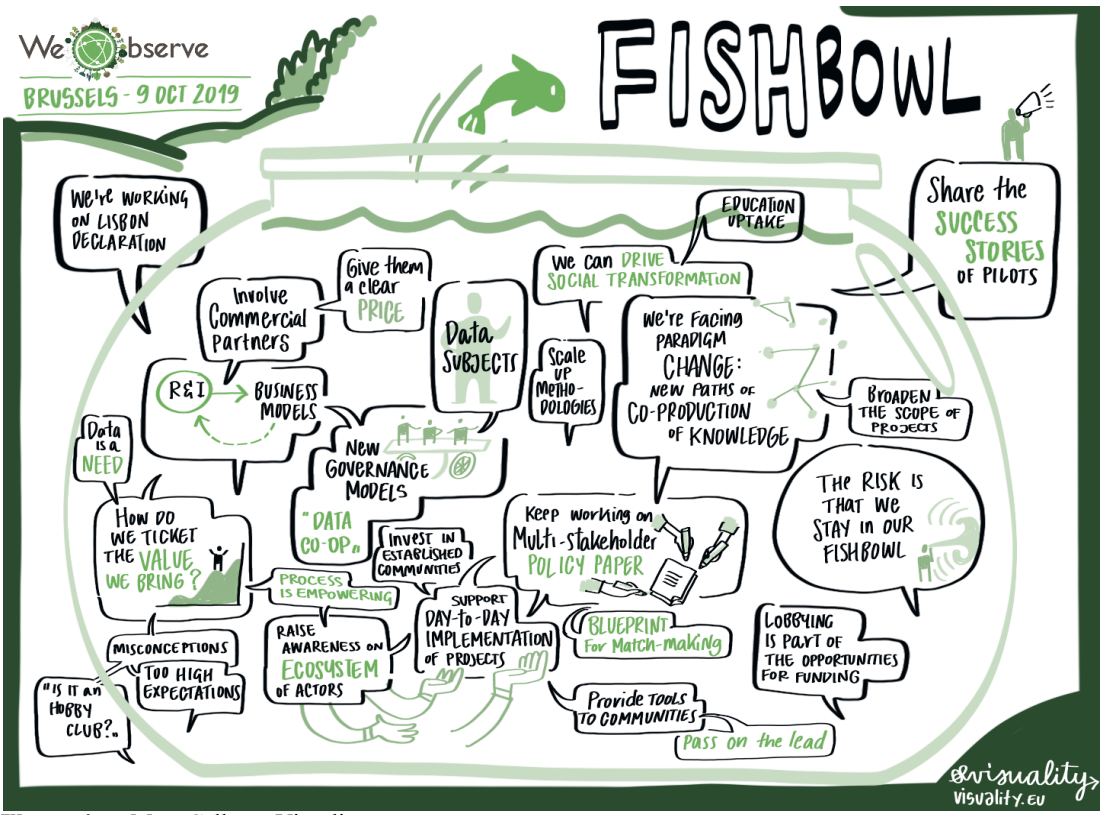


Illustration: Mara Callaert, Visuality.eu

3.4.2 Inputs from F2F Interviews and Desk Research

We conducted 12 in-person interviews with relevant stakeholders about the ecosystem for citizen observatories in Europe, as indicated in Table 5 above.

Our aim in these interviews was to:

1. Obtain insights into the ecosystem for citizen observatories in the EU, especially with respect to its functioning, gaps and needs for creating a (more) enabling environment
2. Obtain insights into effective pathways for WeObserve to add value to the CO ecosystem
3. Extend the interested community of WeObserve stakeholders

The interview process took place between November 2019 and September 2020, and the interviewees were primarily selected based on their experience in the four sister citizen observatory projects, which are the focus of this report. We additionally interviewed coordinators of five other CO or CO-related projects in order to gather a greater diversity of insights. The interviews consisted of 14 open questions, divided into a background section and a content related section, and have generally taken 45-60 minutes. The complete Interview Protocol can be found in Appendix 2.

When in-person interviews were not possible, we reviewed the outputs of the relevant projects in both the published literature and in unpublished project reports, as indicated in the column 'Desk Research' in Table 5 above.

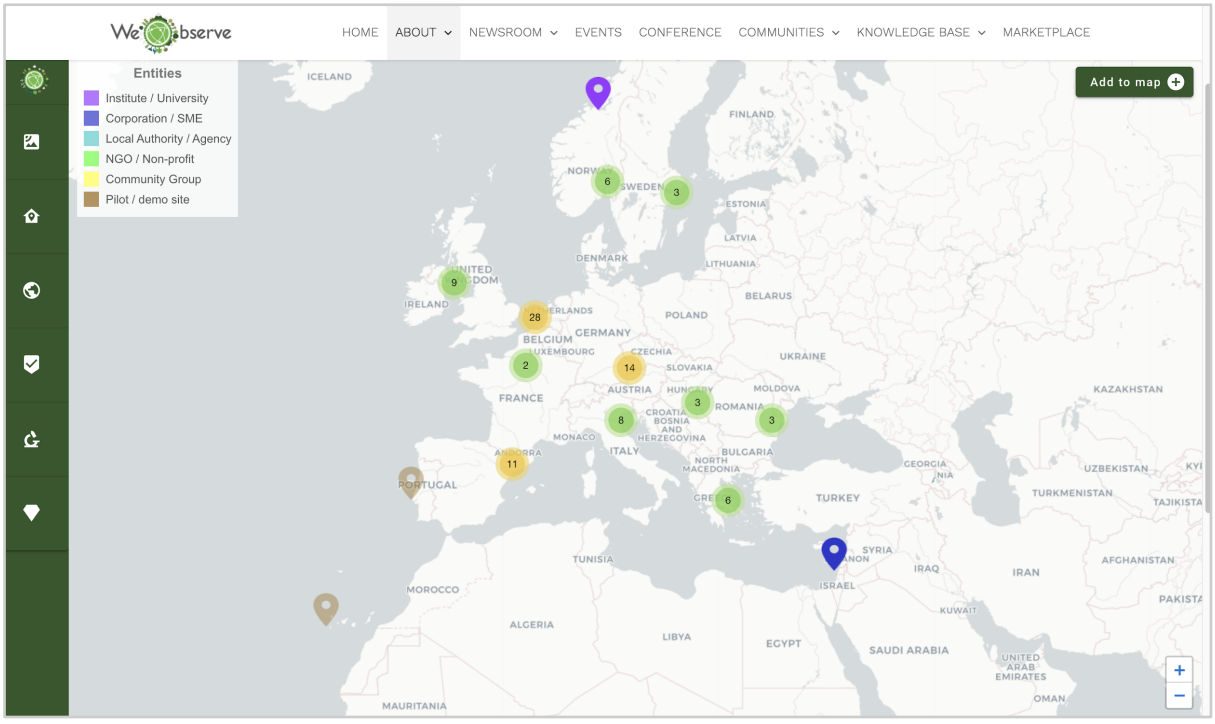
The insights on the key challenges facing citizen observatories obtained via all of the methods were combined in a joint analysis, the results of which are contained in Section 4, and the resulting set of recommendations for strengthening the ecosystem around COs in Europe are presented in Section 5.

4 Insights

4.1 The Landscape of Citizen Observatories in Europe

Although we did not undertake an exhaustive exercise to list and describe as many Citizen Observatories in Europe as possible (the most comprehensive list can be found in the JRC Inventory of environmental citizen science projects[32]) we did map the COs that were funded under the EU FP7 and Horizon 2020 programmes, and invited other initiatives in Europe that identify as being COs to 'add themselves to the map'. The resulting CO Landscape Map can be found on the WeObserve website[33], and continues to be added to regularly (Figure 4). This map illustrates the growing range of COs across Europe. Notably, Eastern Europe is under-represented in this picture and further exploration would be necessary to understand to what extent this is indicative of the actual presence of CO initiatives or due to selection bias.).

Figure 4: Screenshot of the CO Landscape Map on the WeObserve Knowledge Hub (20/11/2020)



Drilling more deeply into the map, by filtering the pinned information according to whether it represents the location of CO activity (pilot or demonstration), or whether it represents an organisation that is involved in leading or support CO initiatives, we see the following picture emerge (Table 5):

[32] https://data.jrc.ec.europa.eu/dataset/jrc-citsci-10004
[33] https://www.weobserve.eu/about/cos-landscape-map/

Table 5: Screenshot of the CO Landscape Map, by Filter (02/12/2020)

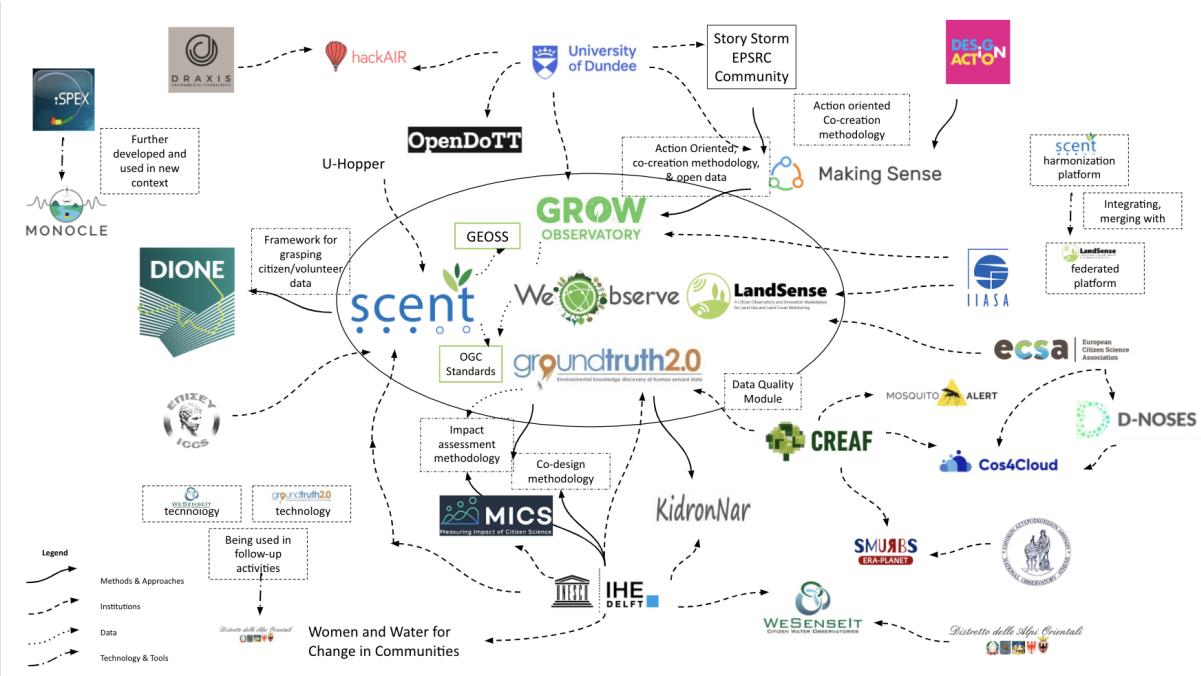
Location of CO Pilot or Demonstration	Local Authorities involved in CO initiatives
	
Research Institutes and Universities	**NGOs and Nonprofits**
	

Looking at the historical pathway from the first Citizen Observatories into the current generation of COs funded under Horizon 2020, as shown in Figure 5 below, it is clear that COs have grown substantially not only in terms of the total number established, but also in terms of the diversification of funding base. Aside from the core funding stream provided by the European Union, first via its Seventh Framework Programme (FP7) and subsequently via its H2020 programme, national funding schemes (e.g. in Spain, the Netherlands) and private sector funding (e.g. Coca Cola Foundation) have also come up.

In order to better understand the interactions between these COs, and their connections and relations, we mapped how the ecosystem of CO consortium partners connect across a range of CO projects and networks. In Figure 6 below we show how methods & approaches, institutions, technology, tools, and data have been built on and developed further in new initiatives and new consortia - leading to the current WeObserve consortium and its four sister COs.

Figure 5: The Evolution of COs across funding programmes

Figure 6: The ecosystem of CO practitioners and CO projects



4.2 Awareness Challenges and Solutions

The main themes that have emerged from our research on the topic of awareness challenges for COs relate to communication challenges towards participants, and achieving buy-in from stakeholders.

In a world filled with many tools for reaching out to engage with local communities and potential participants, such as social media and the web, there is also 'a great deal of noise to rise above'. Citizen Observatories are often competing with media saturation, and competing calls-to-action on related issues.

Once awareness is raised of the issue, and of the existence of a CO to address this issue, translating that into active contribution can still be quite difficult. Many COs can track social media traffic clicks from a twitter account to a website, and a portion of these will translate into registration or subscription to a newsletter, but the greater step of attending an observation activity or downloading an app and making observations sees far fewer responses.

Amongst the general public, the anecdotal evidence is that awareness of CO approaches is not high. Many of the COs were also highly innovative, exploring issues that have lower media coverage (for example, the importance of soil health is much less commonly known about than air quality). This makes the creation of communication 'hooks' difficult, as first the issue needs to be explained, and calls-to-action become much more niche, as the segment of the population directly and immediately affected by these issues may be very small.

Figure 7: The 4COs Workshop on the Challenge of Awareness

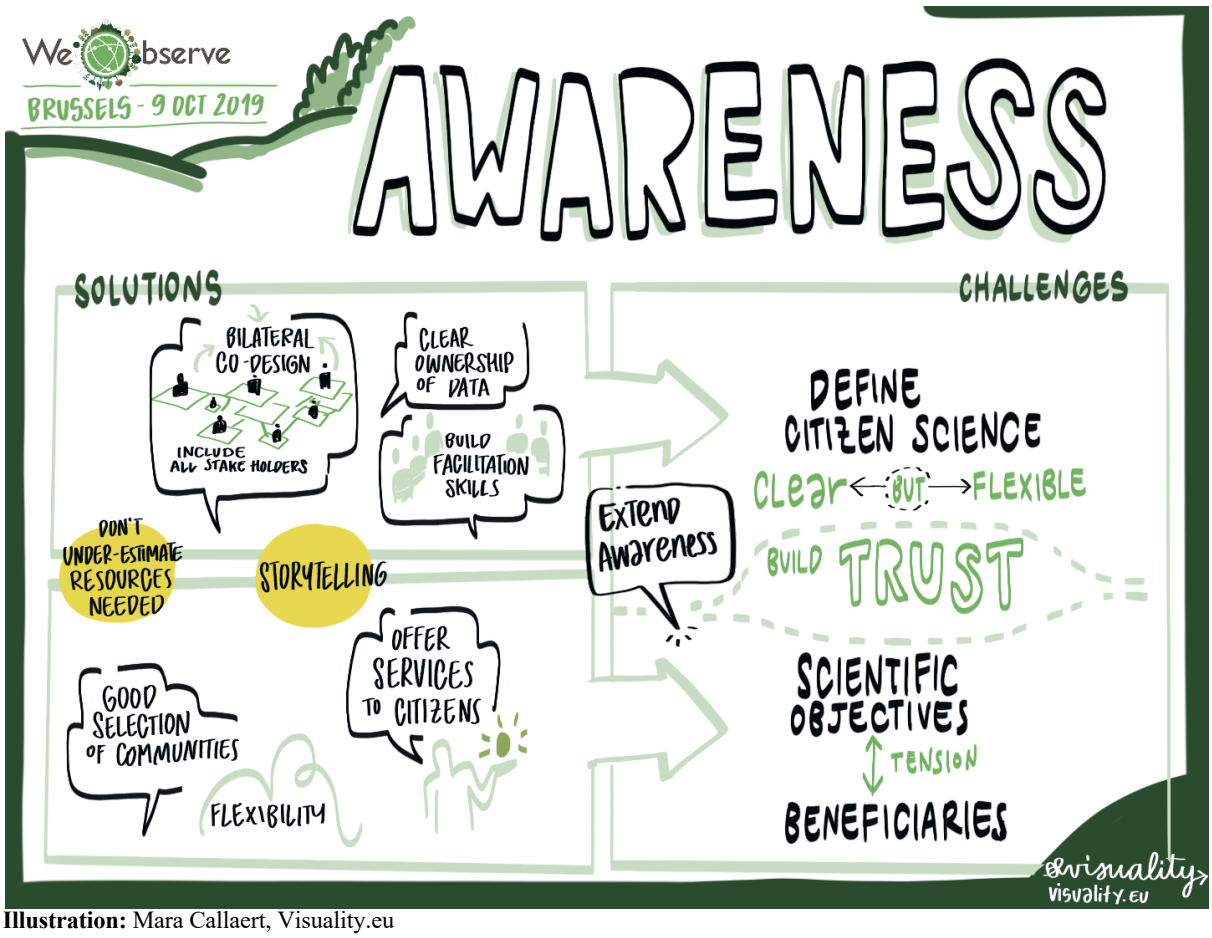


Illustration: Mara Callaert, Visuality.eu

In summary, a high level of effort is required to build up an initial participation base, and the ongoing effort required to maintain an active community of participants is also high. As noted by a CO coordinator at the 4COs Workshop, "building and sustaining community is hard - due to the sheer scale of the effort required".

Similarly, if a co-design approach is used, this process also requires a very big commitment in terms of the length of the journey and the resources required. There is a big shift in the communication paradigm in the context of co-design, where participation goes beyond a few simple tasks to a much deeper examination of the environmental issue and the approach to solve it. This requires good facilitation. Trust issues can arise in such situations, both around the ability to bring about the desired impact, and around ownership issues of the data, and embedding those into the structure of the CO without compromising them.

Approaches that can help to address these issues include a focus on storytelling, to create a shared narrative and shared goals, and investing the time to form a community of engaged participants and support them throughout.

Many CO coordinators expressed a lack of awareness about citizen science and CO approaches on the part of the relevant stakeholders and policy makers. Where there was a level of awareness, it was often too narrow an understanding of the potential of citizen science (such as a cheaper way to gather data). These difficulties were sometimes tied to a lack of resources on the side of the public authority - taking the time to fully understand and appreciate the potential is harder to do when the potential can not then be fully followed through.

When it came to co-design approaches within COs, these were typically outside the realm of experience of policy makers. There was often a tension between the need for clear definition and the need for flexibility, i.e. between pre-designing the course of action for clarity and the need for co-design approaches to remain undefined and not pre-determined from the start. This has knock on effects for the acceptability and sustainability of the CO, as further elaborated on in section 4.3 below.

4.2.1 Awareness lessons learned in the Ground Truth 2.0 project, and their seven COs

The Ground Truth 2.0 project set up COs in six countries (four in Europe and two in Africa) to address natural resources management, biodiversity conservation, water quality management, climate change, and the quality of life in urban areas. Awareness-building about the approach and the aims was achieved in collaboration with key stakeholders from the very start of each initiative, via a co-design process that emphasised the potential value to be realised for each actor. The concept of citizen observatories was difficult to grasp for most stakeholders, whether they were citizens, authorities or thematic experts.

The key to setting up meaningful observatories in each demonstration site was not to teach the concept but to focus on the local environmental issue(s) to be addressed by means of new data, knowledge and relationships and to tailor enabling technologies to elicited needs and requirements.

4.2.2 Awareness lessons learned in the GROW Observatory

The GROW Observatory created a citizen science community of hobby food growers and small-scale farmers in 24 communities (across 13 European countries) to generate, share and use information on land, soil and water resources at high-resolution through the use of low-cost consumer sensing technology. Thanks to familiarity with monitoring practices amongst growers and farmers interested in sustainability practices, the power of the CO approach to have impact was understood very quickly, allowing the project to focus on building up participation in partnership with the grassroots

organisations and activists who already had high awareness of the unique soil health concerns of their community.

Raising awareness about the CO and its aims was supported with innovative use of the online platform Medium to showcase the stories and voices of the growers and reach others who are like-minded. Two particularly effective actions that were deeply embedded in the GROW Observatory were the 'train the trainer' approach to recruiting community champions, who then shared knowledge and know-how further within the community, and the online courses (the GROW massive open online courses, or MOOCs) developed to support this.

The local policy makers and authorities who engaged with the GROW Observatory were overwhelmingly impressed with the CO concept because it was so rich in detail and potential impact. They had more difficulty in grasping the scale of the ambition and the more complex satellite data, because their realm of experience was focused on much more local and granular issues such as ensuring a stable food supply. The interview process from the start of the project to define what information and data would be valuable, and to collaboratively design the observatory policy interface, was not helpful in bridging this gap, as it did not equip them to understand what data could be gathered. However, they did have a very good understanding of the concerns of the participants, and thus awareness of the CO potential started to grow when the data outcomes started becoming evident.

4.2.3 Awareness lessons learned in the LandSense Project, and their six Pilot COs

The LandSense project built and aggregated innovative technologies to support COs 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. The diversity of the pilots meant that the unique context of location and the issue being addressed drove the development of awareness raising campaigns, and engagement methods for each demonstration case.

Although it meant that resources were thinly spread, one advantage of having a large number of diverse demonstration cases within one project was the possibility to learn from each other and cross-apply successful communication and engagement techniques. For example, the Paysages pilot for land-use mapping found it hard to engage participants via a web-based outreach campaign (reaching only 130 participants), but had great success with running Mapathons (achieving 7500+ observations) based on the event methodology developed in the Heidelberg land-use and land-cover mapping pilot. The MijnPark app to map park use and perceptions also benefited from applying successful techniques pioneered in Heidelberg.

The CityOases pilot for mapping the use of urban spaces was particularly innovative and developed a number of creative outreach techniques, such as a deck of cards for raising issue awareness through play, and cooperating with the Austria-wide Citizen Science Award Initiative and the school class winners. However plans to develop a multilingual version of the app for promotion amongst tourists visiting the city of Vienna were set aside due to the outbreak of the Coronavirus. In terms of awareness levels among policy makers, the close cooperation with city administrators was critical to the success of the CityOases pilot.

4.2.4 Awareness lessons learned in the Scent Project, and their two Pilot COs

The Scent project tested a toolbox of smart technologies, low-cost equipment, and applications for citizens to collect various types of environmental information in two COs - the Kifisos River Basin Citizen Observatory for assessing flood risks and patterns in urban Attica, and the Danube Delta

Citizen Observatory for monitoring land cover and land use in the natural wetlands of Romania. Awareness of the CO approach and the aims of the Attica CO was raised by partnering directly with key public authorities and stakeholders in response to the EU Flood Directive, right from the proposal-writing stage of the CO. Alignment with their needs was sought via a series of collaboration meetings, and the user-centric approach to tool development continued to involve these stakeholders throughout.

However, CO activities that take place in physically more remote areas, or areas that require some effort to reach (such as the natural wetlands of the Danube Delta, which require three hours of travel by boat to reach) cannot rely on more casual volunteer participation based on serendipity. Effort must be made to partner with people who are active in those areas for other reasons (such as fishing, agricultural and nature observation communities), to find common ground and shared motivations, as well as to align the goals of the CO with the goals of those already undertaking an activity in those locations. In the Danube Delta CO, the Scent team partnered with the Ornithological Society of Romania to engage their already-active members and visiting student groups in the tasks of the CO, which effectively built on their knowledge of citizen science approaches to bird monitoring. This required flexibility on the part of the CO and a longer time line for collaborations to reach fruition.

4.2.5 Awareness lessons learned in the WeSenseIt Project and their 3 Pilot COs

The WeSenseIt project validated CO approaches in three demonstration cases in distinctly different areas in Europe to address water challenges that were also equally distinct: water quantity and quality management in the Netherlands, river flooding and dam management/failure in the UK, and problems of floods and water shortage in Italy.

In the Dutch pilot, the focus of the CO on flood issues was not appealing to the public. Most residents in the Delfland location perceive flood risk as an issue that should be dealt with by the authorities, and therefore had limited motivation to participate in monitoring activities themselves. The water authority saw the CO as a useful means for awareness-raising on flood risk issues among local residents, but the initiative struggled to find participants throughout the project. The main barrier to using the crowdsourcing app was that people did not find it clear what the added value would be for themselves or others.

The Alto Adriatico CO in Italy also had initial difficulties in reaching large enough numbers of participants. Citizens' awareness and interest in flood management and emergency planning was low at the time, as there had been relatively few flooding events in this area, but fortunately existing flood volunteers were keen to explore the CO technologies. Moreover, leveraging other public events such as the excavation of a World War II bomb served to showcase and test the CO infrastructure and information flows to a wide public and a range of decision makers at local and regional level. These events served as major boosts for the awareness and acceptance of the CO.

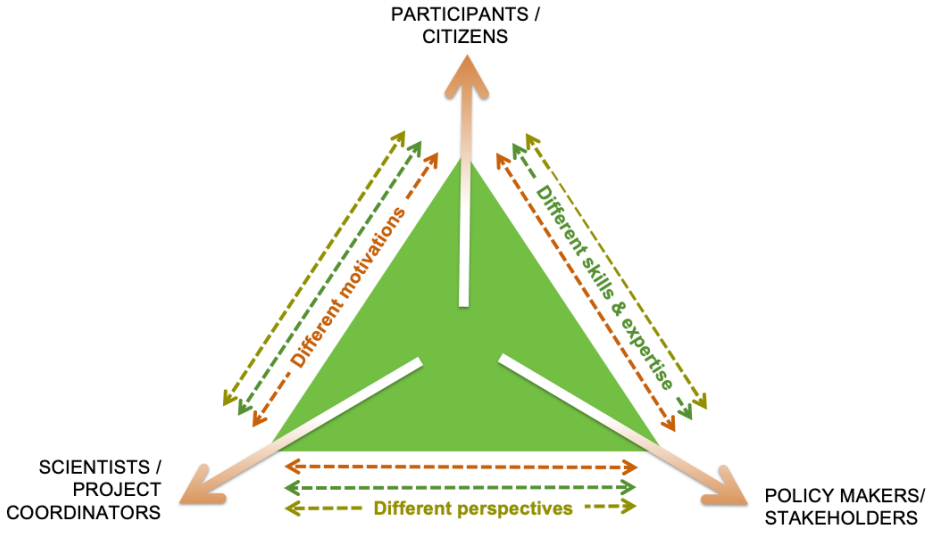
In the UK pilot in Doncaster, the local residents were seen by policy makers as important stakeholders in flood risk management who should be engaged in decision-making processes. Awareness raising was done regularly in schools explaining to students why Doncaster suffers from floods, using scenarios to increase social awareness and responsibility. During the design of the CO, the existing guard of flood volunteers was involved in selecting suitable and relevant locations for water level sensors. Both of these awareness raising methods had good outcomes for participation levels.

4.3 Acceptability Challenges and Solutions

The main themes that emerged from our research on the topic of acceptability centered around issues of trust - sometimes due to different needs and perspectives, and sometimes due to underlying tensions in the needs and motivations of the various parties.

These tensions can be illustrated by imagining a triangle that must stay in balance between citizen participants, the stakeholders around the issue (such as policy makers and public authorities), and the scientists leading or supporting the initiative (and in some cases, the needs of the scientific method). Within the 4COs Workshop session, this was termed 'the Triangle of Trust' by the discussants (as illustrated in Figure 8).

Figure 8: The 'Triangle of Trust', illustrating potential tensions that can emerge in a CO (Hager et al. In review)[34], complementing the triangular illustration of the Ground Truth 2.0 Concept (Wehn et al. 2017)[35]



Achieving buy-in from public authorities in the aims of a CO is often a communication challenge, and a matter of building up trust in the reliability of citizen-generated data. This can stem from the difficulty of defining citizen science to begin with, and coming to a common understanding. Investing time in the development of a shared vocabulary and shared storytelling at the outset of an initiative is therefore time well spent.

Concerns regarding the quality of the data, can be addressed with quality assurance measures, training, and good protocol design, for which many examples exist in the literature (see for example Wiggins et al. 2011[36]). Concerns regarding the ultimate ownership of the data, and the need to address privacy and traceability issues of citizen-based contributions, can be addressed by establishing a federated system for data sharing, and clearly recognising participant contributions. In cases where data may be sensitive, strong measures must be put into place to reassure participants, which requires both good data management measures and procedures, and good communication.

[34] Hager, G. et al. (In review). Onto new horizons: Insights from the WeObserve project to strengthen the awareness, acceptability and sustainability of Citizen Observatories in Europe. Submitted to JCOM Special Issue "Encounters in Citizen Science".
[35] Wehn, U., Pfeiffer, E., Gharesifard, M., Anema, K., & Remmers, M. (2017). 'Methodology for validation and impact assessment, Ground Truth 2.0 project deliverable D1.10. Delft, the Netherlands.'
[36] Wiggins, A., Newman, G., Stevenson, R. D., & Crowston, K. (2011). 'Mechanisms for Data Quality and Validation in Citizen Science'. 2011 IEEE Seventh International Conference on e-Science Workshops, pp. 14–9. (eScienceW), December, Stockholm, Sweden: IEEE. DOI: 10.1109/eScienceW.2011.27

The failure to address these concerns sufficiently can call the trustworthiness of the entire project and/or the coordinators of the initiative into question. There must be trust in the project from all three actor groups in 'the Triangle of Trust', and there must be real value in the data for each in meeting their own needs and goals.

In the case of COs that make use of an enabling technology such as a bespoke sensor or low-cost hardware developed for that purpose, there is a balance to be struck between the social dimensions of the CO and the community needs, and the use and development of the technology. These can sometimes be in conflict with each other, and call into question the acceptability of the measurement tool. One CO coordinator told of reactions from participants - "What are you going to do with that thing?" - that indicated distrust in the tool itself. The tool must be fit for purpose, but also be easy to use and have clear protocols surrounding its use.

Figure 9: The 4COs Workshop on the Challenge of Acceptability

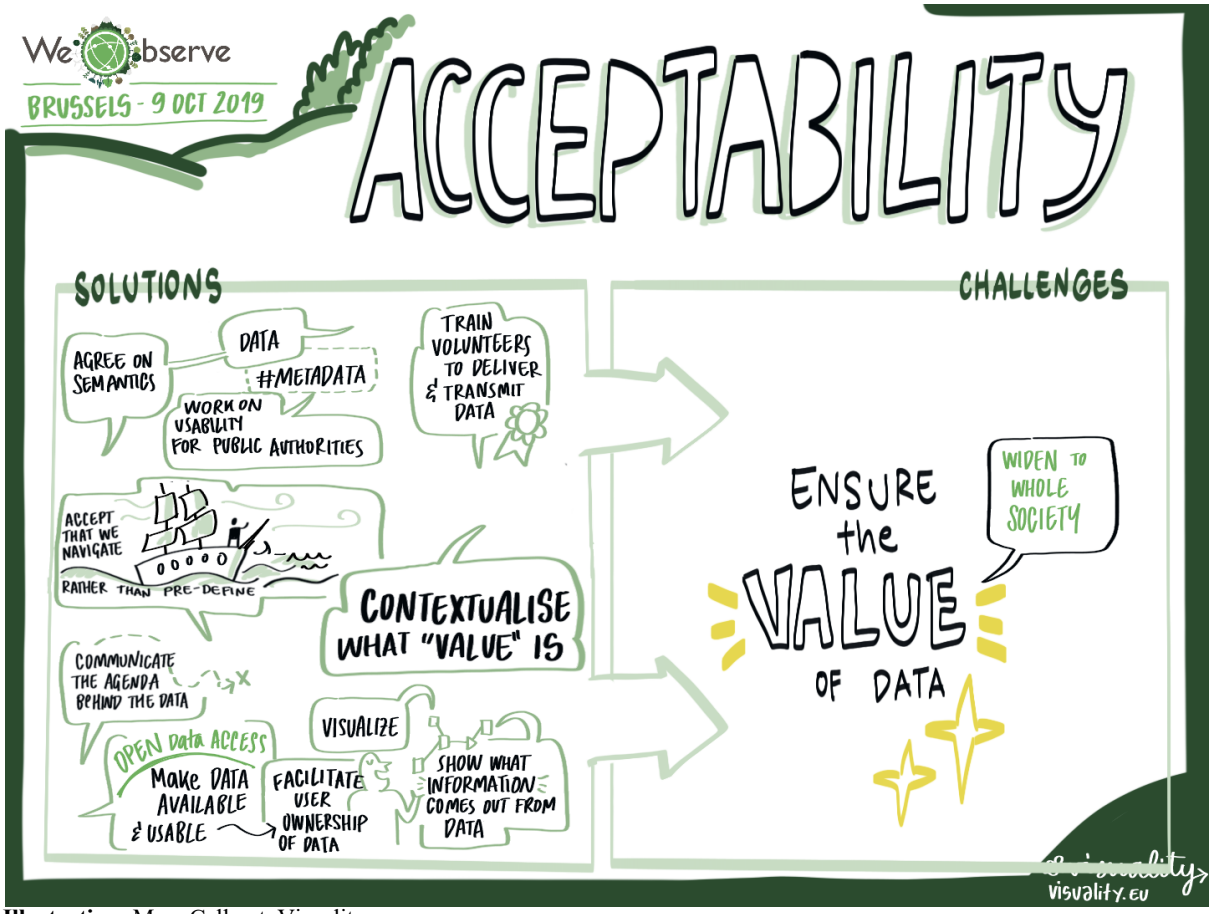


Illustration: Mara Callaert, Visuality.eu

One of the major discussions that emerged during the awareness sessions at the 4COs Workshop, as mentioned in section 4.2, was about the tension between definition and flexibility within the co-design method, which can have knock-on impacts on the acceptability of COs. A lack of clarity, or a lack of a shared vocabulary to describe the goals of the project, can have a negative impact on trust, and thus ultimately on the sustainability of the CO as well.

To address this, it is important to understand the different forces exerting themselves on 'the Triangle of Trust' - different understanding of the problem and the solution, different motivations, different needs and goals, but also different skills and mindsets. These tensions were often referred to in the subsequent interviews with coordinators from the 4COs as well. A common experience within the

COs was a gradual building of trust and change of mindset as early data came in, and the value of that data (and the value of an engaged and informed community of participants) became more clear.

In the example of COs that are structured to enhance satellite data with data collected on the ground, there can be a complete lack of understanding of what the satellite data shows and a fear of the technology interfaces to show that data, whereas there is good understanding of the data at the ground level, and its meaning. Some of the communication effort therefore required is to address the analysis and interpretation of the same body of data, with an appreciation of the different contextual needs.

The recommendation of one CO coordinator was to start with the data, and then collaboratively find the value and the solution together within the CO. As this gets communicated and facilitated, there is then a snowball effect of different stakeholders bringing in their own perspectives, to the long term benefit of the value of the CO. As this 4COs Workshop participant stated, "Data collection can be a complex picture, with different views about the data. The solution is to build that more complex picture together."

Recommendations from those in attendance at the 4CO Workshop included ensuring that citizens own the data, that this is shared and stored in an accessible format online, and that all participants approach the development of the CO flexibility in order to incorporate all needs and viewpoints. This requires CO practitioners to also maintain their flexibility in facilitating this balance. A key recommendation for project coordinators is thus to embed strong facilitation and communication skills within the coordinating team, and to consider embedding a dedicated role of 'Chief Design Officer' to enable co-creation throughout the full project lifecycle.

4.3.1 Acceptability lessons learned in the Ground Truth 2.0 project, and their seven COs

Concerns regarding the acceptability of data generated in the different COs varied along with the diversity of the issues addressed by the different Ground Truth 2.0 COs, and was prevalent not only among some of the authorities but also among some of the citizen scientists. Key to addressing these concerns was the careful training on the use of data collection tools. Moreover, the integral role and advice of subject experts during the co-design process served to build trust in the collected data. Similarly, the development of a data quality module allowed decision makers to assess the quality of data from different sources before integrating it. Taking such measures and communicating about these measures both proved crucial.

4.3.2 Acceptability lessons Learned in the GROW Observatory

Although the project initiation was top-down, the model was a dynamic participatory one that transitioned to a much more collegial relationship between scientists and participants when the data started coming in and the communities took more ownership of how the data was being used. This contributed greatly to engendering trust between the different actors.

Given the complex data protocol and reliance on new low-cost sensor technology in the GROW Observatory, acceptability of the approach and the data was always going to be highly reliant on the outcomes of calibration testing, comparing the results of the CO sensor to high-end sensors available to university partners, and robustly testing its reliability over the harsh winter season. Planning for this in detail was the key to being able to share a successful outcome that aligned well with the satellite data, and was peer-reviewed and published. This increased both confidence and enthusiasm for the CO approach. Community champions were already very keen, but it was only once this evidence came in that they could really hit the ground running.

With the need for robust beta testing of new sensor technology being a big part of the evidence base required for the GROW Observatory, it was crucial to have built enough time and resource into the project budget to do this thoroughly. Although a degree of technology and human error can be

expected, unanticipated events included sensors being sat on by sheep, eaten by livestock, and plowed under by accident. These costs should not be underestimated, and it is also wise to have a back-up plan ready should the technology not hold up, or the supplier of the technology no longer be in business.

4.3.3 Acceptability lessons learned in the LandSense Project, and their six Pilot COs

The majority of the pilots in the LandSense project worked closely with city and municipal authorities who are key stakeholders in the issues being addressed, but in some cases they were hard to engage, or "reluctantly positive" to the aims of the CO. In delving into this issue, some city-level policy makers had cited bad experiences with similar initiatives where issue-reporting methods were misused by citizens to express their frustrations with neighbours, or too many short term or even short-sighted project ideas that had been brought to them over the years with no real long-term commitment.

When data is gathered in a good manner, participants have good training, and there is good alignment with the policy makers needs, then there is a very good experience with the acceptance of the data - but this hasn't always been the norm. In other cases it has been much harder to talk about data quality with authorities, either because their own data quality standards are not transparent to them (and they do not want to subject themselves to scrutiny of their own data quality), or because they are happy with the status quo of the existing data meeting their needs, and resist any changes to that.

The key approach to addressing such challenges is to identify use cases that add value to existing processes, complement or increase services capacity, and make things more efficient, while at the same time not threatening the existing order. Communicating a long term vision and engagement plan, backed by committed staff and a clear sustainability plan increase trust greatly.

Sometimes, however, this type of resistance simply can't be overcome, and the CO must change its focus to address a different group of stakeholders around the issue, such as fellow researchers internationally, or students interested in learning about these issues more proactively.

Each of the LandSense pilot cases also experienced their own context-related challenges. In the case of the City Oases app for example, the local press seized upon the potential of the urban-spaces mapping application during the summer heat wave of 2020, and promoted the usage of the app to a larger readership. This had the effect of greatly boosting the number of people downloading and using the app, but also resulted in disappointment because users had expected a 'Heat Island' reporting application that might help them to find cool spaces in the city, and the app had not been developed with this use case in mind. Nevertheless, this unfortunate experience has opened a new use case for future development of the application, with high potential. The take-away is therefore to remain open to serendipitous new applications, and plan for the ability to respond to them on the fly.

4.3.4 Acceptability lessons learned in the Scent Project, and their two Pilot COs

The Scent project addressed the acceptability of CO approaches and citizen-generated data in the Attica CO through continuous conversation and sharing of interim-data results with both stakeholders and participants. Acceptability of the approach and trust in the data grew as the outcomes started coming in, and it was clear that it could contribute valuably to decision making. Participants took part frequently, and their interest grew as their involvement grew, even making suggestions to enhance the activities and making them more fun. A key innovation that enabled this was taking a games-mechanics approach to developing the underlying monitoring tools, after a thorough enquiry into user requirements and expectations.

However, during the co-design process with Attica CO stakeholders, needs for post-flood event reporting were articulated by the regional authorities, while initially the project focus was on contributing to a better monitoring of flood risk, based on land cover and land use changes. Adding actual flood damage data and associated events reported by citizens enabled the project to map these geo-spatially, taking them into account in the Scent toolbox design. However, the provision of this data raised new issues about the resources available from public authorities to act upon that data in a timely fashion, and there was hesitance to make it publicly available due to security and efficiency concerns. This experience highlights the importance of constant collaborative alignment of the goals and outcomes of the CO between the stakeholders, but also shows how difficult this can be to implement in practice. In this case, new tools were developed to meet this emergent need.

4.3.5 Acceptability lessons learned in the WeSenseIt Project and their 3 Pilot COs

In the WeSenseIt pilots, the CO served as a point of reference for the authorities alongside their existing decision support systems. Authorities kept the citizen observatories separate from their existing systems as they viewed the observatories as 'just one more medium to interact with citizens' rather than the main communication channel. In the Doncaster and Delfland cases, the authorities continued to prefer formal monitoring procedures over the engagement of citizen scientists in sensing activities, not least because of the reliability of physical sensors.

However, the communities and citizens in Doncaster were considered valuable providers of information and insights. The drainage board already relied on the public to report problems to the board. Observations by local citizens and citizen scientists were perceived as helpful for improving local forecasting. The regional water authority in Delfland increasingly perceived the potential of citizen observatories to “hear the voice of the citizens” and draw on the citizens' expertise regarding local issues, and emergency situations related to flood risk management.

Nevertheless, contact with citizens in most instances was still conducted in a top-down manner, since the authority took its task of ensuring that citizens were protected very seriously and also hesitated to try new and untested ways of interacting with the public.

In the Alto Adriatico CO, data collection from social media was compared and contrasted with other sources to ensure a high level of data quality and reliability. The authorities’ perceptions changed significantly with respect to who can provide data as an explicit social sensor. While the authorities were initially limiting explicit data collection to the network of qualified observers (professionals and the volunteer component of “Protezione Civile”, who are not local residents), there was later a strong impetus towards a much broader involvement of local citizens groups.

4.4 Sustainability Challenges and Solutions

The main themes that emerged from our research on the topic of sustainability primarily related to the operational, organisational, and governance continuity of COs beyond the typical project-funding lifetime, and the necessity of planning for this right from the launch of the CO.

A range of factors relating to the maintenance of the underlying technology that need to be accounted for when considering sustainability planning were discussed during the 4COs Workshop, and these included:

- Data ownership
- Embedding of the CO activities into an institutional setting for longer term operations
- Interoperability between existing and emergent platforms
- Running and maintenance costs

- Technological readiness and the need for further development
- Embedding required data skills, such as developing data models and data visualisations for different types of data
- Technological sustainability, and the use of or contribution to open source
- The longevity and reliability of key technology partners and suppliers
- Sharing CO outcomes with participants beyond the end of the project, and properly acknowledging their involvement
- Technology transfer into new hands at the end of the project

Figure 10: The 4COs Workshop on the Challenge of Sustainability

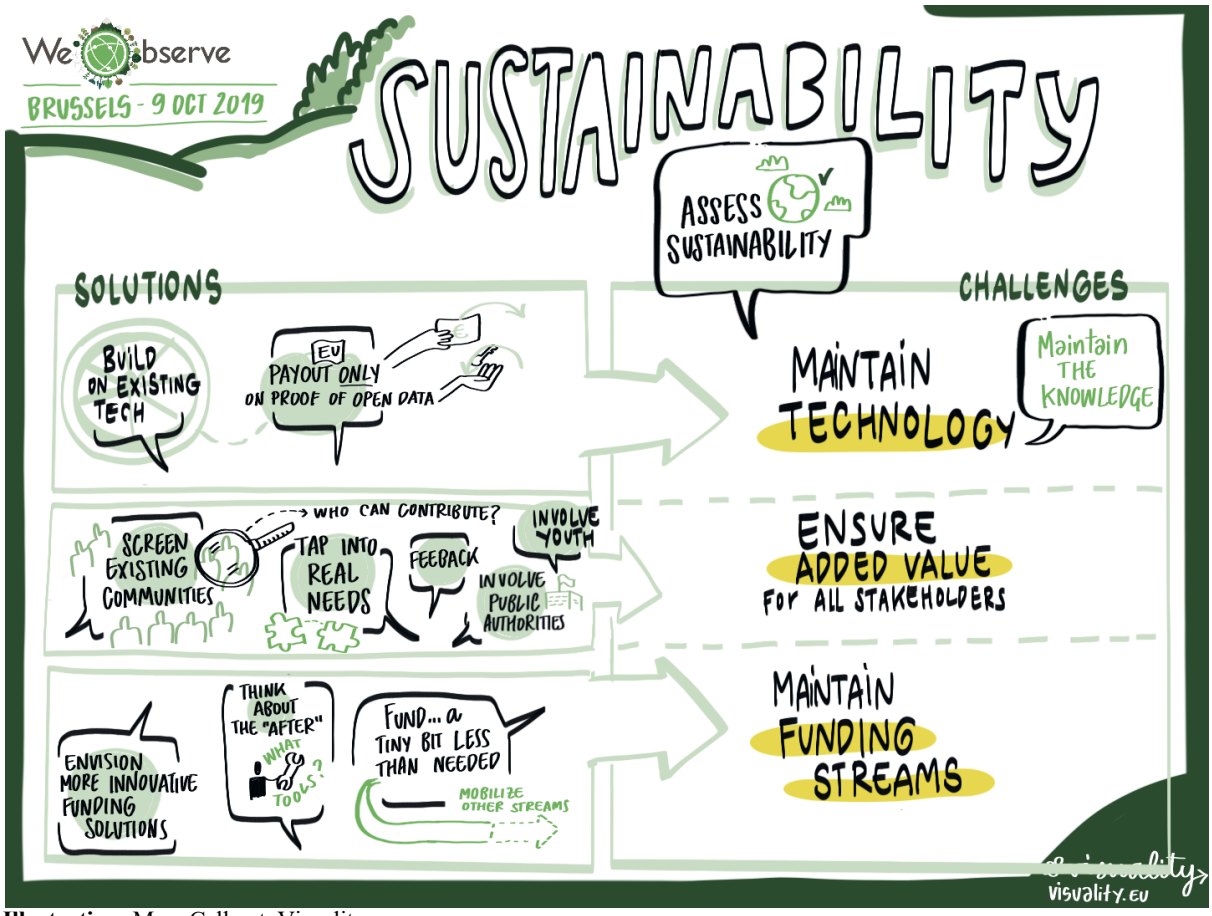


Illustration: Mara Callaert, Visuality.eu

Similarly, the needs of the community of active participants that has been built up within the CO were discussed, for the maintenance of ongoing CO activity by that community, and these included:

- Centralised effort to continue to build and keep the community
- Managing different expectations of the actors for how the CO should be sustained, and by whom
- Maintaining consortium alignment, or alignment with consortium partners
- Recognising different citizen motivations and needs in the sustainability planning

And finally, how to maintain a balance in delivering on the values of science, policy, and citizens was discussed:

- How to balance pressures to seek commercial exploitation or commercial support with the needs and motivations of the community
- How to develop the underlying technology if the market was not yet established

- Aligning value of commercial exploitation with the value of the CO
- Ownership and institutional embedding without compromising the CO's purpose
- How to support the ongoing involvement of policy makers
- How to address environmental sustainability issues surrounding the sensors, e.g. plastic packaging
- Reaching agreement on the ambition and scope of the CO post-funding.

4.4.1 Sustainability lessons learned in the Ground Truth 2.0 project, and their seven Pilot COs

The sustainability of the COs that were set up by the Ground Truth 2.0 project in six countries was addressed 'by design'. The Ground Truth 2.0 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.

The co-design of objectives and technologies can strengthen the sustainability of Citizen Observatories but implies uncertainties for the project consortium. The precise composition of the CO and the required partner expertise, resources, and 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 CO.

4.4.2 Sustainability lessons learned in the 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 collaborative process that underpinned all activities, including shared governance and decision-making, was key to fostering both resilience and sustainability.

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.

4.4.3 Sustainability lessons learned in the LandSense Project, and their six Pilot COs

The pilots in the LandSense project all experienced a good initial engagement with the activities of the COs, but then struggled to maintain participation, motivation, and enthusiasm over the full timeline of the CO activities. In most cases this was due to not having allocated sufficient resources (both time and budget) to sustaining this outreach and engagement effort beyond the first push.

The LandSense project had a strong focus on the technical infrastructure of COs, and promoted technological sustainability by extending successful prototypes from past EU-funded projects such as 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. Many of these will therefore continue to be

used and further developed beyond the end of the project itself, either by project partners, or in new projects that have already been identified and/or funded.

One of the key findings within LandSense was that the lack of sustainability planning in a CO 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. This increases both the trust in the CO approach and in the value of the data being collected. However, integrating the CO into permanent processes can be a challenge when the pilot itself is reliant on external funding to take place, and no ongoing funding has been secured. The LandSense project has addressed this in part by exploring the potential for innovative new commercial models for CO approaches, such as in the CropSupport pilot that allows farmers to monitor their crops and share in-situ data with other stakeholders, which could be of commercial value to insurance companies wishing to offer add-on services to agricultural customers.

4.4.4 Sustainability lessons learned in the Scent Project, and their two Pilot COs

The Scent project primarily addressed sustainability by focusing on making the two CO pilots easily replicable and scalable, particularly in terms of building an underlying 'data-harmonisation' technology platform that can be further specialised to meet the needs of each authority. They also developed a campaign management toolkit to support future CO leaders in maintaining the activity levels within the CO - a factor whose importance was made clear by the big spike in engagement every time there was a big communication or dissemination event in the project.

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 with research institutes or private entities that can support such infrastructure demands.

4.4.5 CO Challenges being addressed in the COs4Cloud project

The COs4Cloud project is addressing one of the biggest acceptability challenges, which is the quality of CO data, by developing ten technological services to improve the CO platforms that collect this data, and help them boost the quantity and the quality of observations that ultimately help ensure their long-term viability.

The COs4Cloud project came about in response to the observed phenomenon of CO projects being initiated but not maintained beyond their fixed funding period, and the successfully built-up community of participants losing their financial support, which is in part because these initiatives have been conceived as projects rather than as permanent infrastructures. Many of the first generation of COs are not active anymore due to this factor.

COs4Cloud addresses this need by building a permanent infrastructure for COs that is integrated into the European Open Science Cloud (EOSC), which is supported by the EU via a funding instrument from national governments - thus providing it with a level of long-term financial support that has typically not been available to COs to date.

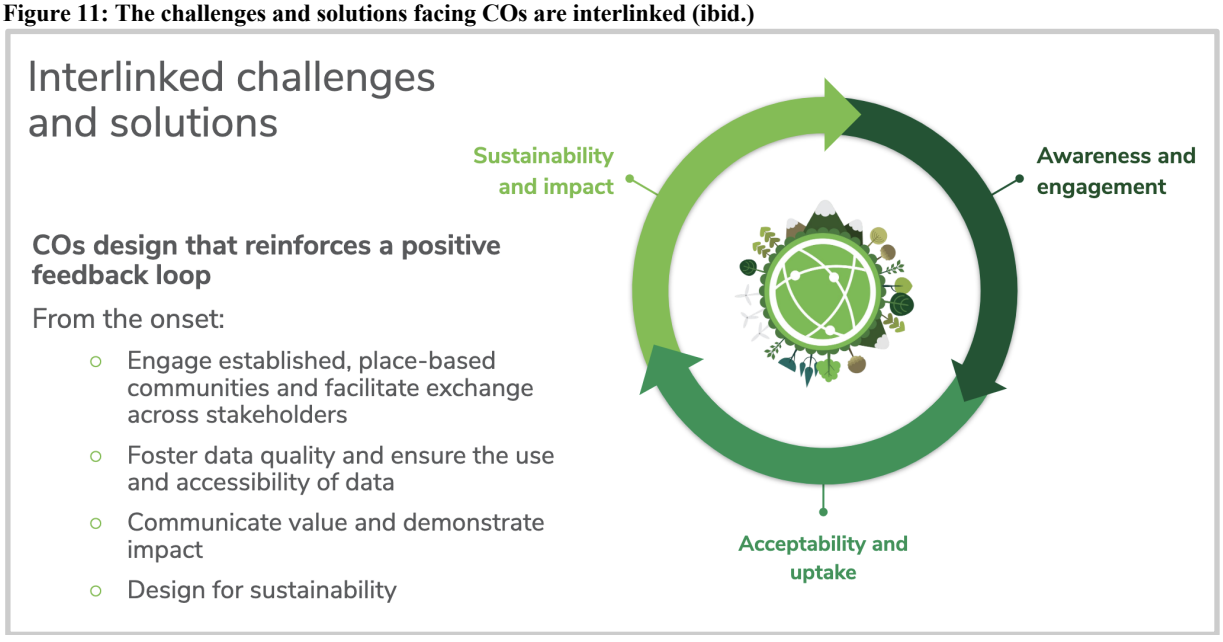
5 Recommendations: Creating a sustainable enabling environment for Citizen Observatories across Europe

Embracing the CO approach will strengthen Europe's ability to tackle society's greatest challenges. But in order to do so, an enabling environment must be built and sustained around COs with the potential to achieve real impact. An enabling environment can be considered to be "the sum of conditions that enable a CO to function, deliver value and impact and sustain its activities" (Hager 2020). In order to support and sustain the ecosystem of COs in Europe over the long term, these conditions include (ibid.):

- A network of stakeholders and active place-based community, that is linked with other networks and communities of practice
- Skills, capacity building, training and knowledge sharing capabilities
- Suitable and reliable technology, data infrastructures and standards
- Legal, policy and funding frameworks that support flexibility, sustainability, and impact and value delivery

Addressing each of the challenge areas described in Section 4 has positive knock-on effects across the other challenge areas, such that growing awareness increases acceptability, and improves the longer term sustainability of the CO, as illustrated in Figure 7 below.

Figure 11: The challenges and solutions facing COs are interlinked (ibid.)



Based on the learning gathered throughout the WeObserve project from our sister COs and other practitioners in the field of citizen science, we recommend a number of distinct actions for those who initiate and run citizen observatories, those who can use the data generated with COs to support their decision making, and those who fund and support the existence of COs.

Specific actions to address these challenges, improve current practice and develop new best-practices are outlined in detail in Hager et al. (In review) and can be clustered under:

- **Communication, co-design, community and network building actions**: These actions may include, e.g., engaging with decision makers, policy and government agencies early on, collaborating with SMEs, or engaging the media.

- **Actions to further improve data quality and standards, integration and interoperability, accessibility and protection**: These actions can range from describing and defining the purpose of gathered data across stakeholders, to developing semantics for data collection further, to establishing new models to balance privacy and data protection requirements with the mandate for open access data and transparent data governance.

- **Actions to allow technology transfer and business prototyping**, including actions to e.g., build on and reuse existing, open access technologies, calculate and communicate CO costs and benefits, or include business partners to develop the market potential of COs

Other aspects that are of particular importance to establishing an enabling environment that address the challenges described in Section 4, include:

- Addressing sustainability of initiatives beyond the project cycle
- Enhancing connections with national and european policy (particularly the European Green Deal and the major EU Missions)
- Sharing evidence openly and widely – data, open innovation, public engagement
- Pursuing interoperability among Citizen Science projects and connection to GEO, and
- Establishing a general infrastructure for Citizen Science in Europe (based on EOSC or other)

5.1 Recommendations to Project Coordinators and Initiators

Many of the actions outlined above should be accounted for in the very first plans for the design and launch of the CO, particularly during the proposal development phase when it is crucial to build in sufficient budget and planning. Project coordinators should:

Plan and provide resources for strong communication

The experiences and lessons learned shared by the WeObserve sister COs emphasize the labour-intensiveness of good communication and good facilitation throughout the life of a CO. A central community manager is therefore needed to support ongoing engagement, maintain two-way communication and thus keep motivation high, also beyond the end of the project funding.

Plan for the support of the community beyond the end of the project

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. It is vital to consider beforehand how the community can continue to be supported beyond the end of the funded project, ideally building that aspect of sustainability planning into the CO stakeholder partnership from launch.

Plan for ongoing 'agile' development of any supportive technologies, and their long-term maintenance

Similarly, tools such as mobile applications and data platforms also require long-term maintenance and new feature development based on user experience, and s to respond to changing monitoring needs. User needs left unaddressed will eventually lower motivation and lead to an unnecessarily premature end of the initiative. This should be accounted for both in the project, to respond in an 'agile' fashion to ongoing improvement opportunities, and beyond the end of the project and should at the minimum account for ongoing maintenance and hosting.

Plan for Replicability

In planning for the sustainability of a CO initiative, project coordinators should also consider aspects of the replicability and scaling up of successful approaches. Several dimensions of the observatory showed clear potential for replicability, including beyond European borders, such as the MOOC-based learning model, crowdsourced data approaches, collective up-scale citizen science experiments and the novel recruitment and engagement strategies.

5.2 Recommendations to Policy Makers and Public Authorities

A key actor of Citizen Observatories are public authorities and policy makers (particularly at local levels) by virtue of the crucial links they constitute to formal policy making processes and related decision making, implementation, monitoring and evaluation. Yet many COs or initiatives just starting out are hampered by relations with formal decision makers being 'the missing link'. We therefore provide the following recommendation for policy makers and authorities, both those among 'the converted' as well as those still pondering the benefits of COs.

Realise your influence as change agent among your peers to foster the uptake of Citizen Observatories

COs are in danger of remaining an approach of 'the converted', i.e. involving only those authorities who are open to the new forms of joint monitoring, collaboration and interaction that COs offer. As 'early adopters', those authorities already involved in COs have a key role to play in the way out of this dilemma. Making the case for how valuable COs are for decision making can be made most convincingly by yourself to your peer policy makers and (local) authorities. It is important to realise this influential role as 'change agent' and to prepare key arguments that can be fed into ad hoc discussions as well as planned debates and interactions within and outside your own organisation.

Pick and choose opportunities to elaborate on your own CO experience and success stories

Seize opportunities to share your experience, success stories and 'how-to's with other local authorities and policy makers. These opportunities may range from incidental conversations to targeted events. For example, during the WeObserve roadshow events with local authorities, emergency managers, regional/national policy makers, scientists and experts, the Alto Adriatico Water Authority (AAWA) showcased how it is effectively using a citizen observatory in the flood risk management of the Brenta-Bacchiglione river basin. These events allow other authorities to learn about the basic principles of citizen observatories, gain hands-on experience of citizen science and citizen observatories and see how decision makers are using the information provided by citizens. Based on this experience, participants can consider and discuss the potential of citizen observatories in their own context of emergency management and mitigation and what comes into play when implementing a citizen observatory.

Reach out to other peers to learn from their experience with COs

Those authorities and policy makers still pondering the benefits of COs can reach out to their peers who are already involved in COs or have hands on experience, to learn how they have made the case for this within their own institutions, raised funds, established suitable partnerships, and dealt with questions and 'red tape'. Finding CO practitioners is becoming easier, e.g. via the CO Landscape

map on the WeObserve Knowledge Hub, and the EU-Citizen.Science platform listing of organisations involved in citizen science[37].

5.3 Recommendations to Funding Bodies

Several challenges for the sustainability of COs need to be addressed on the level of the policy and funding frameworks that set the conditions for COs to function and sustain their activities. They shape the enabling environment for the generation and execution of successful COs. Funding bodies should:

Provide greater flexibility within funding schemes for co-design of 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 CO 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.

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

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.

[37] https://eu-citizen.science/organisations

• 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.

Explicitly include COs in mission driven research funding schemes as a means for citizen and stakeholder engagement.

COs 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 CO approach is reinvented time and again, in disconnected ways. Funding schemes should:

• Identify COs 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.

Provide longer term funding support for Citizen Observatories.

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.

References

Anema, K., Alfonso, L. (2016). Report on proceedings of the Netherlands case study, executed in the Delfland region. WeSenseIt: Citizen Observatory of Water.

Anhalt-Depies, C., Stenglein, J. L., Zuckerberg, B., Townsend, P. A., & Rissman, A. R. (2019). Tradeoffs and tools for data quality, privacy, transparency, and trust in citizen science. Biological Conservation, 238, 108195.

European Commission. 2014. Citizens' Observatories. Empowering European Society Conference Report. Version 1.0, Brussels, Belgium, 4th December 2014. Climate Actions and Earth Observation Unit in DG Research and Innovation.

Ferri, M., Monego, M., Norbiato, D., Tomei, G. (2016). Alto Adriatico Case Study Evaluation. WeSenseIt: Citizen Observatory of Water.

Fraisl, D., Campbell, J., See, L., Wehn, U., Wardlaw, J., Gold, M., ... & Masó, J. (2020). Mapping citizen science contributions to the UN sustainable development goals. Sustainability Science, 1-17

Gold, Margaret. (2018). D2.1 EU Citizen Observatories Landscape Report - Frameworks for mapping existing CO initiatives and their relevant communities and interactions (Version Final submitted draft). Zenodo. DOI 10.5281/zenodo.3670894.

Gabrys, J., Pritchard, H., & Barratt, B. (2016). Just good enough data: Figuring data citizenships through air pollution sensing and data stories. Big Data & Society, 3(2), 2053951716679677.

Gharesifard, M. (2020). Community-based monitoring initiatives of water and environment: Evaluation of establishment dynamics and results. CRC Press / Balkema.

Ground Truth2.0 (2020). https://gt20.eu/. Visited November 2020.

GROW Observatory (2020). https://growobservatory.org/ Visited November 2020.

Hager, G., Gold, M., Wehn, U., Ajates, R., See, L., Woods, M., Tsiakos, V., J., Masó, Fraisl, D., Moorthy, I., Domian, D., and Fritz, S. (In review). Onto new horizons: Insights from the WeObserve project to strengthen the awareness, acceptability and sustainability of Citizen Observatories in Europe. Submitted to JCOM Special Issue "Encounters in Citizen Science".

Hager, G. (2020). Onto new horizons: Learnings from the WeObserve project to strengthen awareness, acceptability and sustainability of Citizen Observatories in Europe. Presentation at the ECSA 2020 conference. Zenodo. http://doi.org/10.5281/zenodo.4017257

Hecker, S., Wicke, N., Haklay, M., & Bonn, A. (2019). How Does Policy Conceptualise Citizen Science? A Qualitative Content Analysis of International Policy Documents. Citizen Science: Theory and Practice, 4(1), 32. DOI: http://doi.org/10.5334/cstp.230

Horizon 2020 Open Conference Citizens' Observatories: Empowering European Society, Brussels December 4th, 2014 event description:
https://ec.europa.eu/programmes/horizon2020/en/news/citizens%E2%80%99-observatories-empowering-european-society-open-conference

Krommyda, M., Bolierakis, S., Kopsinis, Y., Tsiakos, C., Tsertou, A., Amditis, A., Jonoski, A., Popescu, I., Miorandi, D., Tamascelli, S., Cohen, B. (2018). Scent Integrated Toolbox for monitoring flood phenomena. 121-132. 10.2495/FRIAR180121.

Krommyda, M., Tsiakos, C., Tsertou, A., Amditis, A., Cohen, B., Miorandi, D., Tamascelli, S. Scent - Smart Toolbox for Engaging Citizens into Monitoring Flood Phenomena. The 2nd International Conference Citizen Observatories for natural hazards and Water Management Venice, 27-30 November 2018.

Krommyda, M., Tsiakos, V., Rigos, A., Tsertou, A., Amditis, A., Georgiou, H., Jonoski, A., Popescu, I., Assumpcao, T. Innovative sensors for crowdsourced river measurements collection. The 16th International Conference on Environmental Science and Technology in Rhodes, Greece between 4 and 7 September 2019.

Locritani, Marina, S. Merlino, and M. Abbate. "Assessing the citizen science approach as a tool to increase awareness on the marine litter problem." Marine pollution bulletin 140 (2019): 320-329.

Mahajan, Sachit, et al. "A citizen science approach for enhancing public understanding of air pollution." Sustainable Cities and Society 52 (2020): 101800.
Mazumdar, S. (2016). Doncaster Case Study Evaluation. WeSenseIt: Citizen Observatory of Water.

Nichersu, I., Todorov, E., Nichersu, I., Marin, E., Sela, F., Kallioras, A., Diakakis, M., Tsertou, A., Athanasiou, G., Jonoski, A., Popescu, I., Alexopoulou, D., McDonnell, P. (2017). Benchmarking of available in-situ infrastructure. Scent. Smart Toolbox for Engaging Citizens into a People-Centric Observation Web

Roman, L. A., Scharenbroch, B. C., Östberg, J. P., Mueller, L. S., Henning, J. G., Koeser, A. K., ... & Jordan, R. C. (2017). Data quality in citizen science urban tree inventories. Urban Forestry & Urban Greening, 22, 124-135.

Rubio-Iglesias, J.M. 2013. Citizens' observatories for monitoring the environment: A commission perspective. In Proceedings of the Workshop on Citizen's Involvement in Environmental Governance, Arlon, Belgium, 7 October 2013; Directorate General Research and Innovation, European Commission: Brussels Belgium

Scent (2020). https://scent-project.eu/. Visited November 2020.

Serret, H., Deguines, N., Jang, Y., Lois, G. and Julliard, R., 2019. Data Quality and Participant Engagement in Citizen Science: Comparing Two Approaches for Monitoring Pollinators in France and South Korea. Citizen Science: Theory and Practice, 4(1), p.22. DOI: http://doi.org/10.5334/cstp.200

Vohland, K., Sauermann, H., Antoniou, V., Balazs, B., Göbel, C., Karatzas, K., ... & Winter, S. (2019). Citizen Science and sustainability transitions. Available at SSRN 3511088.

Wehn, U., Evers, J., Rusca, M., Faedo, G., Onencan, A. (2013). Report on the governance context for the citizen observatories of water. WeSenseIt: Citizen Observatory of Water.

Wehn, U., Evers, J. (2015). The social innovation potential of ICT-enabled citizen observatories to increase eParticipation in local flood risk management. Technology in Society. https://doi.org/10.1016/j.techsoc.2015.05.002.

Wehn, U., Mccarthy, S., Lanfranchi, V., Tapsell, S. (2015). Citizen Observatories as facilitators of change in water governance? Experiences from three European cases. Environmental Engineering and Management Journal. 14. 2073-2086. 10.30638/eemj.2015.222.

Wehn, U., Pfeiffer, E., Gharesifard, M., Anema, K., Remmers, M. (2017). Methodology for Validation and Impact Assessment. GroundTruth2.0.

Wehn, U., Collins K., Anema, K., Basco-Carrera, L., Lerebours, A. (2018). Stakeholder engagement in water governance as social learning: lessons from practice. Water International. https://doi.org/10.1080/02508060.2018.1403083

Wehn, U., Pfeiffer, E., Gharesifard, M., Alfonso, L., Anema, K. (2020). Updated validation and socio-economic impacts report. GroundTruth2.0.

Woods, M., Ajates, R., Gulari, N., Burton, V. J., van der Velden, N. K., & Hemment, D. (2019). *GROW Observatory: Mission Outcomes*. University of Dundee. https://doi.org/10.20933/100001130

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Linked WeObserve Deliverables

Deliverable	Status
D2.1 EU Citizen Observatories Landscape Report - Frameworks for mapping existing CO initiatives and their relevant communities and interactions	Public
A Roadmap for Citizen Science in GEO - The essence of the Lisbon Declaration. WeObserve policy brief 1.	Public
Mission Sustainable: Fostering an enabling environment for sustainable Citizen Observatories. WeObserve policy brief 2.	Public

Appendix 1: The updated CO Description Template

PPSR CCM Metadata	Database Information
Origin UID	*Globally Unique Identifier in the database where a project was first registered. Allows traceability of a project in multiple databases to its original registration. For example, the Grant Number.*
Origin Database	*The name of the project database where a project was first registered. Allows traceability of a project in multiple databases to its original registration. For example, the CORDIS registration*
PPSR CCM Metadata	**Project Information**
Project Name	*Short name or title of the project*
Project Aim	*Primary aim, goal or objective*
Project Science Topic	*Fixed Vocabulary = Agriculture & Veterinary science / Animals / Archaeology & Culture / Astronomy & Space / Biodiversity / Biogeography / Biology / Birds / Chemical sciences / Climate & Weather / Ecology & Environment / Education / Food science / Genetics / Geography / Geology & Earth science / Health & Medicine / Indigenous culture / Information & Computing sciences / Insects & pollinators / Long-term species monitoring / Ocean, Water, Marine & Terrestrial / Nature & outdoors / Natural resource management / Physics / Psychology / Science policy / Social sciences / Sound / Transportation / Other*
Participation Task	Please select the nature of the participation task(s) in the scientific process of the project. Fixed Vocabulary: "Annotation, Audio or video recording, Classification or tagging, DIY hacking/making, Data analysis, Data entry, Download software for distributed computing, Finding entities, Geolocation, Identification, Learning, Measurement, Observation, Photography, Problem solving, Sample analysis, Site selection and/or description, Specimen/sample collection, Transcription"
Keywords	Keywords (comma separated) which are indexed and aid in searching for and finding projects.
Activity Status	*The activity status of the project. Fixed Vocabulary = Not yet started / Active / Periodically active / On hold / Completed / Abandoned/Terminated*
Start Date	*DD/MM/YYYY*
End Date	*DD/MM/YYYY*
Duration	*Alternative to the Start and End Date, when the duration is known but the start date is not yet set.*
Geographic Extent	*The spatial scale at which the project is implemented. Fixed vocabulary: Global, Macro-regional, National, Sub-national, Regional, City, Neighborhood*
Project Country/Countries	*The countries in which the project takes place*
Project Locality	*Please describe the locality of the project, in terms of where main participant activities take place, for example your backyard, fresh water, online...*

Project Language(s)	*Please indicate the main language(s) that project activities take place in*
Project Website	*Please provide the url of the website where the project is hosted*
Funding Program	*Indication of the program that funds or funded a project.*
Funding Source	*Sponsor(s) of the project*
PPSR CCM Metadata	**Contact Information**
Project Host / Coordinator	*Name of the primary organization responsible for hosting or implementing the project*
Public Contact	*Person that interested public or researchers should contact*
Public Contact Email	*Public contact email address*
Project Website	*Please provide the url of the website where the project is hosted*
PPSR CCM Metadata	**Profile Information**
Image	*An image to represent a project (url to jpeg or png file)*
Image Credit	*A credit for the image, if applicable*
PPSR CCM Metadata	**Participation Information**
How to Participate	*Free text description of how people can get involved in the project. Textual instructions for joining the project*
Project Task	*Free text description of the participant task(s) in the project.*
Intended Outcomes	*A set of described outcomes intended to be achieved by the project.*
Project Equipment	*Required or suggested equipment to be used in the project.*
Participant Links	*URL for links to any external resources associated with a project, such as a mobile application.*
PPSR CCM Metadata	**Project Documentation**
Link to Project Deliverables	
Link to Project Publications	
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions'[38]: 1.Sensors and transmission	Physical sensor ↔ social sensor

[38]Wehn, U.; Rusca, M.; Evers, J.; Lanfranchi, V. Participation in flood risk management and the potential of citizen observatories: A governance analysis. Environ. Sci. Pol. 2015, 48, 225–236.

2. Stakeholders	Authorities ↔ citizens
3. Area of application	Physical environment ↔ human behaviour
4. Purpose of citizen observatory	Protect environment ↔ strengthen governance
5. System integration	Stand-alone ↔ integrated
6. Measurement	Objective ↔ subjective
7. Implementation	Bottom up ↔ top-down
8. Communications paradigm	Uni-directional ↔ interactive
9. Citizen participation in governance processes	Implicit data provision ↔ technical expertise Individual education ↔ direct authority
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')[39]	**Select (multiple) from:** Status assessment (i.e., population monitoring), Impact assessment (i.e., effect of pollution), or Adaptive management (i.e., managing based on monitoring); Ecosystem composition (i.e., indicator species or species at risk), Structure (i.e., biodiversity analysis, keystone species, predator–prey relations), Processes (i.e., linking species with environment, nutrient cycling, etc.).
Model of CO *'(Shirk's 5 Project Models[40])*	***Select from**:* *Contractual projects - where communities ask professional researchers to conduct a specific scientific investigation and report on the results;* *Contributory projects - which are generally designed by scientists and for which members of the public primarily contribute data;* *Collaborative projects - which are generally designed by scientists and for which members of the public contribute data but also help to refine project design, analyze data, and/or disseminate findings;* *Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process; and* *Collegial contributions - where non-credentialed individuals conduct research independently with varying degrees of expected recognition by institutionalized science and/or professional*
Type of CO	***Select from**:*

[39] Conrad, C. C., & Hilchey, K. G. (2011). A review of citizen science and community-based environmental monitoring: issues and opportunities. Environmental monitoring and assessment, 176(1-4), 273-291.

[40] Shirk, J. L., H. L. Ballard, C. C. Wilderman, T. Phillips, A. Wiggins, R. Jordan, E. McCallie, M. Minarchek, B. V. Lewenstein, M. E. Krasny, and R. Bonney. 2012. Public participation in scientific research: a framework for deliberate design. *Ecology and Society* 17(2): 29.
http://dx.doi.org/10.5751/ES-04705-170229

(*'Wiggins & Crowston's 5 Types'*[41])	*Action - Action-oriented citizen science projects encourage participant intervention in local concerns, using scientific research as a tool to support civic agendas. They are most commonly grassroots or "bottom-up", are not conceived or planned by scientists, and usually involve long-term engagement in local environmental concerns.* *Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope.* *Investigation - Investigation projects are focused on scientific research goals requiring data collection from the physical environment.* *Education is frequently a strongly valued but unstated purpose, and task structures often support ongoing learning. These projects range from regional to international in scope, and can achieve very large scales of participation.* *Virtual - Science-oriented Virtual projects are ICT-mediated with no physical elements whatsoever, they are formed through top-down organizing by academics, and most projects' affiliations are exclusively academic.* *Education - Education projects make education and outreach their primary goals, with relevant aspects of place. They can be split into those focusing on informal versus formal learning opportunities, and are sometimes explicitly designed to permit cumulative learning experiences.*
Domain of Application *('Pallacin-Silva's 8 Domains of Application'* [42] *+ 2)*	***Select from****: City Management; Species Monitoring; Water, streams, snow, sea; Biodiversity monitoring; Air and spectrum monitoring; Tools for creating monitoring projects; Global monitoring; Disaster Monitoring; Land-use Monitoring; Commodity-based Monitoring*
Level of Geography *('Haklay's 3 Policy Dimensions'*[43]*)*	***Select from****: Local community; City level; Regional level; State/Country; Continental*
Policy Application Area *('Haklay's 3 Policy Dimensions')*	***Select from****: environmental monitoring and environmental decision making; agriculture and food; urban planning and cities; health and medical research; humanitarian support and development aid; science awareness, and support of scientific efforts*
Level of Engagement *('Haklay's 3 Policy Dimensions')*	***Select from:*** *Passive Sensing - relies on participants providing a resource that they own (e.g., their phone or space in their backyard) for automatic sensing. The information that is collected through these sensors is then used by scientists for analysis* *Volunteer Computing - a method in which participants share their unused computing resources, on their personal computer, tablet, or smartphone, and allow scientists to run complex computer models when the device is not in use.* *Volunteer Thinking - participants contribute their ability to recognize patterns*

[41] Wiggins, A., & Crowston, K. (2011, January). From conservation to crowdsourcing: A typology of citizen science. In System Sciences (HICSS), 2011 44th Hawaii international conference on (pp. 1-10). IEEE.

[42] Palacin-Silva, M. and Porras, J. (2018) Shut up and take my environmental data! A study on ICT enabled citizen science practices, participation approaches and challenges. EPiC Series in Computing, Volume 52, 2018, Pages 270–288. ICT4S2018. 5th International Conference on Information and Communication Technology for Sustainability. + ***two new categories***

[43] Haklay, M. Citizen Science and Policy: A European Perspective. Washington, DC: Woodrow Wilson International Center for Scholars, 2015

	or analyze information that will then be used in a scientific project. Commonly, the analysis task is fairly standardized, making it easy to aggregate and compare results from different participants *Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna* *Participatory Sensing - gives the participant more roles and control over the process. While many environmental and ecological observations follow data collection protocols that were designed by scientists, in participatory sensing the process is more distributed and emphasizes the active involvement of the participants in setting what will be collected and analyzed.* *Civic / Community science - also known as bottom-up science, is initiated and driven by a group of participants who identify a problem that is a concern for them and address it using scientific methods and tools. Within this type of activity, the problem formation, data collection, and analysis are often carried out by community members or in collaboration with scientists or established laboratories."*

Appendix 2: Interview Protocol & Guidance

Document Title	**WP2 – T2.1 Interview guidance**
Status	Preparatory work for D2.4 "Update: EU Landscape of existing citizen observatory initiatives/projects, associations and networks"
Related Work Package & Task	WP2 – Support: Co-create and strengthen the citizen observatories knowledge based T2.3 Map EU landscape of existing citizen observatories initiatives, relevant communities and their interactions
Working doc. lead	IHE
Author(s)	Uta Wehn, Margaret Gold
Dissemination level	Confidential

Versions and Contribution History

Version	Date	Modified by	Modification details
V1	20.6.2019	Uta Wehn	Produced first comprehensive version
	21.06.2019	Margaret Gold	Minor edits
V2	10/01/2020	Margaret Gold	Incorporation of feedback from colleagues

Background and purpose of this document

The WeObserve project aims to move Citizen Science into the mainstream by building a sustainable ecosystem of citizen observatories and related activities. T2.1 in WP2 aims to enhance the baseline analysis of existing and emerging CO initiatives, related communities and their interactions. To this end, one of the defined activities within task 2.1 is to conduct **in-depth face to face interviews** about the ecosystem for citizen observatories in Europe with relevant stakeholders, which will feed into deliverable D2.4 "*Final Report: EU Landscape of existing citizen observatory initiatives/projects, associations and networks*".

Guidance for semi-structured face-to-face interviews

The envisaged outcomes of the interviews are:

1. To obtain insights into the ecosystem for citizen observatories in the EU, especially with respect to its functioning, gaps and needs for creating a (more) enabling environment
2. To obtain insights into effective pathways for WeObserve to add value to the CO ecosystem
3. To extend the interested WeObserve stakeholder community

Each interview is expected to last 20-30 minutes.

The guidelines provided here detail the activities that the WeObserve interviewers need to undertake in the phase before the interview takes place, during its implementation and immediately following the interview.

Before the interview

1. Familiarise yourself with the interview protocol (see next section)
2. Prepare print outs of the WeObserve informed consent sheet (see Ethics Deliverables), tailored to the interview setting (date and data manager)
3. Prepare printed copies of the interview protocol (section 2.4) for your own use (not for the interviewee) during the interview for detailed note taking
4. Arrange WeObserve flyers for distribution to the interviewees
5. Pencils are more guaranteed to keep writing than pens!

During the interview

The interview will follow the following main structure:

Interview structure	*Purpose & approach*
Welcome and introduction	- *Briefly introduce the WeObserve project & hand out flyer;* - *explain objectives and structure of the interview;* - *hand out the informed consent sheet & obtain the signed form back from the interviewee (this can also be done when scheduling the interview)* - *explain that data from the interview will be analysed anonymously and aggregated with other data* - *explain that the results of the study will also be shared with the respondent organization in due time* - ***make clear that the interviewee can withdraw from the interview or the study at any stage by contacting Margaret Gold mg@margaretgold.co.uk***
Demographic information	- *Interviewee can provide the name of the organization or remain anonymous, as preferred by the interviewee.*
Content-related questions	- *Interviewer asks the detailed interview questions (see interview protocol) to obtain detailed insights;* - *Interviewee responds as preferred (incl. skipping questions)*
Closing	- *Thank the interviewee for their time;* - *explain next steps for WeObserve;* - *ask for interest in follow up, newsletter, report etc.*

The interviewer will take notes on paper throughout the interview. If the interview is taking place online (Skype, GoTo, Zoom, etc) ask permission to type up notes as you go along, as some interviewees may find the sound of typing distracting.

A recording can be done only with the explicit consent of the interviewee. However, it is strongly recommended NOT to rely exclusively on the recording (in case it fails), so please be sure to take notes.

The interview protocol below provides the guiding questions and prompts for the semi-structured interview.

6. Please complete one interview protocol for each interview.
7. The main questions (in bold) should be followed up by the bulleted prompts (below each question). Bullets related to specific questions are supposed to serve as prompts for the interviewer to follow up the posed question for additional detail.
8. Ideally, all the questions included in this protocol should be posed (and answered).

After the interview

9. Transcribe the interview as soon as possible following the interview (ideally on the same day), turning your notes into full sentences and elaborations (incl. your own observations or comments) based on your full recollection of the interview.
10. Compose the interview notes within this dedicated form.
11. Add the interview to the overview spreadsheet

Interview protocol

Interview protocol

Date of interview:
Location & event of interview:
Interviewer
Name of interviewer:
Organisation of interviewer:

Welcome & introduction

Background on WeObserve / focus of WP2 on the landscape of COs in Europe
Purpose of the interview:

- To obtain insights into the ecosystem for citizen observatories in the EU, especially with respect to its functioning, gaps and needs for creating a (more) enabling environment
- To obtain insights into effective pathways for WeObserve to add value to the CO ecosystem

What WeObserve will do with the obtained information

- From these interviews and other activities, WeObserve will create an updated landscape report with identified gaps in the CO ecosystem functioning in Europe
- WeObserve will form recommendations on how to strengthen the enabling environment for COs in Europe

Feedback to, and interest for, the interviewee

- The updated landscape report will offer an overview what the major gaps are

- The updated landscape report will provide concrete advice on how they can be addressed, thus helping to strengthen the ecosystem for COs in Europe (and beyond)

IMPORTANT

- Hand over WeObserve Informed Consent sheet & get signature
- collect business card

Demographic information

Interviewee
Name:
Gender:
Interviewee organisation:
Job title/function:
Years of experience in this job:
Main responsibilities:

Background questions

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1. What is your involvement in COs and Citizen Science?
   - Specific CO projects
   - CS-related policy

2. What are the main target group(s) of your CO/CS activities?
   - Type of stakeholders
   - Demographic characteristics
   - Geographic reach

Content-related Questions -

---

3. What challenges, if any, have you experienced with respect to AWARENESS of CO/CS, i.e. citizens and other stakeholders not being aware of the potential of CS?

   Potential awareness challenges:

   a. Lack of awareness of potential of CS among participants (citizens, scientists, decision makers, others)
   b. Lack of awareness of potential of CS by policy makers

c. ...

4. How did you overcome this?
5. What challenges, if any, have you experienced with respect to the ACCEPTABILITY of CO/CS, i.e. acceptability of CO/CS data outputs?

   Potential acceptability challenges:

   a. Concerns about CO/CS data not meeting required quality standards for informed decision making

   b. Lack of trust/acceptance of CS data to complement 'authoritative data'

   c. …

6. How did you overcome this?
7. What challenges, if any, have you experienced with respect to the SUSTAINABILITY of CO/CS, i.e. the longer term existence of CO/CS beyond initial (project-based funding)?

   Potential sustainability challenges:

   a. Insufficient infrastructure/ standards for data preservation/ interoperability to sustain and scale CS projects

   b. Missing/hampering legislation

   c. Lack/insecurity about funding

   d. …

- How did you overcome this?
- Are there other challenges that you have faced, that you would like to add to these?
- How did you overcome those?
- What recommendations would you make for improving the supportive ecosystem around COs, and improving the enabling environment for CS in Europe?
- From these interviews and other activities, WeObserve will make a consolidated landscape report. How can WeObserve add value to your activities and to the large CO community?
  - How could we best formulate and present the WeObserve landscape report?
  - What/who would be our best entry point (regional/national level) for buy in and legitimacy?
  - What could be the best process(es) for feeding WeObserve CO landscape report into relevant entities/institutions?
  - Any other advice you can give WeObserve on this issue?
- Would you like to add anything else on this topic?
- Is there someone else you would recommend us to interview on this topic?

Closing

Explanation of the next steps

- All results from interviews & workshop will be analysed.
- WeObserve will produce the updated CO landscape report and recommendations

- Would you like to be involved in some other WeObserve activities:

Are you interested to be kept informed?

Those are all the questions that we wanted to ask. Thank you for your time!

Thank you for your time!

Appendix 3: Focus Group Protocol and Guidance

Document Title	WP2 – T2.1 Focus group guidance
Status	Preparatory work for D2.4 "Update: EU Landscape of existing citizen observatory initiatives/projects, associations and networks"
Related Work Package & Task	WP2 – Support: Co-create and strengthen the citizen observatories knowledge based T2.1 Map EU landscape of existing citizen observatories initiatives, relevant communities and their interactions
Working doc. lead	IHE
Author(s)	Uta Wehn, Margaret Gold
Dissemination level	**Confidential**

Versions and Contribution History

Version	Date	Modified by	Modification details
V0.1	20.6.2019	Uta Wehn	Initial comprehensive version
	21.06.2019	Margaret Gold	Minor editing

1 Background and purpose of this document

The WeObserve project aims to move Citizen Science into the mainstream by building a sustainable ecosystem of citizen observatories and related activities. T2.1 in WP2 aims to enhance the baseline analysis of existing and emerging CO initiatives, related communities and their interactions. To this end, one of the defined activities within task 2.1 is to conduct **focus groups** about the three central challenges facing citizen observatories in Europe with relevant stakeholders, which will feed into deliverable D2.4 "*Final Report: EU Landscape of existing citizen observatory initiatives/projects, associations and networks*".

This document explains how the five focus group discussions should be implemented in 2019 and 2020.

2 Guidance for WP2 focus groups

In sum, the **envisaged focus group outcomes** are:

- *To obtain insights into the ecosystem for citizen observatories in the EU, especially with respect to its functioning, gaps and needs for creating a (more) enabling environment*

- *To obtain insights into the shape of the WeObserve Landscape report in order to add value to the WeObserve stakeholders*
- *To extend the interested WeObserve stakeholder community*

The expected duration of the workshop is **1,5 hours** - slots of 1 hour or less are **not** suitable.

The targeted participants are:

1. COs
2. Policy makers (e.g. at the 4 CO projects' closing event)
3. funded initiatives (self-identified as CO)
4. grass roots initiatives (fits definition but doesn't self-identify)
5. COs in domains not yet represented by the above

The guidelines provided here detail the activities that workshop facilitators need to undertake in the phase before the workshop takes place, during its implementation and immediately following the workshop.

3 Before the Workshop

- Familiarise yourself with the accompanying PPT slide set for the workshop and adjust it to the specific workshop setting (facilitator name, location, date, host event); adjust the activity instructions in case the workshop length differs from the envisaged 1,5 hour length.
- Prepare print outs of the WO informed consent sheet (see Ethics Deliverables), tailored to the workshop setting (date and data manager)
- Prepare print out of WO 'Let's stay in touch sheet'
- Have post its, markers and other supporting material ready
- Pack the WO banner and set it up in the room before the workshop starts
- Set up the room with 5-6 tables for groups of 3-4 people (max!) per table
- Distribute WO flyers on the tables
- Clarify main facilitator/support roles among WO partners present to implement the workshop

4 During the Workshop

- Follow the session design (see table below) and use the slide set
- Place the 'Let's stay in touch' sheet prominently at the entrance of the workshop/circulate it during the workshop

5 After the Workshop

- Take photos of all materials produced during the workshop (post its, compass posters, etc.) and upload it to PP
- Gather all physical workshop material post its, compass posters, etc. and keep it safe
- Hold a de-briefing meeting with the WO team to capture lessons learned
- Digitise all workshop material (write up post its, etc.) and include it in the prepared Excel sheets (ideally on the same or the following day)

6 Detailed Workshop design

Session item	*Purpose*	*Targeted outputs*	*Who*	*Materials, support*	*Timing*
Welcome and introduction	*Introduce the WeObserve project; explain context, objectives and structure of the workshop; hand out the informed consent sheet*		*WO facilitator*	*Slides; informed consent sheets*	
Instructions	*Ask participants to form groups (per region) & briefly introduce themselves to their group (2 sentences p.p.)*		*WO facilitator*	*slides*	
Form groups	*Form group*		*Participants*	*Group set up (3-4 persons per table)*	
Instructions	*Introduce activity*		*WO facilitator*	*Slides, handout*	
Group work	*In each group, participants address the following 3 questions (first individually on post its, then in group discussion* *What do you think are the challenges for COs/CS in terms of* *1. ...AWARENESS?* *2. ...ACCEPTABILITY?* *3. ...SUSTAINABILITY?*	*Clustered ideas per topic and group*	*Participants (WO facilitator helps groups as needed)*	*Post its, markers*	
Plenary summary & discussion	*Brief summary of main insights of each group shared with the plenary; discussion across groups/main insights*	*Collated clusters of ideas (post its) across groups*	*One person per group, WO facilitator as chair*		
	In each group, participants address the following 3 questions (first individually on post its, then in group discussion *How could the identified challenges be addressed, by whom and how?* *What should be strengthened in the 'Enabling Environment' for COs and Citizen Science in Europe and How?* *How can WeObserve add value to the larger CO community*			*Post its, markers*	
Plenary summary & discussion	*Brief summary of main insights of each group shared with the plenary; discussion across groups/main insights*	*Collated clusters of ideas (post its) across groups*	*One person per group, WO facilitator as chair*		

Closing	*Bridge from summary of focused discussions to broader perspective, a call for interviews on short term needs & barriers to implementation; next steps for WO.*		*WO facilitator*	*slides*	

Appendix 4: Ground Truth 2.0

The Ground Truth 2.0 Project

PPSR CCM Metadata	Database Information
Origin UID	Grant agreement ID: 689744
Origin Database	https://cordis.europa.eu/project/id/689744
PPSR CCM Metadata	**Project Information**
Project Name	Ground Truth 2.0
Project Aim	Ground Truth 2.0 was a 3-year EU funded project that set up and validated six citizen observatories in real conditions, in four European and two African demonstration cases. The project demonstrated that such observatories are technologically feasible, can be implemented sustainably and that they have many societal and economic benefits. The ultimate objective was the global market uptake of the concept and the enabling technologies.
Activity Status	Completed
Start Date	01/09/2016
End Date	31/12/2019
Duration	39 Months
Project Website	https://gt20.eu/
Funding Program	European Union's Horizon 2020 Research and Innovation Programme under grant agreement No.689744.
Funding Source	European Union
PPSR CCM Metadata	**Contact Information**
Project Host / Coordinator	IHE Delft
Public Contact	Uta Wehn
Public Contact Email	u.wehn@un-ihe.org
PPSR CCM Metadata	**Profile Information**

Image	
PPSR CCM Metadata	**Project Documentation**
Link to Project Deliverables	https://gt20.eu/documents/gt20-deliberables/
Link to Project Publications	https://gt20.eu/documents/publication/

Meet Mee Mechelen Citizen Observatory

PPSR CCM Metadata	Project Information
CO Name	Meet Mee Mechelen
CO Aim	Citizen observatory Meet Mee Mechelen aims to improve the dialogue between citizens and decision makers by creating a platform where they can share information on the local living environment, specifically on air quality and noise. With such a platform, local problems can be signalled, better monitored, put on the political agenda and improved.
Project Science Topic	Ecology & Environment / Nature & outdoors / Natural resource management / Social sciences
Participation Task	Data analysis, Data entry, Measurement ,Geolocation
Keywords	engineering and technology, environmental engineering, natural resource management
Activity Status	Ongoing
Start Date	2017
End Date	Ongoing
Duration	Not applicable
Geographic Extent	Local
Project Country/Countries	Belgium
Project Locality	City level - Mechelen

Project Language(s)	Dutch, French, English
Project Website	https://klimaan.be/
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	Klimaan
Public Contact	No information
Public Contact Email	https://klimaan.be/contact/
PPSR CCM Metadata	**Profile Information**
Image	Meet Mee Mechelen
PPSR CCM Metadata	**Participation Information**
How to Participate	To measure air quality: People can help to collect data together with the VITO AQ sensor. After data processing, these maps can be consulted via Map Air and Sound tool. Through Akvo Flow it is possible to collect reliable data, including geolocation. This app is used to question the experiences of people from Mechelen regarding air quality and noise. Akvo Flow collects data regarding air quality and noise pollution based on a questionnaire. After loading and processing, this data is shown in the tool Sound data Akvo Flow. To measure noise level in the environment. It is possible to install the VueForge app. With this app you can map how the noise situation in Mechelen varies throughout the city and throughout the day. After data processing, you can consult this information via the visualization tool Maps Air and noise . To participate in the citizen measurement campaigns participants need to register in advance filling a registration form. See here.
Project Task	Collecting and measuring air and noise data in the Mechelen city.
Intended Outcomes	To become an online and offline meeting place where stakeholders gather and build data, share information and knowledge about air quality and ambient noise and make it accessible for everyone, to support policy making and initiatives for a better living environment.
Project Equipment	Air quality measurement instruments (VITO AQ Sensor) coupled with a GPS - works offline and sends the data to a server and data-base in VITO to process
App Links	Akvo Flow app to collect reliable data, including geolocation.

	VueForge app to measure the noise level in your environment.
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions 1.Sensors and transmission	Physical sensors
2. Stakeholders	Stedelijk Milieuraad, members of environmental NGOs such as Leefmilieu-groep Mechelen-Zuid, Fietsersbond Mechelen, Natuurpunt, Thuis in Nekkerspoel and Klimaan,Research Institute VITO, science education center Technopolis, City of Mechelen (City administration) and Flemish department of Environment
3. Area of application	Physical environment
4. Purpose of citizen observatory	Protect environment (air pollution) and strengthen governance (supporting policy making).
5. System integration	Stand-alone
6. Measurement	Objective
7. Implementation	Co-design
8. Communications paradigm	Interactive
9. Citizen participation in governance processes	Explicit data provision (direct & Intentional data provision) Communicative influence (it was recognized by politicians and the media; new ways of involving the public; addi-tional possibilities for influencing public opinion; using the produced data as evidence & as a bargaining chip)
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Type of assessment of ecosystem: adaptive assessment The ecosystem composition that is being monitored: Not applicable
Model of CO *(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process
Type of CO ('*Wiggins & Crowston's 5 Types'*)	Action - Action-oriented citizen science projects encourage participant intervention in local concerns, using scientific research as a tool to support civic agendas. They are most commonly grassroots or "bottom-up", are not conceived or planned by scientists, and usually involve long-term engagement in local environmental concerns.
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	City Management; Air and spectrum monitoring
Level of Geography *('Haklay's 3 Policy*	Local community; City level

Dimensions')	
Policy Application Area *('Haklay's 3 Policy Dimensions')*	environmental monitoring and environmental decision making; urban planning and cities; health and medical research
Level of Engagement *('Haklay's 3 Policy Dimensions')*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

Grip op Water Citizen Observatory

PPSR CCM Metadata	Project Information
CO Name	Grip of Water Altena
CO Aim	The aim of the Observatory is to reduce the impact of future heavy rainfall events in the Altena region (the Netherlands). If focus on climate-proof water management.
Project Science Topic	Climate & Weather / Ocean, Water, Marine & Terrestrial / Nature & outdoors / Natural resource management / Social sciences
Participation Task	Data entry, data analysis, Geolocation, Measurement.
Keywords	engineering and technology, environmental engineering, natural resource management
Activity Status	Ongoing
Start Date	2016
End Date	Not applicable
Duration	Not applicable
Geographic Extent	Local
Project Country/Countries	The Netherlands
Project Locality	Locally -Land van Heusden en Altena, in the province of North Holland.
Project Language(s)	Dutch, English
Project Website	http://altena.gripopwater.nl/ and also https://wsrivierenland.maps.arcgis.com/apps/MapSeries/index.html?appid=ecdc63fe87bc431db608377635fa2567

PPSR CCM Metadata	Contact Information
CO Host / Coordinator	Agrarische Natuur Vereniging is the point of contact for residents (farmers and citizens) of Altena for 'grip on water', in collaboration with the Rivierenland water board and the municipality of Altena.
Public Contact	No information
Public Contact Email	Public contact form: http://altena.gripopwater.nl/contact/
PPSR CCM Metadata	**Profile Information**
Image	
PPSR CCM Metadata	**Participation Information**
How to Participate	To participate, get in contact with Grip op Water Alterna.
Project Task	They are constantly looking to strengthen enthusiastic citizens, organizations and companies that want to make Altena more water-resistant. This can be done, for example, by thinking along, passing on observations or organizing activities.
Intended Outcomes	Creating a small community of stakeholders around the topic of pluvial flooding, awareness raising about participatory approaches for reducing the risk of pluvial flooding, and creating a new way of communication and interaction between municipality, water authorities and citizens.
Project Equipment	Not applicable. Visual observations
App Links	The online web platform: https://wsrivierenland.maps.arcgis.com/apps/MapSeries/index.html?appid=ecdc63fe87bc431db608377635fa2567as a mobile application. Citizens and authorities can share information about the weather and water system through interactive maps. Stakeholders can share their knowledge on the implementation of measures and inspire others to generate water storage areas.
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions': 1.Sensors and transmission	Physical sensor and social sensor (citizen contribution through the platform).
2. Stakeholders	Agrarische Natuurvereniging Altena, Altenatuur, HydroLogic Research, Municipality of Altena, Waterboard Rivierenland
3. Area of application	Physical environment

4. Purpose of citizen observatory	Protect the environment and also the inhabitants.
5. System integration	Stand alone (information provided by citizens) an Integrated (with water board)
6. Measurement	Objective and subjective
7. Implementation	Co-created
8. Communications paradigm	Interactive. Two-way communication between the local authorities and the larger community of residence in Altena It provided support for participation and interaction of stakeholders.
9. Citizen participation in governance processes	Explicit data provision (direct & intentional data provision) Communicative influence (the level of influence of different stakeholders (especially citizens) in decision and policy making processes has slightly changed. It provides new opportunities for raising awareness, expressing concerns and sharing information among stakeholders.
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Type of assessment of ecosystem: Adaptive management (i.e., managing based on monitoring); The ecosystem composition that is being monitored: Not applicable
Model of CO *(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process
Type of CO ('*Wiggins & Crowston's 5 Types'*)	Action - Action-oriented citizen science projects encourage participant intervention in local concerns, using scientific research as a tool to support civic agendas. They are most commonly grassroots or "bottom-up", are not conceived or planned by scientists, and usually involve long-term engagement in local environmental concerns.
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	Water, streams, snow, sea; Disaster Monitoring
Level of Geography *('Haklay's 3 Policy Dimensions')*	Local community; City level
Policy Application Area *('Haklay's 3 Policy Dimensions')*	environmental monitoring and environmental decision making; urban planning and cities
Level of Engagement *('Haklay's 3 Policy Dimensions')*	Participatory Sensing - gives the participant more roles and control over the process. While many environmental and ecological observations follow data collection protocols that were designed by scientists, in participatory sensing the process is more distributed and emphasizes the active involvement of the participants in setting what will be collected and analyzed.

RitmeNatura Citizen Observatory

PPSR CCM Metadata	Project Information
CO Name	RitmeNatura
CO Aim	The Observatory is the place where phenological data, in particular that collected by citizens, is stored and make it accessible in real time, with the aim of influencing decision making.
Project Science Topic	Biodiversity / Climate & Weather / Ecology & Environment / Long-term species monitoring / Nature & outdoors / Natural resource management / Social sciences
Participation Task	Data analysis, Data entry, Geolocation, Identification, Measurement, Observation, Sample analysis, Classification or tagging,
Keywords	engineering and technology, environmental engineering, natural resource management
Activity Status	Ongoing
Start Date	2017
End Date	Not applicable
Duration	Not applicable
Geographic Extent	Regional
Project Country/Countries	Spain
Project Locality	Specific areas that you would like to observe carefully along the year
Project Language(s)	Catalan, Spanish, English
Project Website	http://ritmenatura.cat/
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	CREAF, Servei Meteorològic de Catalunya
Public Contact	No information
Public Contact Email	info@ritmenatura.cat
PPSR CCM Metadata	**Profile Information**

Image	
PPSR CCM Metadata	**Participation Information**
How to Participate	If people want to participate, and are interested in watching nature, they just have to choose one plant or a specific area that they would like to observe carefully along the year. They will have to take notes of the dates that the specimen(s)s are changing: migration of birds, flowering of plants, ripening of fruit, hibernations, fall of leaves, and register it into the RitmeNatura.cat portal.
Project Task	RitmeNatura.cat is looking for Nature-lover citizens that are willing to learn how to collect phenological information and help scientists in studying the impact of climate changes on plants and animals.
Intended Outcomes	RitmeNatura generates synergies that lead to new collaboration agreements between different actors.
Project Equipment	A device (mobile phone) to upload phenological observations in iNaturalist
App Links	iNaturalist, a citizen science platform to record biodiversity data. Join the RitmeNatura project within iNaturalist.
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions': 1.Sensors and transmission	Social sensor
2. Stakeholders	Butterfly and bird enthusiasts, nature associations, other existing Citizen Observatories (e.g. Natusfera), NGOs, CREAF, Meteorological Service of Catalonia' (Meteocat),Catalan Office of Climate Change, Department of Territory, Sustainability and Housing Agency of Catalonia, the Barcelona Provincial Council (Diputacio de Barcelona), the Barcelona Metropolitan Area (AMB).
3. Area of application	Physical environment
4. Purpose of citizen observatory	Strengthen governance (aim of influencing decision making).
5. System integration	Integrated with Natusfera platform and PhenoTandem project
6. Measurement	Subjective (phenological observations)
7. Implementation	Co-created
8. Communications paradigm	Interactive (acting as an umbrella organisation for information and organizations on phenology and attracting more media attention to the climate change topic, providing valuable information)
9. Citizen participation in governance processes	Explicit data collection (direct & intentional data provision) Communicative influence (raised awareness of climate change among

	community of biodiversity & phenology enthusiasts, researchers, and the general public)
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities'	Type of assessment of ecosystem: Status assessment (phenology monitoring) The ecosystem composition that is being monitored: Structure(i.e., biodiversity analysis, keystone species, predator–prey relations) and processes (i.e., linking species with environment, nutrient cycling, etc.).
Model of CO *'(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process
Type of CO ('*Wiggins & Crowston's 5 Types'*)	Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope.
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	Species Monitoring; Biodiversity monitoring
Level of Geography *('Haklay's 3 Policy Dimensions')*	Regional level
Policy Application Area *('Haklay's 3 Policy Dimensions')*	environmental monitoring and environmental decision making
Level of Engagement *('Haklay's 3 Policy Dimensions')*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

Vatten Fokus Citizen Observatory

PPSR CCM Metadata	Project Information
CO Name	Vatten Fokus
CO Aim	The focus of the CO is on water quality management in socio-economic systems in the Mälarendalen region. The aim of the citizen observatory is to support all stakeholders to collaborate in the governance and action of the aquatic ecosystems by collecting data, sharing knowledge, making data accessible and complements established governmental initiatives.
Project Science Topic	Ocean, Water, Marine & Terrestrial / Nature & outdoors / Natural resource management / Social sciences
Participation Task	Data analysis, Data entry, Identification, Learning, Measurement,, Sample analysis, Specimen/sample collection
Keywords	engineering and technology, environmental engineering, natural resource management

Activity Status	Ongoing
Start Date	2017
End Date	Not applicable
Duration	Not applicable
Geographic Extent	Regional
Project Country/Countries	Sweden
Project Locality	Mälarendalen Region (includes Stockholm)
Project Language(s)	Swedish, English
Project Website	https://vattenfokus.se/
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	Akvo.org
Public Contact	https://vattenfokus.se/om-vattenfokus/kontakt/
Public Contact Email	No information
PPSR CCM Metadata	**Profile Information**
Image	VattenFokus
PPSR CCM Metadata	**Participation Information**
How to Participate	If people want to get involved in the project supporting the local initiatives to collect information about water quality or want to start a local Vatten Fokus group, they can get in contact *here*.
Project Task	Collect information about water quality (water quality measurements, chemical parameters, ecological parameters, optical parameters, hydrological parameters)
Intended Outcomes	Awareness raising within the community. Plan to apply for funding to create a wetland. Progress towards collaborative stewardship of water resources. Citizens communicating with policy and decision makers, via CO based on the Vatten-Fokus activities, data and results.
Project Equipment	Some testing tools to test the water quality in lakes and watercourses. For example, for measuring nitrate and phosphate concentration (mg / l)

	participants use a colorimetric test kit to assess the chemical status of a watercourse or lake. For measuring ecological parameters, the method combines observations of the immediate area with chemical and optical measurements to obtain a better overall picture of water quality and the health of the water ecosystem. For measuring optical parameters, VattenFokus uses a method to determine the depth of visibility, which includes a transparent plastic tube, called a Secchi tube.
App Links	FreshWater Watch app
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions' 1.Sensors and transmission	Physical sensor (testing tools) and social sensor (observations).
2. Stakeholders	Group Dunkern (Grupp Dunkern), The association Föreningen Dunk-ers och Gryts väl, Local residents association, Farmers. Nyköpingsåarnas vattenvårdsförbund, Flens kommun (council), Länsstyrelsen i Södermanland (region)
3. Area of application	Physical environment
4. Purpose of citizen observatory	Protect environment and strengthen governance
5. System integration	Stand-alone
6. Measurement	Objective and subjective
7. Implementation	Co-created
8. Communications paradigm	Interactive (interactions and exchange of information, new learning opportunities about scientific aspects of water quality monitoring and management)
9. Citizen participation in governance processes	Explicit data provision (direct & intentional data provision) Communicative influence. The baseline situation indicated a top-down system in which authorities have a direct influence on decision making processes and citizens have limited or no say. VattenFokus provided an opportunity for citizens to test the water quality and communicate about this with authorities. Citizens expected that through these tests they can show the authorities that a change in water quality monitoring and management is required
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Type of assessment of ecosystem: Adaptive management (i.e., managing based on monitoring) The ecosystem composition that is being monitored: Processes (i.e., linking species with environment, nutrient cycling, etc.)
Model of CO *(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process

Type of CO (‘*Wiggins & Crowston’s 5 Types’*)	Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope.
Domain of Application *(‘Pallacin-Silva’s 8 Domains of Application’ + 2)*	Water, streams, snow, sea; Biodiversity monitoring
Level of Geography *(‘Haklay’s 3 Policy Dimensions)*	Regional level
Policy Application Area *(‘Haklay’s 3 Policy Dimensions’)*	environmental monitoring and environmental decision making; health and medical research
Level of Engagement *(‘Haklay’s 3 Policy Dimensions’)*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

Maasai Mara Citizen Observatory

PPSR CCM Metadata	Project Information
CO Name	Maasai Mara
CO Aim	The Maasai Mara Citizen Observatory aims to improve the livelihoods of the citizens of the Mara Region and the environment. It sets up a multi-stakeholder platform for generating and sharing of data, information and knowledge to improve policy making and implementation for sustainable livelihoods and biodiversity management in the Mara ecosystem.
Project Science Topic	Biodiversity / Climate & Weather / Ecology & Environment / Long-term species monitoring / Nature & outdoors / Natural resource management / Social sciences
Participation Task	Data analysis, Data entry, Geolocation, Identification, Observation
Keywords	engineering and technology, environmental engineering, natural resource management
Activity Status	Ongoing
Start Date	2017
End Date	Not applicable
Duration	Not applicable

Geographic Extent	Regional
Project Country/Countries	Kenya
Project Locality	Narok County at the south-west Kenya, and includes the Mara Triangle, the Maasai Mara National Reserve, and the conservancies around this reserve.
Project Language(s)	Swahili, English
Project Website	http://mara.info.ke/
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	Maasai Mara University
Public Contact	No information
Public Contact Email	No information
PPSR CCM Metadata	**Profile Information**
Image	Maasai Mara Citizen Observatory
PPSR CCM Metadata	**Participation Information**
How to Participate	People can get in contact through Twitter account.
Project Task	To collect key data from the field ranging from biodiversity sightings, to human wildlife conflict locations to the updating of fences and roads.
Intended Outcomes	Increasing awareness about the concept of community-based monitoring, establishing a community of stakeholders with a shared vision and mission, creating knowledge and awareness about the fact that data gaps exist, and creating an understanding about how this can be tackled using a participatory approach, with inclusion of all stakeholders.
Project Equipment	TAHMO stations for meteorological measurements, low cost sensors for water level measurement (weather stations and water level sensors), and a mobile phone for the Maasai Mara Citizen Observatory.
App Links	Maasai Mara Citizen Observatory (MMCO) App and platform: https://play.google.com/store/apps/details?id=com.mara.upande.groundtruth20&hl=en&gl=US (for sharing the collected information. It incorporates the data collected by a number of in-situ sensors, such as weather stations and water level sensors) Mara Collect App: https://play.google.com/store/apps/details?id=org.mara.collect.android&hl=en

	&gl=US (It allows collecting data about emergencies, incidents, biodiversity, scenery, pollution and natural hazards)
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions' 1.Sensors and transmission	Physical sensor (TAHMO stations) and social sensors
2. Stakeholders	Organized community groups such as WRUAs and conservancies, NGOs (e.g. WWF), the African Conservation Centre, Friends of Maasai Mara, Maasai Mara Wildlife Conservancies Association (MMWCA), Kenya Meteorological Department, Na-tional Museums of Kenya, Egerton Univer-sity, Maasai Mara University, The Parliament of Kenya, Kenya Wildlife Service (KWS), Kenya Forest Service (KFS), Kenya Water Resources Authority (WRA), Kenya Water Tower Agency (KWTA), Kenya Ministry of Defence, the Narok County Government.
3. Area of application	Physical environment
4. Purpose of citizen observatory	Strengthen governance (to constitute a multi-stakeholder platform for generating and sharing of data, information and knowledge to improve policy making and implementation for sustainable livelihoods and biodi-versity management in the Mara ecosystem.)
5. System integration	Stand-alone
6. Measurement	Objective and subjective
7. Implementation	Co-design
8. Communications paradigm	Interactive (MMCO Apps and the MMCO WhatsApp group)
9. Citizen participation in governance processes	Explicit data provision (direct & intentional data provision) Between individual education and Communicative influence (The baseline situation indicated a closed system in terms of public participation; a system in which authorities have a direct influence on decision making processes and citizens have limited or no say. Changes were expected in the level of influence of different stakeholders (especially citizens) in decision and policy making processes. The impact assessment indicates a slight change in this regard, with MMCO providing new possibilities for online and offline interactions and communications, awareness raising and data sharing among stakeholders.
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities'	Type of assessment of ecosystem: Adaptive management (i.e., managing based on monitoring) The ecosystem composition that is being monitored: Ecosystem composition (i.e., indicator species or species at risk)
Model of CO *'(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process

Type of CO (‘*Wiggins & Crowston’s 5 Types’*)	Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; engage citizens as a matter of practicality and outreach, and they tend to be regional in scope.
Domain of Application *(‘Pallacin-Silva’s 8 Domains of Application’ + 2)*	Species Monitoring; Biodiversity monitoring
Level of Geography *(‘Haklay’s 3 Policy Dimensions’)*	Regional level
Policy Application Area *(‘Haklay’s 3 Policy Dimensions’)*	environmental monitoring and environmental decision making
Level of Engagement *(‘Haklay’s 3 Policy Dimensions’)*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

Nitli Luli Citizen Observatory

PPSR CCM Metadata	Project Information
CO Name	Niti Luli
CO Aim	The citizen observatory serves to overcome a lack of accountability, coordination and communication between different governance levels, and especially the lack of involvement of local stakeholders in the planning and implementation of programmes. Niti Luli’s mission is to provide the virtual space for a ‘permanent community meeting’ of local communities, government agencies, NGOs and donors, and to simplify communication and sharing of information to make natural resource management responsive to community needs.
Project Science Topic	Natural resource management / Social sciences
Participation Task	Identification, Problem solving
Keywords	engineering and technology, environmental engineering, natural resource management
Activity Status	Ongoing
Start Date	2017
End Date	Not applicable
Duration	Not applicable

Geographic Extent	Local and national level
Project Country/Countries	Zambia
Project Locality	At the local level, it serves to simplify access to information, increase influence of communities in decisions, and reduce bottlenecks in processes created by distances and lack of resources. At the national level, it serves to aggregate information from multiple community groups.
Project Language(s)	Local language, English
Project Website	No information
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	No information
Public Contact	No information
Public Contact Email	No information
PPSR CCM Metadata	**Profile Information**
Image	Niti Luli Sesheke West & Mufulani CBNRM Observatory
PPSR CCM Metadata	**Participation Information**
How to Participate	No information
Project Task	Collection of data collating monitoring information
Intended Outcomes	Increase communication between communities and authorities, communities better informed and more supportive of conservation, more collaboration between departments, increase responsiveness of authorities to community concerns.
Project Equipment	TAHMO weather stations
App Links	Zambia Collect app: https://apkpure.com/niti-luli-citizen-observatory/com.niti_luli.upande.groundtruth20

WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions': 1.Sensors and transmission	Physical (TAHMO stations) and Social sensor
2. Stakeholders	Village Action Groups (elected) and simi-lar village committees; National/Regional CRB Associations; Conservation CSOs and NGOs (WWF, CBNRM Forum, Environmental Hub, The Nature Conservancy) International Crane Foundation, Zambia Climate Change Net-work, OSM Chapter Zambia), Scientific units within government depart-ments (Wildlife, fisheries, forestry); National CRB Association (through the ob-servatory), Community Resource Boards and similar committees, District Administration Sesheke, Local Council Sesheke, National Assembly Representative
3. Area of application	Human behaviour
4. Purpose of citizen observatory	Protect environment and strengthen governance
5. System integration	Integrated, supporting the work of existing Village Action Groups (VAG) and Community Resource Boards (CRB), a structure mandated under the Wildlife Law to realize a community-based natural resource management (CBNRM) approach.
6. Measurement	Objective and Subjective
7. Implementation	Co-creation
8. Communications paradigm	Interactive. In institutional terms, the platform connects communities more directly to authorities and peers at higher levels. On the citizen side, aggregating information from local CRBs is expected to allow the regional and national associations to support advocacy with evidence. On the authorities' side, the platform creates more transparency on a number of issues critical to the success of environmental stewardship.
9. Citizen participation in governance processes	Explicit data provision (direct & intentional data provision) Individual education
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Type of assessment of ecosystem: Adaptive management (i.e., managing based on monitoring); The ecosystem composition that is being monitored: Not applicable.
Model of CO *(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process
Type of CO ('*Wiggins & Crowston's 5 Types'*)	Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope.
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	Community-based Monitoring

Level of Geography *('Haklay's 3 Policy Dimensions')*	Local community; Regional level
Policy Application Area *('Haklay's 3 Policy Dimensions')*	environmental monitoring and environmental decision making
Level of Engagement *('Haklay's 3 Policy Dimensions')*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

Appendix 5: The GROW Observatory

The Grow Observatory Project

PPSR CCM Metadata	Database Information
Origin UID	Grant agreement ID: 690199
Origin Database	https://cordis.europa.eu/project/id/690199
PPSR CCM Metadata	**Project Information**
Project Name	GROW Observatory
Project Aim	The GROW Observatory (GROW) creates a sustainable citizen platform and community to generate, share and utilise information on land, soil and water resources at a resolution hitherto not previously considered. The vision was to underpin participatory and sustainable custodianship of land and soil, whilst meeting the demands of food production, and to answer a long-standing challenge for space science, namely the validation of soil moisture detection from satellites for improved climate modelling.
Activity Status	Completed
Start Date	01/11/2016
End Date	31/10/2019
Duration	36 months
Project Website	https://growobservatory.org/
Funding Program	European Union's Horizon 2020 research and innovation programme under grant agreement No.690199
Funding Source	European Union
PPSR CCM Metadata	**Contact Information**
Project Host / Coordinator	University of Dundee
Public Contact	No information
Public Contact Email	hello@growobservatory.org
Project Website	*https://www.dundee.ac.uk/*
PPSR CCM Metadata	**Profile Information**

Image	
PPSR CCM Metadata	**Project Documentation**
Link to Project Deliverables	*https://growobservatory.org/outputs/*
Link to Project Publications	*https://growobservatory.org/outputs/*

GROW Observatory consists of 24 soil sensing communities (GROW Places) across 13 European countries. GROW Places have a common goal to measure soil moisture, temperature, light level and battery level. Although there is a lot of diversity in GROW Places such as geographical location, specific community objectives and outcomes, profile of the Community Champion, organisation and sensor holders, number of sensors installed in each place, number of gatherings and events organised, entrepreneurship and innovation level, GROW Places are not defined as separate Observatories. Thus we decide to gather all the information in an unique CO template.

GROW Places

PPSR CCM Metadata	Project Information
CO Name	There were 24 soil sensing communities (GROW Places) in the following places: Austria, Canary Island, Croatia, England, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Poland, Scotland, Slovenia, Wales.
CO Aim	The aim of GROW Places was to support the validation of Sentinel-1 satellite products for soil moisture through the emergence of a movement of citizens generating, sharing and using information on growing and the land. GROW Places enable citizens to measure land and soil parameters at high spatial resolution over large geographical areas, generating a unique soil and land data repository for science while supporting growers to learn about and test new practices, guiding their knowledge to foster the integration of regenerative techniques into their existing land and soil management routines. Specific objectives per GROW Place: Austria: There are two GROW Places (Lebensgut Miteinander and Hendlbergof) and four Community Champions in Austria. Through farm demonstrations, seminars and community development, the aim is to provide an example of a regenerative lifestyle that can be replicated and attainable for all and to better understand and improve the soil and further develop the growing practices. Canary Island: The aim of the CO is to build a community which can have a real impact on what's happening in El Hierro in terms of climate change and

	agriculture as well as to build community knowledge and translate the learnings to day by day agricultural practices. Croatia: There are two GROW Places communities in Croatia: the coastal (Dalmatia) and central Croatia (Varoška lug) regions. The aim is to provide much needed support for agriculture on Croatia's coast and islands by bringing tech, data, marketing and sustainable tourism practices. In a nutshell, to bring opportunities and raise awareness to growers in Croatia about opportunities through GROW observatory. England: GROW Place England is Bradford and it's aim is to document, connect and promote local food and growing activity, on- and off-line, in and around Bradford. There are GROW's sensor users in Northamptonshire too. Greece: GROW Place Alexandroupoli aims to increase the region's adaptive capacity through better understanding of temperature thresholds, soil moisture, growing degree days, drought for the varieties grown and the adoption of new cultivation techniques and strategies. Ireland: GROW Place Ireland NW is based in Donegal, in the north west of Ireland and GROW Place Ireland SE is based across several counties including Carlow, Kilkenny, Waterford, Tipperary, Laois and Wexford The aim is to facilitate food growing while empowering local people, of all ages, backgrounds and abilities, to strengthen their communities. Italy: The main aim is to transfer research to the farmers' community with accessible technology. In that way, farmers will be able to better control their irrigation with better timing and quantity for individual crop needs. Portugal: There are two GROW Places in Portugal (in the Herdade da Ribeira and Vale da Lama). The aim is to conduct research deploying more than 1000 sensors and generate and share data in different sites in Portugal. Poland: The Polish GROW Place is in the southwest of Poland, close to Studety mountains. The aim is to develop a silvopasture-based demonstration and educational farm with a strong emphasis on outreach and research. Slovenia: The Grow Place AIS Ljubljana aims to improve the use of agricultural natural resources, which is why micro-location data on the water regime are very useful. Wales: To match the data on crop production to accurate soil data and assess the impact of some of the different cropping strategies on the soil.
Project Science Topic	Climate & Weather / Ecology & Environment / Education / Food science Nature & outdoors / Natural resource management / Social sciences
Participation Task	Data analysis, Geolocation, Measurement, Observation
Keywords	social sciences, economics and business, economics, sustainable economy, agricultural sciences, agriculture, forestry, and fisheries, agriculture, sustainable agriculture
Activity Status	Ongoing. Some GROW Places are still sensing and gathering data, for example in El Hierro (Canary Islands) and Italy. Others, there are undertaking other ways of gathering data and building community. Many are still very active.

Start Date	It depends on GROW Place: 2017-2019
End Date	No applicable
Duration	No applicable
Geographic Extent	Local, city, regional, national, global (across Europe)
Project Country/Countries	Austria, Canary Island, Croatia, England, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Poland, Scotland, Slovenia, Wales.
Project Locality	Austria: Local communities in the Austrian Alps and in the Wienerwald. Canary Island: Local community in El Hierro Croatia: In the coastal (Dalmatia) and central Croatia (Varoška lug) regions. England: Bradford, a city in West Yorkshire built at the junction of three valleys in the eastern moorland region of the South Pennines. Greece: Alexandroupoli city, the capital of the Evros regional unit. Italy: Puglia region, the Sud Fortore district, located in Southern Italy, bordering the Apennines on the west and Gargano Promontory on the east side. Luxembourg: It covers the whole of the Grand-Duchy of Luxembourg. Netherlands: It is the city area of 's-Hertogenbosch in the South Netherlands. Portugal: The Herdade da Ribeira, near Grandola in Alentejo and at the regenerative project of the Vale da Lama, near Lagos in the Algarve, including the inspiring Quinta do Vale da Lama. Poland: In the southwest of Poland, close to Sudety mountains. Scotland: predominantly in Tayside and the Central belt of Scotland. Slovenia: City Ljubljana Wales: North West Wales, Snowdonia
Project Language(s)	Austria: German, English Canary Island: Spanish, English Croatia: Croatian, English England: English Scotland: Scottish, English Wales: Walesh, English Ireland: Irish, English Greece: Greek, English Italy: Italian, English Luxembourg: Luxembourgish, English Netherland: Dutch, English Portugal: Portugues, English Poland: Polish, English Slovenia: Slovenian, English
Project Website	Austria*:* *https://knowledge.growobservatory.org/index.html@p=966.html* *https://medium.com/grow-observatory-blog/introducing-grow-place-austria-e96fa9177eae* Canary *Island:*

	https://medium.com/grow-observatory-blog/grow-place-canary-islands-where-water-soil-and-climate-converge-in-the-atlantic-31ee439ebe9a Croatia: https://medium.com/grow-observatory-blog/grow-place-croatia-cosmolocal-community-building-b2ef1ad873d2 England: https://medium.com/grow-observatory-blog/grow-place-england-sensors-and-students-in-northamptonshire-96a329764cc7 Greece: No information Ireland: https://medium.com/grow-observatory-blog/grow-place-ireland-citizen-sensing-in-community-gardens-ce546eae9a51 Italy: https://medium.com/grow-observatory-blog/grow-place-italy-water-science-on-the-land-3ed0eb14e6e9 Luxembourg: https://medium.com/grow-observatory-blog/grow-place-luxembourg-transition-permaculture-and-soil-12d2ff55c13e Netherlands: No information Portugal: https://medium.com/grow-observatory-blog/even-the-soil-microbes-dance-in-portugal-8e858f9eac88 Poland: https://medium.com/grow-observatory-blog/grow-place-poland-deep-roots-at-the-foot-of-the-sudety-mountains-4dff20be4d74 Scotland: No information Slovenia: https://medium.com/grow-observatory-blog/grow-place-slovenia-sensors-deployed-4aad2b005324 Wales: https://medium.com/grow-observatory-blog/grow-place-wales-community-and-resilience-in-challenging-times-619654436efc
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	Austria: Lebensgut Miteinander & Hendlberghof and the Community of small scale growers. Tatjana Tupy and Magdalena Resch are leading Lebensgut Miteinander GROW Place, and Volkmar Geiblinger, Nicole Geiblinger are leading Hendlbergof. Canary Island: Michal Mos Croatia:Tanja Polegubic is leading the Coastal Croatia GROW Place and James Wardell, the community champion in central Croatia. England: Vicente Ramirez Garcia, GROW Place Community Champion from Bradford and Samuel Yisrael is one of GROW's sensor users from Northamptonshire. Greece: No information Ireland: Joanne Butler, from the Community-led Social Enterprise and Dee Sewell are the GROW Community Champions in Ireland. Italy: Chiara Corbari is leading our new GROW place in Italy. Luxembourg: The Community Champions, Tania Walish and Karine Paris Netherlands: No information Portugal: At Herdade da Ribeira Abaixo, near Grandola in Alentejo, is led by a research station, ce3c-Fcul (https://ciencias.ulisboa.pt/en/ce3c-centre-ecology-evolution-and-environmental-changes). Gil Penha-Lopes is the Community Champion from the Faculty of Sciences at the University of Lisbon. Poland: Noemi Nemes and her team from Deep Roots, an ecological farm, are leading the GROW Place in Poland. Scotland: Wendy McCombes leads the GROW Place Scotland and runs

	growing and cooking projects of Forward Coupar Angus, including the community gardens. Slovenia: Ana Cebin and Borut Vrscaj lead the GROW place in Slovenia through the Agricultural Institute of Slovenia (AIS), a public non-profit research institution and are part of the Department of Agricultural Ecology and Natural Resources (DAENR), Wales: Alice Grey from Tyddyn Teg is leading the GROW Place in Wales.
Public Contact	No information
Public Contact Email	If people are interested in participating they can get in contact through hello@growobservatory.org.
PPSR CCM Metadata	**Participation Information**
How to Participate	GROW Place Austria: If you live in or near Vienna and you are interested in contributing data from your soil, please fill in the *contact form* or join them on *facebook*.
Project Task	Deploy sensors on different soil types with different land uses, in irrigated and non-irrigated areas and collect data.
Intended Outcomes	Specific outcomes per GROW Places: Canary Island: To create a project on soil quality in relation to moisture and build a moisture map of the island. Croatia: To bring together a wider community across Dalmatia and build the potential of combining new tools and methods, building on the resources already available in Croatia. England: To provide future planning through the data gathered and use nationally sensor users' data to adapt to the changing climate. Ireland: To increase people's knowledge of soil, using affordable sensors, and collect data that can help validate climate prediction models from satellites. Italy: To better control the irrigation water needs with a better timing and quantity over different water demanding crops, in combination with other applications of irrigation water needs forecast. Also, to increase the robustness of the numerical hydrological modelling which Chiara and her team have been using for research in validating soil moisture information over large areas. Netherlands: To create new opportunities for sustainable economic growth and social welfare and build better connections between farmers and consumers and people who love the countryside. Portugal: To safeguard rural diversification, invest in the future, creating new employment possibilities in the GROW Places. Poland: To know their soil better and to get connected to many more soil and regeneration enthusiasts around Europe to are aware of the importance of the soil and are dedicated to environmental issues Slovenia: To obtain topsoil moisture measurement data that can be linked to other information in various research activities that DAENR is currently working on.

Project Equipment	Physical sensors, nutrient testing kits and mobile app
App Links	*Soil Sensor Locations* *Dynamic Soil Moisture Maps* GROW Observatory mobile app *(android and ios)* *The Code of Soil app* *Plan My Water information service app*
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions' 1.Sensors and transmission	Physical sensor (soil sensors) and social sensor.
2. Stakeholders	citizens, scientists, universities, education and research institutions, policymakers, government agencies and others collaborating on research for environmental monitoring. small to large sized commercial growers, private enterprises, NGOs.
3. Area of application	Physical environment
4. Purpose of citizen observatory	Protect the environment (using crowdsourced ground observations from low-cost sensors to validate soil moisture information from Sentinel-1 satellite, and improving climate services related to extreme events such as floods, drought, and wildfires) and strengthen governance (be active part in policies).
5. System integration	Integrated and stand alone
6. Measurement	Objective (sensor measurements) and subjective (observations)
7. Implementation	"Top-down" validation of remotely sensed soil moisture using in situ measurements and "bottom up" actions in which participants are increasingly involved to be an active part in policies and GROW place support a movement of citizens and communities generating, sharing and using data and information on soil health. Detailed info here.
8. Communications paradigm	Uni-directional (social media, data collection) and interactive (MOOC, Community Champions participation)
9. Citizen participation in governance processes	Explicit data provision (direct and intentional data provision) Communicative influence
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Status assessment (sending the data to the observatory, compare the data and monitor the level of soil moisture) Adaptive management (from data to action)
Model of CO *(Shirk's 5 Project Models)*	Co-Created projects - which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process (at local level)

Type of CO (‘*Wiggins & Crowston’s 5 Types’*)	Action - Action-oriented citizen science projects encourage participant intervention in local concerns, using scientific research as a tool to support civic agendas. They are most commonly grassroots or “bottom-up”, are not conceived or planned by scientists, and usually involve long-term engagement in local environmental concerns. (Climate action) Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope. (Forestry space and, protected areas) Virtual - Science-oriented Virtual projects are ICT-mediated with no physical elements whatsoever, they are formed through top-down organizing by academics, and most projects’ affiliations are exclusively academic. (MOOC, webinars, Community Champions) Education - Education projects make education and outreach their primary goals, with relevant aspects of place. They can be split into those focusing on informal versus formal learning opportunities, and are sometimes explicitly designed to permit cumulative learning experiences. (through MOOC, knowledge base)
Domain of Application	Land-use Monitoring
Level of Geography *(‘Haklay’s 3 Policy Dimensions’)*	Local community; City level; Regional level; State/Country; Continental
Policy Application Area *(‘Haklay’s 3 Policy Dimensions’)*	environmental monitoring and environmental decision making; agriculture and food; science awareness, and support of scientific efforts
Level of Engagement *(‘Haklay’s 3 Policy Dimensions’)*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna Civic / Community science - also known as bottom-up science, is initiated and driven by a group of participants who identify a problem that is a concern for them and address it using scientific methods and tools. Within this type of activity, the problem formation, data collection, and analysis are often carried out by community members or in collaboration with scientists or established laboratories.”

Appendix 6: LandSense

The LandSense Project

PPSR CCM Metadata	**Database Information**
Origin UID	Grant agreement ID: 689812
Origin Database	https://cordis.europa.eu/project/id/689812
PPSR CCM Metadata	**Project Information**

Project Name	LandSense
Project Aim	The LandSense Citizen Observatory aims to aggregate innovative EO technologies, mobile devices, community-based environmental monitoring, data collection, interpretation and information delivery systems to empower communities to monitor and report on their environment. A number of key characteristics fundamental to the LandSense Citizen Observatory include:Bidirectional information flows between different communities (i.e. citizens, scientists, policymakers, industries, SMEs, NGOs, etc.); Involve new citizen functions in accumulating and using information; Support multi-scalar government from the EU level downwards; Complement EO (i.e. remotely sensed) data and state-organized data collection Give communities access to easily-understandable information needed for decision-making.
Activity Status	Active
Start Date	01/09/2016
End Date	31/12/2020
Duration	52 months
Project Website	https://landsense.eu/
Funding Program	H2020
Funding Source	European Commission
PPSR CCM Metadata	**Contact Information**
Project Host / Coordinator	International Institute of Applied Systems Analysis
Public Contact	No information
Public Contact Email	No information
PPSR CCM Metadata	**Profile Information**
Image	LandSense A Citizen Observatory and Innovation Marketplace for Land Use and Land Cover Monitoring

Image Credit	No information
PPSR CCM Metadata	**Project Documentation**
Link to Project Deliverables	*https://landsense.eu/Project/Deliverables*
Link to Project Publications	*https://zenodo.org/communities/landsense/?page=1&size=20*

The Mijn Park Citizen Observatory

PPSR CCM Metadata	**Project Information**
CO Name	*Mijn Park*
CO Aim	*A key component of the project is the LandSense Engagement Platform. Various communities will be able to actively participate within the LandSense engagement platform through a variety of interactive tools and functions to facilitate information transfer, assessment, valuation, uptake and exploitation of environmental data and results. This interaction is achieved by bringing together and extending various key pieces of technology including: Geo-Wiki, LACO-Wiki, Geopedia, Sentinel Hub and the EODC. The platform will offer collaborative mapping functionalities to allow citizens to view, analyze and share data collected from different campaigns and create their own maps, individually and collaboratively. In addition, citizens can participate in ongoing LandSense demonstration cases using their own devices (e.g. mobile phones and tablets), through interactive reporting and gaming applications, as well as launching their own campaigns*
Project Science Topic	*Urban Landscape Dynamics, agricultural land use, forest & habitat monitoring.*
Participation Task	Data entry, Observation. Landsense campaigns - how to take part as an active citizen scientist and datasets
Keywords	*social sciences, economics and business, sociology, governance, public services, natural sciences, earth and related environmental sciences, soil science, land-based treatment*
Activity Status	*Active*
Start Date	*01/09/2016*
End Date	*31/12/2020*
Duration	*52 months*
Geographic Extent	*Global, National, City.*

Project Country/Countries	*Austria, France, Germany, Spain, Netherlands and Serbia.*
Project Locality	*Please describe the locality of the project, in terms of where main participant activities take place, for example your backyard, fresh water, online...*
Project Language(s)	*German, French, Spanish, Dutch, Serbian*
Project Website	*https://landsense.eu/*
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	*International Institute of Applied Systems Analysis*
Public Contact	*Person that interested public or researchers should contact*
Public Contact Email	*Public contact email address*
Project Website	*https://iiasa.ac.at/*
PPSR CCM Metadata	**Profile Information**
Image	
Image Credit	*A credit for the image, if applicable*
PPSR CCM Metadata	**Participation Information**
How to Participate	*Explore the Citizen Observations through Campaigns. https://landsense.eu/Explore/Campaigns* *Example: Urban landscape dynamics (Amsterdam) - Crowdsourcing perceptions of urban green space quality.*
Project Task	*This campaign collects on-site expressions of satisfaction with features of city parks from volunteers. The volunteers act like kind of 'human sensors' indicating how they feel at certain points in the park.*
Intended Outcomes	*This campaign examines how location-based information on the experience and satisfaction of users can help inform planning and design experts.*
Project Equipment	*A smartphone app dedicated to green spaces.*
Participant Links	*https://play.google.com/store/apps/details?id=com.iiasa.mijnpark*
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions': 1.Sensors and transmission	Social sensor. *The volunteers act like kind of 'human sensors' indicating how they feel at certain points in the park.*
2. Stakeholders	*Researchers from the Vrije Universiteit Amsterdam in collaboration with the City of Amsterdam.* *This campaign is designed for everybody who can use a smartphone and wants*

	to contribute to a greener city, and in the case of the pilot contribute to decisions regarding renovations in the Rembrandtpark. *Members of the Department of Planning and Sustainability of Amsterdam as well as students and residents of Amsterdam are asked to contribute to the campaign and to evaluate the quality of the Rembrandtpark.*
3. Area of application	Physical environment
4. Purpose of citizen observatory	strengthen governance
5. System integration	Stand-alone
6. Measurement	Subjective. *This campaign collects on-site expressions of satisfaction with features of city parks from volunteers. The volunteers act like kind of 'human sensors' indicating how they feel at certain points in the park.*
7. Implementation	Bottom up
8. Communications paradigm	Uni-directional
9. Citizen participation in governance processes	Implicit data provision
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Status assessment
Model of CO *'(the CAISE 3 Models of PPSR)*	*Contributory project*
Type of CO ('*Wiggins & Crowston's 5 Types'*)	*Virtual - Science-oriented Virtual projects are ICT-mediated with no physical elements whatsoever, they are formed through top-down organizing by academics, and most projects' affiliations are exclusively academic.*
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	*Land-use Monitoring;*
Level of Geography *('Haklay's 3 Policy Dimensions)*	*Local community*
Policy Application Area *('Haklay's 3 Policy Dimensions')*	*urban planning and cities*
Level of Engagement *('Haklay's 3 Policy Dimensions')*	*Passive Sensing - relies on participants providing a resource that they own (e.g., their phone or space in their backyard) for automatic sensing. The information that is collected through these sensors is then used by scientists for analysis*

Appendix 7: Scent

The Scent Project

PPSR CCM Metadata	Database Information
Origin UID	Grant agreement ID: 688930
Origin Database	https://cordis.europa.eu/project/id/688930
PPSR CCM Metadata	**Project Information**
Project Name	Scent
Project Aim	Scent engages citizens in environmental monitoring and enables them to become the 'eyes' of the policy makers. In doing so, citizens support the monitoring of land-cover/use changes using their smartphones and tablets. A citizen-led online observation movement captures land-cover use and changes through user-friendly tools and technologies, The Scent Toolbox. This complements existing forms of monitoring such as satellite and remote sensing which are costly and less dynamic. The Scent toolbox is tested in two large scale pilots; the urban case of the Kifisos river in Attica, Greece and the rural case of the Danube Delta in Romania. The impact of the toolbox in the assessment of flood risks and flooding patterns is evaluated.
Activity Status	Completed
Start Date	01/09/2016
End Date	31/08/2019
Duration	36 months
Project Website	https://scent-project.eu/
Funding Program	European Union's Horizon 2020 research and innovation programme under grant agreement No. 688930.
Funding Source	European Union
PPSR CCM Metadata	**Contact Information**
Project Host / Coordinator	Institute of Communication and Computer Systems (ICCS)
Public Contact	Dr. Angelos J. Amditis - Scent Project Coordinator
Public Contact Email	a.amditis@iccs.gr

PPSR CCM Metadata	Profile Information
Image	
PPSR CCM Metadata	**Project Documentation**
Link to Project Deliverables	*https://scent-project.eu/project-deliverables*
Link to Project Publications	*https://scent-project.eu/publications*

Danube Delta Citizen Observatory

PPSR CCM Metadata	Profile Information
CO Name	The Danube Delta
CO Aim	The Danube delta has suffered dramatic changes due to human intervention such as damming, fishing and forestry, disturbing the ecological balance of the wetlands. Monitoring the changing landscape is the first step in protecting the environment and communities. Playing Scent Explore and Scent Measure, the volunteers competed with each other to catch Scent creatures hiding along the river in augmented reality. Simply by taking a photo or video of the creatures with the app, the volunteers collected valuable environmental information about land-use/land cover, river parameters such as water velocity and depth, and soil moisture. The information gathered by the volunteers using the apps was uploaded to the Scent Toolbox, where scientists and researchers can create flood extent maps for the monitoring of the wetland, and the protection of the Danube Delta's environment and inhabitants.
	Using gaming features of the Scent Toolbox, collaborative collection of Land Cover and Land Use images along the Danube Delta routes by boat. In suitable locations, measurement of water levels and water surface velocity through inexpensive tools, including the volunteers' mobile phones. Data fusion of those observations with dron-based imagery in areas that were not accessible by citizens. Activities were repeated several times throughout the year, in order to cover all weather conditions and flooding levels of the wetland.
Project Science Topic	Natural resource management / Ecology and Environment / Biodiversity Nature & outdoors /Ocean, Water, Marine & Terrestrial
Participation Task	Measurement , Observation, data entry

Keywords	social sciences, sociology,governance, crisis management, flood risk management, natural sciences, computer and information sciences, artificial intelligence, machine learning
Activity Status	Completed
Start Date	08/2018 - campaigns
End Date	05-06/2019 - campaigns
Duration	11 months campaigns
Geographic Extent	Regional
Project Country/Countries	Romania
Project Locality	River basin and delta
Project Language(s)	Romanian, English
Project Website	https://scent-project.eu/the-danube-delta-romania#top
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	Danube Delta National Institute Romanian Ornithological Society
Public Contact	Prof Iulian Nichersu, DDNI, iulian.nichersu@ddni.ro
Public Contact Email	hello@scent-project.eu | getinvolved@scent-project.eu
PPSR CCM Metadata	**Profile Information**
Image	No information
PPSR CCM Metadata	**Participation Information**
How to Participate	The Danube Delta project campaigns are finished but people can get involved in the project through social media (Twitter, Facebook, LinkedIn, YouTube, Instagram).
Project Task	Using the Scent Explore and Scent Measure apps, 193 volunteers from the local community collected more than 18,979 pieces of data including land-cover/land use images; river measurements such as water level and surface flow velocity; and soil measurements such as soil moisture and air temperature.
Intended Outcomes	To monitor the changing landscape of the Danube Delta in Romania and

	protect the environment and communities.
Project Equipment	Mobile application (apps) - Scent Explore and Scent Measure apps Scent Collaborate as well as sensors mounted on drones Environmental sensors that support the collection of the data needed for the flood models such as in-situ sensors that are available in the areas of interest, portable sensors that the volunteers use to collect additional measurements as well as sensors mounted on drones flying over the areas of interest.
App Links	*https://scent-project.eu/the-danube-delta-romania*
WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions': 1.Sensors and transmission	Physical sensor
2. Stakeholders	Flood agents of local volunteer emergency services under the Local Council, the field agents of Tulcea Water Directorate (SGA) and Danube Delta Biosphere Reserve (DDBRA), Local Committee for Emergency Situations, Sensor Platform and Remote Sensing (SPRS) experts, Modellers (MOD), Civil Protection/Operational, National Administration of Land melioration - Territorial Branch, Tulcea Prefecture Institution, Meteorological Centre Constanta, Danube Delta National Institute (DDNI), Operational Centre Emergency, Inspectorate Situation Danube Delta (ISU), National Institute of Hydrology and Water Management (INHGA).
3. Area of application	Physical environment - land cover/land use, water, soil
4. Purpose of citizen observatory	Protect environment, communities and strengthen governance
5. System integration	Integrated with Kifisos River Basin
6. Measurement	Objective - river measurements such as water level and surface flow velocity; soil measurements such as soil moisture and air temperature
7. Implementation	Top-down
8. Communications paradigm	Interactive
9. Citizen participation in governance processes	Explicit data provision
Types of Monitoring Activities	Assessments of ecosystems: adaptive assessment; Aspects of the ecosystems monitored: ecosystem composition
Model of CO *'(Shirk's 5 Project Models)*	Collaborative projects - which are generally designed by scientists and for which members of the public contribute data but also help to refine project design, analyze data, and/or disseminate findings;
Type of CO ('*Wiggins & Crowston's 5*	Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope

Types)	
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	Land-use Monitoring; biodiversity monitoring; Water streams; air-spectrum monitoring; Disaster Monitoring
Level of Geography *('Haklay's 3 Policy Dimensions')*	Regional level
Policy Application Area *('Haklay's 3 Policy Dimensions')*	environmental monitoring and environmental decision making
Level of Engagement *('Haklay's 3 Policy Dimensions')*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

Kifisos River Basin Citizen Observatory

PPSR CCM Metadata	Profile Information
CO Name	Kifisos River Basin
CO Aim	The land-cover of the Kifisos River has transitioned from rural to urban, and industrial in some areas. The hydrologic network of the basin has been heavily engineered to support expanding constructions. But, in many cases, the hydraulic works were poorly designed. There are many areas where there are illegal constructions, even within the main river course. As a result, during periods of heavy and rapid rain events, the river floods due to the insufficiency of drainage networks, causing severe damage to infrastructure around the river. Therefore the main aim is to get important information about river parameters, such as water level and surface flow velocity, images of land-cover/land-use, and measurements of soil moisture and air temperature. All the data gathered would help hydrologists and policymakers better understand river dynamics and create flood maps for the management and prevention of flooding.
Project Science Topic	Natural resource management I Ocean, Water, Marine & Terrestrial I Nature & outdoors I Ecology & Environment
Participation Task	Measurement, Observation, Photography, data entry
Keywords	social sciences, sociology,governance, crisis management, flood risk management, natural sciences, computer and information sciences, artificial intelligence, machine learning
Activity Status	Completed
Start Date	2018 - Campaigns
End Date	2019 - Campaigns

Duration	10 months - campaigns
Geographic Extent	Regional
Project Country/Countries	Greece
Project Locality	River basin
Project Language(s)	Greek, English
Project Website	https://scent-project.eu/kifisos-river-basin-attica-greece
PPSR CCM Metadata	**Contact Information**
CO Host / Coordinator	ICCS
Public Contact	No information
Public Contact Email	No information
PPSR CCM Metadata	**Profile Information**
Image	No information
PPSR CCM Metadata	**Participation Information**
How to Participate	Kifisos River Basin project campaigns are finished but people can get involved in the project through social media (Twitter, Facebook, LinkedIn, YouTube, Instagram)
Project Task	Using the Scent Explore and Scent Measure apps, 511 volunteers from the local community collected more than 5,225 pieces of important information about river parameters, such as water level and surface flow velocity, images of land-cover/land-use, and measurements of soil moisture and air temperature
Intended Outcomes	Get information about river parameters, such as water level and surface flow velocity, images of land-cover/land-use, and measurements of soil moisture and air temperature. to help hydrologists and policymakers better understand river dynamics and create flood maps for the management and prevention of flooding
Project Equipment	Mobile application (apps) - Scent Explore and Scent Measure apps Scent Toolbox, Scent Collaborate Environmental sensors that support the collection of the data needed for the flood models such as in-situ sensors that are available in the areas of interest, portable sensors that the volunteers use to collect additional measurements as well as sensors mounted on drones flying over the areas of interest.
Participant Links	https://scent-project.eu/kifisos-river-basin-attica-greece

WeObserve - Project Information from the Descriptive Frameworks	
'Wehn's 9 dimensions' 1.Sensors and transmission	Physical l sensors
2. Stakeholders	National Administration of Land melioration - Territorial Branch, the company SCIENTACT, Special Secretariat of Water, Ministry of Environment and Energy, Hellenic Rescue Team of Attica (HRTA), SOR, Attica region citizens, the Municipality of Piraeus, NTUA - School of Civil Engineers, the University of Athens, Geology Department, Hellenic Centre of Marine Research, local councils.
3. Area of application	Physical environment - air, soil moisture, water
4. Purpose of citizen observatory	Protect the environment, and create flood maps for the management and prevention of flooding.
5. System integration	Integrated with Danube Delta Citizen Observatory
6. Measurement	Objective - river measures such as water level and surface flow velocity, and soil measurements such as soil moisture and air temperature
7. Implementation	Top-down
8. Communications paradigm	Interactive
9. Citizen participation in governance processes	Explicit data provision Individual education
Types of Monitoring Activities ('Conrad & Hilchey's 3+3 Types of Monitoring Activities')	Assessments of ecosystems: adaptive assessment; Aspects of the ecosystems monitored: ecosystem composition
Model of CO *(Shirk's 5 Project Models)*	Collaborative projects - which are generally designed by scientists and for which members of the public contribute data but also help to refine project design, analyze data, and/or disseminate findings;
Type of CO ('*Wiggins & Crowston's 5 Types'*)	Conservation - Conservation projects support stewardship and natural resource management goals, primarily in the area of ecology; they engage citizens as a matter of practicality and outreach, and they tend to be regional in scope.
Domain of Application *('Pallacin-Silva's 8 Domains of Application' + 2)*	Land-use Monitoring; biodiversity monitoring; Water streams; air-spectrum monitoring; Disaster Monitoring
Level of Geography	Regional level
Policy Application Area	environmental monitoring and environmental decision making
Level of Engagement *('Haklay's 3 Policy Dimensions')*	Environmental and Ecological Observation - focuses on monitoring environmental pollution or observations of flora and fauna

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