An Ecosystem of Citizen Observatories for Environmental Monitoring

# D3.3 WeObserve Toolkits For Building Champion Communities II

# Document details

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# Disclaimer



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# Revision History

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| 0.2 | 31.01.20 | Dr. Raquel Ajates | Draft outline, glossary and abbreviations. |
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| 0.4 | 18.02.20 | Dr. Raquel Ajates | Work on content and inclusion of tables and images |
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| 1.0 | | | Submitted version |

# Glossary of terms

| Term | Description |
|---|---|
| Tools | Implements that vary in form (paper based, digital and online) and support participation in citizen science and citizen observatory activity. |
| Toolkit | Widely understood as a collection of tools and methods which help facilitate the execution of activities towards a specific purpose. For citizen observatories, toolkits support and improve best practices, encompass a range of methods for collective inquiry, and provide digital and analogue tools which can facilitate a progressive approach in environmental monitoring. |
| Open Access | Open access is a set of principles and a range of practices through which research outputs are distributed online, free of cost or other access barriers. To reduce barriers for uptake it is usual for rights and access to be explicitly defined through open licences. |
| Co-creation | A methodology in which citizens are involved in the whole research process of a citizen science project. In a co-created project citizen scientists are involved in question identification, hypothesis development and/or data interpretation. They may additionally be involved in data collection, data analysis and dissemination of findings (Bonney et al., 2009; Shirk et al. 2012., |
| Co-design | A research and professional solution-based methodology that supports inclusive problem solving. It places the citizen or stakeholder at the centre of a planned process of learning that focuses on the achievement of mutually agreed outcomes (Evans and Terrey, 2016). |
| Communities of Practice | 'Groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.' (Wenger et al., 2002:4). |
| Co-Evaluation | A methodology in which citizens involved in a project are actively involved in the evaluation of project activities, shortcomings and achievements. |
| Cookbook | A term that refers to the WeObserve online resource containing a set of tried and tested "recipes", best practices, and instructions including barriers and strategies for Citizen Observatories. The Cookbook is in development at the time of writing. |

# Abbreviations and acronyms

| Abbreviation | Description |
|---|---|
| CLI | Community Level Indicator |
| CO | Citizen Observatory |
| CoP | Community of Practice |
| CS | Citizen Science |
| GEOSS | Global Earth Observation System of Systems |
| GT2.0 | Ground Truth 2.0 |
| GROW | The GROW Observatory |
| Indicator | A measure for which data are available to quantify outputs or outcomes (also referred to as a metric) |
| LULC | Land Use and Land Cover |
| MOOC | Massive Open Online Course |
| SDGs | Sustainable Development Goals |

# Table of Contents

# Executive Summary

This Deliverable builds on the work presented in Deliverable 3.1 *WeObserve Toolkits for building champion communities I.* D3.1 presented the rationale, method, findings and analysis of a Citizen Observatories toolkit survey. This is the second part of activity in the development to establish toolkits which can be leveraged as part of the WeObserve consortium. The conclusion of this document presents the ongoing preparation of online resources and the release of three toolkits, which leverage the tools created and developed within the consortium. Furthermore, it provides a summary of the tools developed by H2020 COs including:

1) how the process for developing and refining these categories took place
2) how the tools are represented on the website
3) ongoing preparation and future plans for uptake and sustainability, including promotion during the life of the project. and after the end of the project.

The aim is to position the WeObserve Toolkit for Champion Communities as a set of tested and validated tools that are developed, validated and accessible. The toolkit will allow replication and scaling and cover the four tool gaps reported by COs:

Category 1: Co-designing your observatory
Category 2: Training and data capture for environmental monitoring
Category 3: Data quality and visualisation
Category 4: Evaluation and advocacy

D3.3 provides a snapshot of the WeObserve Toolkit to date; ongoing development of this task resides in an online version of the Toolkit on the WeObserve website (https://www.weobserve.eu/knowledge-base/toolkit/) this living platform is where new tools will continue to be released and promoted as soon as they are available. In addition, a revised MOOC will run in Autumn 2020 featuring updated tools.

# 1 Introduction

The rising trend in citizen science (CS) has led to the development of Citizen Observatories (COs) for environmental monitoring. There are a number of definitions of what makes a Citizen Observatory, the main commonalities are the participation of citizens in environmental monitoring and governance, the bi-directional flow of data and information, the enhancement of earth observation systems with citizen-generated observations 'in situ', and the use of modern mobile and web technologies to do so https://www.weobserve.eu/about/citizen-observatories/. COs have been supported by the European Commission in several research and innovation programmes. The WeObserve project aims to improve coordination between existing COs and related regional, European and international activities (WeObserve, 2019). Through various tasks, activities and a series of events the project aims to raise awareness, improve acceptability and ensure sustainability of COs across Europe and globally.

The WeObserve Consortium considers the development of user-centred and validated toolkits as a key method to engage and enable citizens to take part in high quality CO activity and to support the development of new COs. In the CS and CO context, toolkits refer to collection of methods, tools and templates in a variety of multimedia formats which help facilitate the execution of activities towards a specific purpose. The concept of toolkits can be applied in many diverse fields, being very popular in computer science and design (Woods et al 2018) with some publications relevant to COs also found in Public Engagement and Development Studies (Aslin and Brown, 2004). For COs, toolkits support and improve best practices, encompass a range of methods for collective inquiry, and provide digital and analogue tools which can facilitate a progressive approach in environmental monitoring.

The WeObserve consortium is aware of insights from the academic literature advising to replace a growing ''toolkit'' approach to participation, which emphasises selecting the relevant tools for particular jobs, with framing and valuing participation as a process (Reed, 2008). With this in mind WeObserve (WP3) is building on CO approaches to directly address the stimulation and uptake of the citizen observatories knowledge base through the development of toolkits, ensuring they adhere to best practice by making them available as open online resources. In addition, WeObserve has taken up GROW Observatory approaches to achieving scale through the conceptualisation of Massive Open Online Courses (MOOCs) for Citizen Observatories. Therefore, tools and toolkits are also adapted and delivered though the education programme of MOOCs *Citizen Science Projects: How to Make a Difference* (https://www.futurelearn.com/courses/weobserve-the-earth). The MOOC activity is reported in D3.2 and upcoming D3.4, titled *WeObserve distance learning programme I and II.*

To sum up, our approach to toolkits is dynamic, and is implemented across platforms in the development of the Toolkit, MOOCs and forthcoming WeObserve Cookbook by:

- mapping tools to CO participation stages
- offering citizen scientists a variety of ways and resources to discover, test and learn toolkits in the context of a long-term relationship with existing and future CS, COs projects (e.g through MOOCs) and the living WeObserve Toolkit on the WeObserve website: https://www.weobserve.eu/knowledge-base/toolkit/)

- supporting citizens to be able to gain extra insights from data and apply those insights to improve practice and policy.

In its third year of the project, the WeObserve consortium is updating and refining the WeObserve Toolkit as well as exploring solutions to go beyond short-term access to the tools. The strategy being developed involves securing robust structure to enable wide and long-term uptake of tools. This deliverable focuses on reporting progress achieved on Toolkit development work and plans for its sustainability beyond the life of the project.

## 1.1 Background

This deliverable builds on work for Task 3.1 Develop WeObserve toolkits for scaling up citizen engagement in citizen observatories, and continues it. In the previous deliverable D3.1 WeObserve toolkits for building champion communities I, we described, the scoping use of toolkits, research design, development, validation process and results of the survey carried out in year 2 of the project. In summary, UNIVDUN:

- Organised and delivered a internal workshop for scoping use of toolkits
- Research to pre-populate tool description templates
- Creation of Task force, which along with WeObserve CoP 2 Engage presented and provided feedback of Toolkit Survey at the WeObserve Plenary meeting in November 2018.
- Creating a premise for rich data gathering and positioning existing toolkits found in current COs.

The Toolkit Survey included questions on the following topics:

- Specific tools and methods that are used and developed within COs and related CS projects.
- Tool author and main audience for each submission.
- In-depth rich metadata and information aligning with CO steps, intended users and relevant references.

The Survey design and results were shared with the EU.CitizenScience project to inform the development of their online learning platform (EU.CitizenScience, 2019). Below we share a screenshot of a completed submission received as an illustration of the level of detail recorded for each tool. Individual tables for each submission were included in Deliverable 3.1 WeObserve toolkits for building champion communities I.

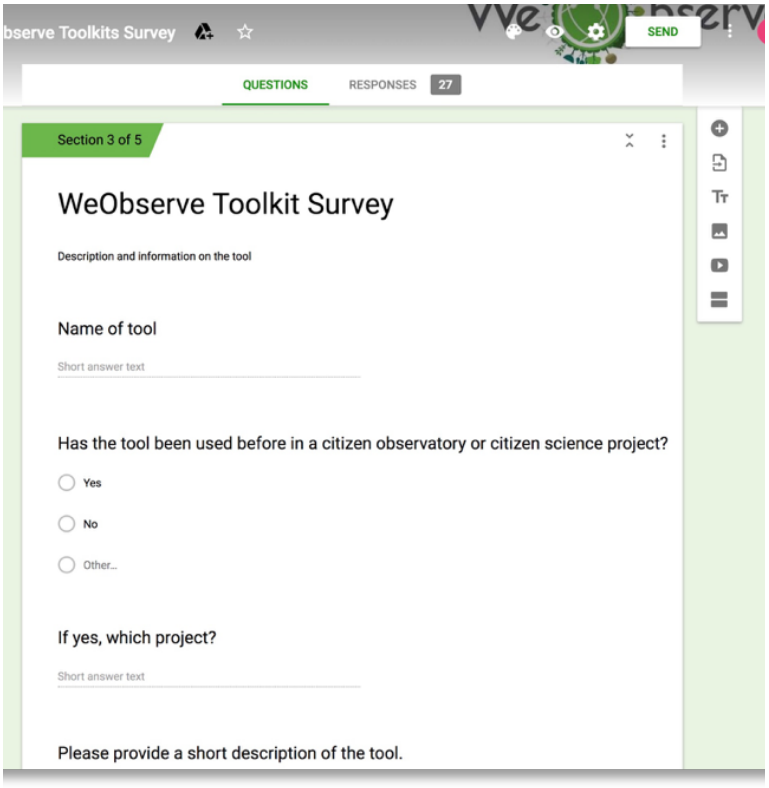


FIGURE 1: SCREENSHOT OF WEOBSERVE TOOLKIT ONLINE SURVEY

| Name of Tool | Birdata |
|---|---|
| Description of Tool | BirdLife is Australia's new Birdata web portal. Birdata was formerly the online tool for entering data into the 'Atlas of Australian Birds'. Birdata has been redesigned to expand and take in data from the Atlas project and also from various dedicated monitoring projects such as Powerful Owl Project. |
| Steps Supported | • Capturing or generating the data<br>• Managing the data<br>• Analyzing the data<br>• Visualizing the data<br>• Informs decision making |
| Description on how the tool supports the above steps | Individuals or groups enter count data for birds generated through planned or ad hoc surveys from anywhere in Australia. It allows you to see the data that has been progressively collected and submitted. It identifies formal Birdlife Australia projects. Allows for a visual review of data via map of survey points for species, regional groups, season, etc. Data is periodically assessed and reported on by Birdlife Australia which is a highly valued source of trend data and emerging issues in bird conservation |
| Intended user of the tool | • Citizens<br>• Policy makers<br>• NGOs<br>• Scientists / Researchers |
| References and links | https://birdata.birdlife.org.au/ |

FIGURE 2: SCREENSHOT OF A COMPLETED SUBMISSION TO WEOBSERVE TOOLKIT SURVEY

The survey generated the following four classifications for tools based on the stage of a CO project they can be used in:

- Co-Creating Citizen Science
- Onboarding
- Community Level  Indicators and Impact evaluation
- Data Quality and Robustness

The above headings were mapped to the different stages of CO development identified with stakeholders, see Table 1. below for details.

TABLE 1: GENERALISED USER-FOCUSED STEPS ALIGNED TO AREA FOR DEVELOPMENT FROM D3.1

| Co-creating CS for social innovation | Onboarding | Community-Level Indicators | Data Quality and Robustness |
|---|---|---|---|
| **Understanding the issue or problem**<br><br>**Forming a team**<br><br>**Creating a community**<br><br>**Choosing a question** | **Deciding what data to collect**<br><br>**Developing protocols for data collection**<br><br>**Training for data collection** | **Deciding what data to collect**<br><br>**Developing protocols for data collection**<br><br>**Informs decision making**<br><br>**Change-making / planning action**<br><br>**Measuring impacts**<br><br>**Disseminating results** | **Capturing or generating the data**<br><br>**Managing the data**<br><br>**Understanding the data**<br><br>**Analysing the data**<br><br>**Visualising the data** |

The classification of categories in Table 1 offered the basis for categorising the survey results in D3.1. All categories feature multiple steps, and some steps overlap with one another, we noted that certain tools placed within categories are focused and specific, whilst others can support many more steps. As such, these multi step tools can be seen as kits to underpin strategic approaches in CO's, for instance in the integration of indicators.

Following an update and the addition of new tools in preparation or openly available in 2020, and a second Workshop session at the WeObserve Plenary in January 2020, nuanced gaps and duplications in this framework were identified and the categories in Table 1 were refined. The translation of these categories followed a thematic sorting and affinity mapping methodology. More accessible language was proposed on the WeObserve website, and this is discussed below in Section 1.2, followed by an up to date list of tools.

## 1.2 Purpose and scope of the report

The purpose of this report is to update the description, development, structure and components or tools that form the WeObserve Toolkit. The Toolkit forms the pillars for the generation of the WeObserve Cookbook to clarify and agree the final outcomes.

The Toolkit involves the development of an infrastructure, with specific replicable tools and processes for individuals, groups, agencies and COs to devise, promote and evaluate their own campaigns as Champion Communities.

The WeObserve Toolkits are formalised as **specific** answering key gaps for CO's, **replicable** ie open source and generalisable, and **usable** by **stakeholders** ie in plan language and accessible through a variety of formats, including mobile apps, downloadable pdfs, platforms and learning opportunities. These will support and sustain engagement and self-organised CO activities within WeObserve and beyond the end of the formal funding period.

This Deliverable includes an update on the tools reported previously in D3.1, including a list of all the new tools collated during a workshop at the January 2020 WeObserve Plenary discussed in detail in the following section. The document then presents "Tools in Focus", these are defined as strategic approaches in COs, extending case study tools from different categories, explaining how they were developed, validated and applied.

Based on the main aim of WeObserve as a H2020 Coordination and Support Action (CSA) to help tackle three key challenges that COs face, namely, awareness, acceptability and sustainability, the focus for the Toolkit and this deliverable falls on tools developed by WeObserve H2020 funded Observatories, i.e. GROW Observatory, SCENT, LandSense and GroundTruth 2.0.

In this section we take the opportunity to briefly explain how the Toolkit and the Cookbook complement each other. The WeObserve Cookbook will combine outputs and emerging results from all CoPs in a coherent format including:

- Co-design methodologies for setting citizen-centred COs
- Engagement strategies
- Lessons learnt on best practice in COs and the use of tools
- Insights on barriers for COs and how to address them
- Strategies for interoperability and data standards
- Capturing impacts of COs
- Lessons from WeObserve CoPs.

The table below illustrates the different characteristics for each piece of work:

TABLE 2: WEOBSERVE TOOLKIT AND COOKBOOK ALIGNMENT

| Toolkit | Cookbook |
|---|---|
| It develops and builds **infrastructure** that can be used by COs to increase citizen engagement in data observation, data use and decision making. | It combines the **outputs** and **emerging results** from all CoPs. |
| Development of an infrastructure, with **specific replicable tools and processes** for **stakeholders** (individuals, groups, agencies and COs) to devise, promote and evaluate their own campaigns as Champion Communities. | It will capture the **lessons on best practices** as well as the **insights on barriers for CO**s and how these can be addressed, detailing strategies for interoperability and standards, engagement strategies and co-design of COs, capture the |

| | |
|---|---|
| | impacts of COs and include the lessons from CoPs. |
| Online apps, material and downloadable resources.<br>Live WeObserve Toolkit on WeObserve website. | The insights will also be **disseminated** through **publications** in relevant scientific journals and presentations in specialised **conferences** via WP5 and they will provide the basis for the acceleration and uptake activities of WP3. |
| Potential WeObserve Toolkits to build Champion Communities will address topics covering different stages of CO activity, such as:<br>● Co-creating citizen science for social innovation<br>● Data capture training<br>● Data visualisation<br>● Project evaluation | More interactive environment **online**, flexible and dynamic with varying stakeholder groups - aiming to consolidate and **provide guidance** on practice-based reflection - including case studies to help people identify which situation they are in (and therefore which tools will best suit their purpose). |
| The Toolkit will be part of the content within the wider Cookbook. | The cookbook will provide **guidance** and **links** to tools including for Champion Communities. |

The WeObserve Cookbook is outlined as follows:

The purpose of the Cookbook is to synthesise the science of Citizen Observatories and to guide users through various resources. Therefore, throughout, the Cookbook will point to relevant papers and tools such as the three WeObserve toolkits as well as tools identified in the tools survey. In this way, there will be strong links between the Cookbook and the Toolkit.

## 1.3 Refinement of Tool Categorisation Framework

This section describes the process followed to refine the Toolkit categories in Table 1, resulting from the 2018 Toolkit Survey. Since the survey closed in February 2019, it was deemed necessary to proceed with a next round of tool collation to capture missing tools from Observatories that were devised or activated after the closure of the initial survey. As the WeObserve Toolkit focuses on tools developed by COs, the WeObserve Plenary held at IIASA in Vienna 30-31st January was considered the ideal forum to run a Toolkit session with the following objectives:

- Provide partners with a recap on the toolkit survey and Deliverable 3.1 plans
- Carry out a collaborative session to share new tools developed since the closure of the Toolkit Survey
- Group those new thematic areas in relevant categories
- Discuss the structure of the digital version of tools on the WeObserve website (https://www.weobserve.eu/knowledge-base/toolkit/) and the steps to create this resource.
- Plan the maximisation of the alignment between the WeObserve Toolkit and the Cookbook.


FIGURE 3: TITLE SLIDE OF TOOLKIT SESSION AT WEOBSERVE JANUARY 2020 PLENARY

A presentation of toolkits was prepared and partner organisation proposed additional tools, one on each post-it. Figure 4 shows the tools shared by partners, and grouped with affinities relating to aims and outcomes in relationship to each other. Groupings were suggested thematically under the following headings :

- Digital apps with different functionalities
- Co-creating COs for social innovation
- Success/progress indicators and Project Evaluation
- Data quality and visualisation

A week after the plenary meeting, a follow up online meeting took place to analyse the results and insights of the workshop in the context of the Toolkit Survey. Tools provided at the Plenary were compared with the Toolkit Survey results to identify and remove duplicate entries. Please see Appendix 1 for a list. Thematic categories were revised using more accessible language to facilitate uptake by practitioners not familiar with CO projects or technical CS jargon.

Following on from this after reviewing the new expanded list of COs tools, we identified nuanced gaps and duplications in the classification that emerged from the Toolkit Survey; for example, many projects view co-design and onboarding tools as part of the same category. Also CLIs were viewed as a method that can be used at several steps or stages of CO projects, and therefore strategic, that a wider concept that better reflects this former heading is Evaluation and Advocacy, to take into account tools that support CO to evaluate their activities and put their results and data to use at different societal levels. As a result, WP3 refined the tool categories as shown in the Table 3.

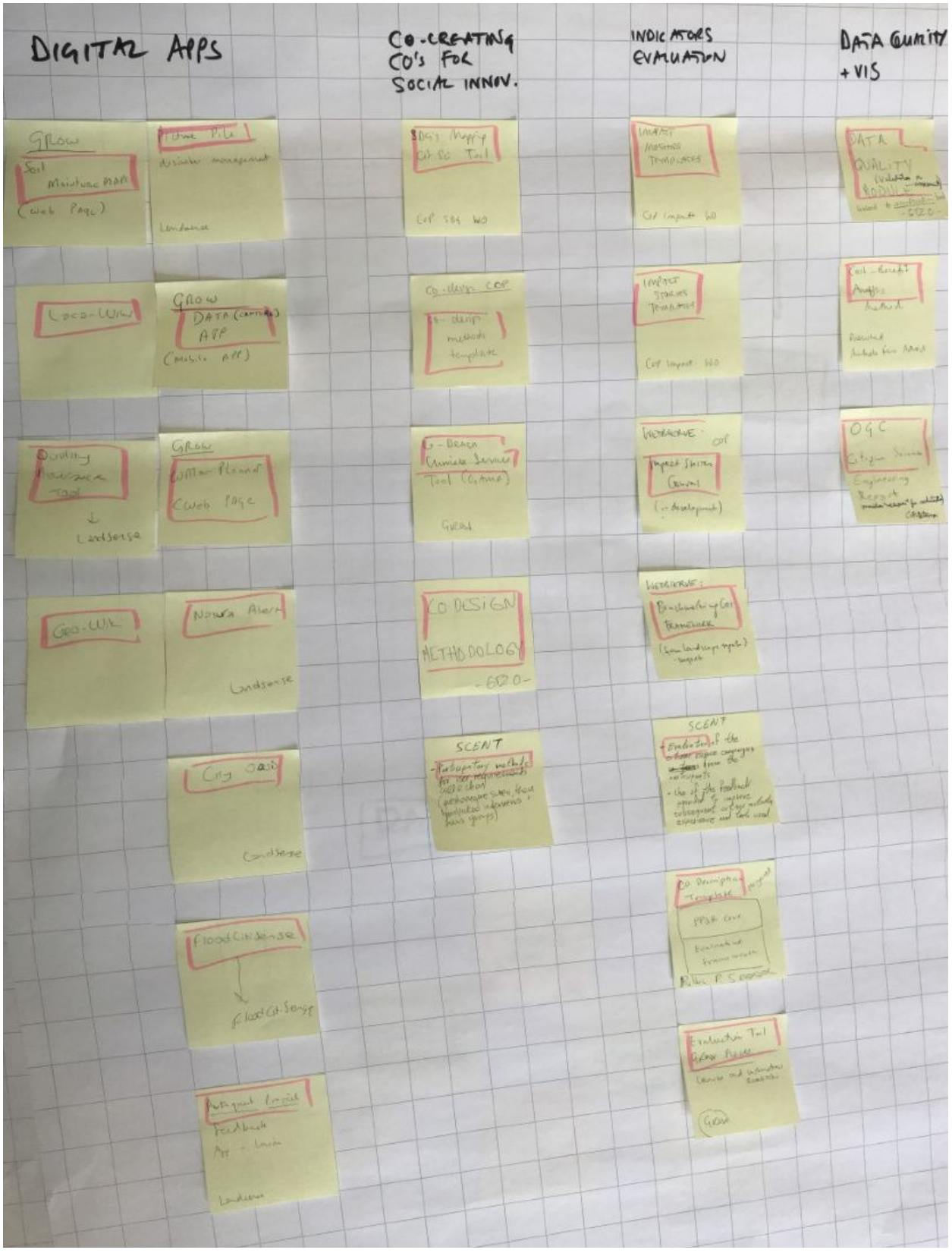


FIGURE 4: TOOLKIT SESSION OUTPUT AT WEOBSERVE JANUARY 2020 PLENARY

TABLE 3: ALIGNMENT BETWEEN SURVEY CATEGORIES AND REFINED TOOL CATEGORISATION FRAMEWORK

| D3.1 Toolkit Survey Categories | | D3.3 Toolkit focus areas (Revised) |
|---|---|---|
| **Co-Creating Citizen Science for Social Innovation** | > | **Co-Designing your Observatory** |
| **Onboarding** | > | **Training and Data Capture for Environmental Monitoring** |
| **Data Quality and Robustness** | > | **Data Quality and Visualisation** |
| **Community Level Indicators** | > | **Evaluation and Advocacy** |

The descriptions for each category are as follows and have been mirrored in the online version of the Toolkit on the WeObserve website:

**Category 1 - Co-designing your observatory**
These tools support the co-creation and co-design of a Citizen Science project or Citizens Observatories by any citizen or community that addresses social innovation in some form, facilitated through methods by which they can ideate, plan and identify as well as bring relevant stakeholders into a project.

**Category 2 - Training and Data Capture for environmental monitoring**
These tools enable Citizens Observatory communities decide what environmental concerns they share, how they can be measured, how often, by whom, what technology and training is needed as well as the set of indicators that will enable them to measure progress throughout the project in line with community goals. This category also includes tools that support data collection for a range of environmental and geographical dimensions.

**Category 3 - Data quality and visualisation**
This category includes tools that will help you with all aspects of citizen-generated data management, including: Validation, analysis, quality assurance and visualisation. A specific aim of WeObserve is to promote the access and uptake of citizen-generated data; thus interoperability is a key indicator of data quality as it enables the widespread use and application of Citizens Observatories data.

**Category 4 - Evaluation and advocacy**
Demonstrating the impact of Citizens Observatories is a key gap, which can be overcome by measuring a whole range of dimensions, including social innovation with communities (e.g. education, etc), the environment, policy and change-making. Tools in this category will assist Citizens Observatories consider how to best map and measure the impact of their activities.

# 2 Overview of 2020 WeObserve Toolkit components

This section starts with an up to date list of tools developed by WeObserve partners in the context of CO work. The table below includes both test and validated tools that are already freely accessible and those are prepared as open access, as well as tools in development that

will be made available in the coming months of the project. An in-depth review of selected tools from different categories is then offered as case studies of how the tools were developed, validated and applied in specific project contexts.

The full toolkit or specific components can be used with a "mix and match" approach as required to take citizens through the journey of participation in a CO, from the initial stages of co-design or co-creation, to the dissemination and application of results to create positive change in their communities and beyond.

TABLE 4: OVERVIEW OF WEOBSERVE COS' TOOLS

| Name of tool | Description | Project | Links to tool & resources |
|---|---|---|---|
| **Co-designing your Citizen Observatory** | | | |
| **SDG mapping CS Tool** | Template for identifying what SDGs and SDG indicators if any, CS projects are aligned to. | WeObserve SDGs CoP | In development; this tool will be uploaded to the online WeObserve Toolkit on the WeObserve website once ready. |
| **Co-design methods template** | Coming soon | WeObserve Co-Design CoP | In development; this tool will be uploaded to the online WeObserve Toolkit on the WeObserve website once ready. |
| **Co-design methodology** | Coming soon. | GT2.0 | In development; this tool will be uploaded to the online WeObserve Toolkit on the WeObserve website once ready. |
| **Co-Designing Citizens Observatories Card Tool** | This tool includes:<br><br>- Card set with 5 different categories of cards: 1) Personas 2) Places 3) Scenario 4) Data and 5) SDGs<br>- Instructions Booklet<br>- Accompanying slides for facilitator<br><br>For additional information see:<br><br>Woods, M, Ajates Gonzalez, R, Bromley, S, Hemment, D & Konsta, G 2019, 'Design for Climate Services: A Co-Design Approach', Paper presented at Academy for Design Innovation Management Conference 2019, London, United Kingdom, 18/06/19 - 21/06/19 pp. 1-5. | GROW | This tool is complete and awaiting open access approval with DOI and license, it will be available online WeObserve Toolkit and on the WeObserve website once ready. |
| **Participatory methods** | Participatory methods were utilised in the context of different phases of the SCENT project. The approach described is focused on the development of a | SCENT | In development; this tool will be uploaded to the online WeObserve |

| | | | |
|---|---|---|---|
| | participatory strategy, involving both citizens and dedicated stakeholders (i.e. public authorities) towards the definition of the end-user requirements of the SCENT toolbox.<br><br>For additional information see:<br><br>https://scent-project.eu/wp-content/uploads/2019/03/SCENT-D1.1_SCENT-Stakeholder-Analysis-and-End-User-Requirements.pdf | | Toolkit on the WeObserve website once ready. |
| **LandSense Campaigner** | This service will integrate and build upon the existing Geopedia and Geo-Wiki/LACO-Wiki tools, led by LandSense partners, SINERGISE and IIASA, respectively. This service will comprise a suite of user-friendly tools for end-users to visualise and analyse geospatial data including mapping, spatial analysis, and the ability to set up campaigns for data collection of citizen in-situ observations (using either smartphones, tablets or computers), where the service will be available as a marketplace for commercial users. | LandSense | In development<br><br>Website: https://landsense.eu/Project/What-Is-LandSense |
| **GROW MOOCs** | The GROW MOOC Programme comprised four online courses, which covered a wide range of topics, including:<br>● Introduction to CS and COS<br>● Earth Observation and citizen sensing<br>● Designing your own experiments<br>● DIY sensing technology<br>● Collecting and analysing data<br>● Acting on data to achieve positive change in the world. | GROW | GROW online courses have now ended, but the WeObserve MOOC offers an illustration of the format and content of the GROW MOOCs: https://www.futurelearn.com/courses/weobserve-the-earth |
| **WeObserve MOOC** | This free online course covers the following topics:<br>● Understanding the issue or problem:<br>● Creating a community<br>● Deciding what data to collect<br>● Capturing or generating the data<br>● Analysing the data<br>● Disseminating results<br>● Change-making / planning action. | WeObserve | MOOC page: https://www.futurelearn.com/courses/weobserve-the-earth |
| **Community Level Indicators (CLIs) Canvas** | The CLIs Canvas allows communities setting up or collaborating with COs to identify research questions, define what type of data need to be collected, by whom, how often and with what technology, as well as offering a method to measure progress towards objectives defined by participants themselves.<br><br>Current open access information see https://doi.org/10.20933/100001112 | Making Sense and GROW | This tool is extended in WeObserve and awaiting open access approval with DOI and license, it will be available online WeObserve Toolkit and on the WeObserve website once ready. |
| **SCENT Campaign Manager** | The Scent Campaign Manager is a web-based application, which allows public administrators, policy makers and other interested users to create and manage citizen science campaigns for monitoring and streamlining the collection of environmental information. | SCENT | https://scent-project.eu/scent-toolbox |
| | | | |

| Training & Data capture for environmental monitoring | | | |
|---|---|---|---|
| **Research in Your Growing Space Handbook** | This is a comprehensive guide intended to support growers in designing and running their own research projects in their growing space. It takes users through detailed steps, from the identification and refinement of research questions, experiment design, data collection and analysis and using actionable insights. | GROW | Handbook: https://knowledge.growobservatory.org/index.html@p=1226.html |
| **Picture Pile** | Allows users to look at a pair of satellite images from different years and report if they can see any evidence of deforestation.<br><br>All data collected are completely open and can be freely used by everyone. | LandSense | Blog: https://blog.iiasa.ac.at/2016/05/17/picture-pile-gaming-for-science/<br><br>Apple: https://apps.apple.com/us/app/picture-pile/id926740054<br><br>Android: https://play.google.com/store/apps/details?id=com.iiasa.picturepile&hl=en_GB |
| **GeoWiki** | The Geo-Wiki platform provides citizens with the means to engage in environmental monitoring of the earth by providing feedback on existing information overlaid on satellite imagery or by contributing entirely new data. Data can be input via the traditional desktop platform or mobile devices, with campaigns and games used to incentivise input. | | https://application.geo-wiki.org/Security/login?BackURL=%2FApplication%2Findex.php |
| **LandSense Campaigner** | This service will integrate and build upon the existing Geopedia and Geo-Wiki/LACO-Wiki tools, led by LandSense partners, SINERGISE and IIASA, respectively. This service will comprise a suite of user-friendly tools for end-users to visualise and analyse geospatial data including mapping, spatial analysis, and the ability to set up campaigns for data collection of citizen in-situ observations (using either smartphones, tablets or computers), where the service will be available as a marketplace for commercial users. | LandSense | In development<br><br>Website: https://landsense.eu/Project/What-Is-LandSense |
| **GROW MOOCs** | The GROW MOOC Programme comprised four online courses, which provided 17 weeks of learning and education. The MOOCs covered a wide range of topics, including:<br>● Introduction to CS and COs<br>● Earth Observation and citizen sensing<br>● Designing your own experiments<br>● DIY sensing technology<br>● Collecting and analysing data<br>● Acting on data to achieve positive change in the world. | GROW | GROW online courses have now ended, but the WeObserve MOOC offers an illustration of the format and content of the GROW MOOCs: https://www.futurelearn.com/courses/weobserve-the-earth |
| **WeObserve MOOC** | This free online course covers the following topics:<br>● Understanding the issue or problem:<br>● Creating a community<br>● Deciding what data to collect | WeObserve | MOOC page: https://www.futurelearn.com/courses/weobserve-the-earth |

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| | • Capturing or generating the data<br>• Analysing the data<br>• Disseminating results<br>• Change-making / planning action. | | |
| **Community Level Indicators (CLIs) Canvas** | The CLIs Canvas allows communities setting up or collaborating with COs to identify research questions, define what type of data need to be collected, by whom, how often and with what technology, as well as offering a method to measure progress towards objectives defined by participants themselves. | Making Sense and GROW | This tool is extended in WeObserve and awaiting open access approval with DOI and license, it will be available online WeObserve Toolkit and on the WeObserve website once ready. |
| **GROW Videos** | The GROW Observatory released a wide range of videos on its Youtube channel, mainly focusing on a) "How to" videos, e.g *Measuring slope, angle and aspect on a growing site* and b) "Disseminating results and advocacy" videos, e.g. GROW Policy workshop videos and GROW Key Achievements. | GROW | GROW Youtube channel: https://www.youtube.com/channel/UCNBezWJ_KQx0I-Kjb63_G3A/videos |
| **LandSense City Oases App** | This app allows users to pick an activity and see information and reviews of selected spots. If users visit spots, they can rate them based on a few selected subjective criteria. | LandSense | Android: https://play.google.com/store/apps/details?id=com.iiasa.cityoases&hl=de_AT<br><br>App Store: https://apps.apple.com/de/app/city-oases/id1457332554 |
| **Crop Support app** | The digital platform CropSupport provides support to farmers and other interested citizens in collecting data on land use and land cover. For the service of collecting data, farmers get through CropSupport platform useful data on their land, such as processed satellite images which contain information on potential crop stress due to exposure to pests, plant diseases, lack of water or nutrients in the soil. CropSupport platform has been developed by the consulting firm Inosensu from Novi Sad within the European project H2020 LandSense: A Citizen Observatory and Innovation Marketplace for Land Use and Land Cover Monitoring. It consists of CropSupport Web applications available on https://landsense.inosens.rs CropSupport and Android applications. | LandSense | Android: https://play.google.com/store/apps/details?id=rs.inosense.landsense |
| **LandSense Mijn Park** | This mobile application aims to collect 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. | LandSense | Android: https://play.google.com/store/apps/details?id=com.iiasa.mijnpark |
| **LandSense Natura Alert** | Natura Alert allows citizens to pinpoint the location of threats to biodiversity and habitat changes. Particular focus is given to threats that are occurring in Important Bird Areas (IBAs) around the world and Natura 2000 sites in the European Union. | LandSense | Android: https://play.google.com/store/apps/details?id=at.ac.iiasa.naturaalert<br><br>Iphone: https://apps.apple.com/de/app/id1437998439 |

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| **Maasai Mara Citizen Observatory App** | The Maasai Mara Citizen Observatory Android App allows citizens (local & tourists) to collect and receive key data from the field ranging from biodiversity sightings, to human wildlife conflict locations to the updating of fences and roads. | GT 2.0 | Android: https://play.google.com/store/apps/details?id=com.mara.upande.groundtruth20 |
| **Mara Collect App** | This app is based on the Open Data Kit (ODK) and is used for primary data collection of biodiversity and livelihood in the Mara region. | GT 2.0 | Android: https://play.google.com/store/apps/details?id=org.mara.collect.android |
| **SCENT Explore App** | SCENT Explore is a mobile application that enables citizens to capture in a playful way environmental related information, such as collecting images of LC/LU elements along with textual descriptions, measuring water level and flow velocity and reporting flood related events like the existence of obstacles in the river etc. | SCENT | Android: https://play.google.com/store/apps/details?id=com.xteamsoftware.scentexplore<br><br>Iphone: https://apps.apple.com/app/id1418892602 |
| **SCENT Measure** | Scent Measure application works in tandem with a portable smart sensor, connected to the user's mobile phone or tablet, aiming to measure soil conditions. Users can simply insert the sensor into the ground and select whether to measure and report soil moisture levels and/or air temperature and receive the measurements directly to the app. | SCENT | Android: https://play.google.com/store/apps/details?id=eu.iccs.scent.scentmeasure |
| **SCENT Crowdsourcing Platform** | The crowdsourcing platform is a key digital infrastructure of the Scent Toolbox, connecting all applications and services and orchestrating their functionality in a purposeful manner. It acts as a central data broker that links the Scent frontend applications used by citizens to provide images, annotations, sensory data, event reports and videos, to all the other toolbox components. It also manages the data quality of citizen-generated images. | SCENT | Scent Toolbox website https://scent-project.eu/scent-toolbox<br><br>Source code: https://bitbucket.org/account/user/uhopper/projects/SCNT |
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| **Data Quality & Visualisation** | | | |
| **Data Quality Module** | Validation/Assessment of citizen generated data linked to a data visualisation developed by GT2.0 | GT2.0 | To be made available |
| **Open Geospatial Consortium (OGC) Citizen Science Engineering Report** | This report provides recipes for aligning CS open data to OGC standards. | WeObserve Interoperability CoP | Wiki: http://external.opengeospatial.org/twiki_public/CitSciIE/WebHome<br><br>Github page: https://github.com/opengeospatial/citsciie |
| **Laco-Wiki** | Web-based solution for validating land cover and land use maps. Using a variety of reference layers including satellite and aerial imagery from Google and Bing as well as OpenStreetMap, validation involves a simple four-step | LandSense | Laco-Wiki website: https://laco-wiki.net/en/Welcome |

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| | process. After uploading a dataset, users can generate and validate the samples and create a report with the accuracy assessment. | | Login platform: https://laco-wiki.net/en/Account/Login?ReturnUrl=%2Fen%2FData%2FCreate |
| **Quality assurance tool** | LandSense will provide a range of quality assurance measures that can be applied in real-time and to post-data collection of Land Use & Land Cover (LULC) information, organised into processing workflows that will be customised for each demonstration case. It will be built upon the open source quality assurance and control service developed in the previous FP7-funded COBWEB citizen observatory, adding the additional measures needed for LULC data. | LandSense | Tools in development. Project website: https://landsense.eu/Project/What-Is-LandSense |
| **LandSense Campaigner** | This service will integrate and build upon the existing Geopedia and Geo-Wiki/LACO-Wiki tools, led by LandSense partners, SINERGISE and IIASA, respectively. This service will comprise a suite of user-friendly tools for end-users to visualise and analyse geospatial data including mapping, spatial analysis, and the ability to set up campaigns for data collection of citizen in-situ observations (using either smartphones, tablets or computers), where the service will be available as a marketplace for commercial users. | LandSense | In development<br><br>Website: https://landsense.eu/Project/What-Is-LandSense |
| **GROW MOOCs** | The GROW MOOC Programme comprised four online courses, which covered a wide range of topics, including:<br>● Introduction to CS and COS<br>● Earth Observation and citizen sensing<br>● Designing your own experiments<br>● DIY sensing technology<br>● Collecting and analysing data<br>● Acting on data to achieve positive change in the world. | GROW | GROW online courses have now ended, but the WeObserve MOOC offers an illustration of the format and content of the GROW MOOCs: https://www.futurelearn.com/courses/weobserve-the-earth |
| **WeObserve MOOC** | This free online course covers the following topics:<br>● Understanding the issue or problem:<br>● Creating a community<br>● Deciding what data to collect<br>● Capturing or generating the data<br>● Analysing the data<br>● Disseminating results<br>● Change-making / planning action. | WeObserve | MOOC page: https://www.futurelearn.com/courses/weobserve-the-earth |
| **By the Code of Soil** | By the Code of Soil entails an application for personal computers which creates an artistic interpretation of soil moisture, temperature and light data from the cluster of GROW sensors closest to the user. Configurations of shapes and sounds emerge from audiovisual textures and frequencies to create a data portrait of soil properties. This artwork appears unannounced on users' computers each time the orbiting Sentinel-1A satellite passes overhead – approximately twice every 24 hours but never at the same time of the day. It offers a novel and artistic interpretation of sensor data with the potential to reach a wider audience and start new conversations about soil and data. | GROW | https://growobservatory.org/code-of-soil.html |
| **GROW** | The GROW Observatory app for Android or iOS devices | GROW | Android: |

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| **Observatory App** | is free for anyone to use. The app contains science-based information on practices that help improve your soil and support the wider ecosystem and gives advice on plants that you can grow 'right now' in your location. The planting advice provided by the app includes crowdsourced information from growers who have provided more up to date and accurate sowing and harvesting dates for their areas. | | https://play.google.com/store/apps/details?id=at.ac.iiasa.grow<br><br>Iphone: https://apps.apple.com/us/app/grow-observatory/id1409694401 |
| **LandSense Paysages app** | PAYSAGES is a mobile application aiming to engage citizens in the process of updating and validating LU/LC data. Particular emphasis is given to distinguishing residential land use from industrial land use and from land use dedicated to the tertiary sector. This aspect is linked to the difficulty in distinguishing buildings (and small land plots) that are for residential use and the ones that are for agricultural use. | LandSense | Android: https://play.google.com/store/apps/details?id=com.iiasa.paysages |
| **SCENT Crowdsourcing Platform** | The crowdsourcing platform is a key digital infrastructure of the Scent Toolbox, connecting all applications and services and orchestrating their functionality in a purposeful manner. It acts as a central data broker that links the Scent frontend applications used by citizens to provide images, annotations, sensory data, event reports and videos, to all the other toolbox components. It also manages the data quality of citizen-generated images. | SCENT | Scent Toolbox website https://scent-project.eu/scent-toolbox<br><br>Source code: https://bitbucket.org/account/user/uhopper/projects/SCNT |
| **SCENT Collaborate** | Scent Collaborate is a web application that allows users to validate the textual description of citizen-generated images, simply by browsing images and stating whether e.g. they can see pastures, forests, river banks, buildings, etc.<br><br>The source code of the application is not open source. But users can freely access it and validate the information provided by images. | SCENT | Access https://scent-project.eu/scent-collaborate |
| **SCENT Water tools** | The tools enable the collection of river parameters from citizen generated data. More specifically, these algorithms enable the extraction of water level from images containing a water level indicator that is half-submerged into water and the extraction of water surface velocity from a video containing a pre-defined floating object moving on the surface of a water body. | SCENT | SCENT Toolbox website https://scent-project.eu/scent-toolbox<br><br>Access https://isense-gitlab.iccs.gr/scent_public/water-velocity-calculation-tool<br><br>https://isense-gitlab.iccs.gr/scent_public/water-level-measurement-tool |
| **SCENT Harmonisation Platform** | The platform enables the management, storage, provision and visualisation of all citizen-generated data and added-value information produced by the various Scent tools (i.e. improved Land Cover / Land Use maps, flood risk maps) and translates them to standardised resources following the Open Geospatial Consortium (OGC) standards. This is not open source, a reference implementation used in the context of the WO CoP's 2nd Interoperability experiment. | SCENT | Access http://scent-harm.iccs.gr/ |

| Evaluation and Advocacy | | | |
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| **Impact Story Template** | Template to capture policy/governance impact from CS projects | WeObserve | In development |
| **Impact Story Canvas** | Tool to transform the content from the Impact Story Template into an engaging story | WeObserve | In development |
| **Benchmarking COs Framework** | Framework developed by ECSA for the WeObserve Landscape Report | WeObserve | In development |
| **Evaluation of CS campaigns and tools** | Methods for the interaction with the stakeholders towards the evaluation of the SCENT toolbox. The citizen science activities are evaluated from the participants' perspective. Use of the feedback provided to improve subsequent experience and tools used. | SCENT | In development |
| **CO Description Template** | Public Participation in Scientific Research (PPSR) - Core data model framework | WeObserve | In development |
| **Holistic Co-Evaluation Tool for Citizen Observatory and Citizen Science projects** | Canvas and method for co-evaluating a variety of project impacts with participating communities across several dimensions. | GROW | Completed and awaiting DOI and License. |
| **LandSense Campaigner** | This service will integrate and build upon the existing Geopedia and Geo-Wiki/LACO-Wiki tools, led by LandSense partners, SINERGISE and IIASA, respectively. This service will comprise a suite of user-friendly tools for end-users to visualise and analyse geospatial data including mapping, spatial analysis, and the ability to set up campaigns for data collection of citizen in-situ observations (using either smartphones, tablets or computers), where the service will be available as a marketplace for commercial users. | LandSense | In development<br><br>Website: https://landsense.eu/Project/What-Is-LandSense |
| **GROW MOOCs** | The GROW MOOC Programme comprised four online courses, which covered a wide range of topics, including:<br>• Introduction to CS and COS<br>• Earth Observation and citizen sensing<br>• Designing your own experiments<br>• DIY sensing technology<br>• Collecting and analysing data<br>• Acting on data to achieve positive change in the world. | GROW | GROW online courses have now ended, but the WeObserve MOOC offers an illustration of the format and content of the GROW MOOCs: https://www.futurelearn.com/courses/weobserve-the-earth |
| **WeObserve MOOC** | This free online course covers the following topics:<br>• Understanding the issue or problem:<br>• Creating a community<br>• Deciding what data to collect<br>• Capturing or generating the data<br>• Analysing the data<br>• Disseminating results<br>• Change-making / planning action. | WeObserve | MOOC page: https://www.futurelearn.com/courses/weobserve-the-earth |
| **By the Code of** | By the Code of Soil entails an application for personal | GROW | https://growobservator |

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| **Soil** | computers which creates an artistic interpretation of soil moisture, temperature and light data from the cluster of GROW sensors closest to the user. Configurations of shapes and sounds emerge from audiovisual textures and frequencies to create a data portrait of soil properties. This artwork appears unannounced on users' computers each time the orbiting Sentinel-1A satellite passes overhead – approximately twice every 24 hours but never at the same time of the day. It offers a novel and artistic interpretation of sensor data with the potential to reach a wider audience and start new conversations about soil and data. | | y.org/code-of-soil.html |
| **GROW Observatory App** | The GROW Observatory app for Android or iOS devices is free for anyone to use. The app contains science-based information on practices that help improve your soil and support the wider ecosystem and gives advice on plants that you can grow 'right now' in your location. The planting advice provided by the app includes crowdsourced information from growers who have provided more up to date and accurate sowing and harvesting dates for their areas. | GROW | Android: https://play.google.com/store/apps/details?id=at.ac.iiasa.grow<br><br>Iphone: https://apps.apple.com/us/app/grow-observatory/id1409694401 |
| **Community Level Indicators (CLIs) Canvas** | The CLIs Canvas allows communities setting up or collaborating with COs to identify research questions, define what type of data need to be collected, by whom, how often and with what technology, as well as offering a method to measure progress towards objectives defined by participants themselves. | Making Sense, made open access by WeObserve | As previous |
| **GROW Videos** | The GROW Observatory released a wide range of videos on its Youtube channel, mainly focusing on a) "How to" videos, e.g *Measuring slope, angle and aspect on a growing site* and b) "Disseminating results and advocacy" videos, e.g. GROW Policy workshop videos and GROW Key Achievements. | GROW | GROW Youtube channel: https://www.youtube.com/channel/UCNBezWJ_KQx0I-Kjb63_G3A/videos |

# 3 Tools In Focus

In this section we zoom into a set list of examples from different categories to illustrate some tool case studies from different projects. For each tool we provide:

- Background to tool
- Format
- Description of tool development and validation process
- Image
- Project it was originally developed for
- How it has been used
- Lesson learnt
- Tips for adapting the tool to other projects
- Link to tool if already available; tools not yet open access will be made available on the living WeObserve Toolkit on the WeObserve website.

## 3.1 Co-Designing Citizens Observatories Card Tool


**1) Background to tool**

Co-design methodologies for facilitating meaningful citizen engagement in the formation stages of projects are becoming increasingly important and popular as society realises how the complex challenges we face need to be co-created with citizens and stakeholders in order to be effective and accepted (Evans and Terrey, 2016; Ground Truth 2.0, 2019 . Additionally co-design has an essential role to play in "building trust with citizens and stakeholders, eliciting knowledge of policy and delivery problems that public organisations do not possess, and monitoring and supporting the needs and aspirations of target groups over time" (Evans and Terrey, 2016:246).

In the context of climate change, droughts, floods and other climate-related hazards present critical challenges for communities across the world. Co-design approaches are well-placed to respond to such wicked problems (Buchanan, 1992) however a user-led approach to the development of climate services is rare (Christel et al, 2017). Instead, scientists and governments rely on research and innovation between science and industry to develop climate services for early warning systems and decision-making. This tool is uniquely placed to contribute to a citizen-centred approach in which citizens are themselves potential users of such services and at the forefront of change-making practices.

**2) Format and Project it was originally developed for**

This tool was developed as part of the GROW Observatory (https://growobservatory.org/). It includes the following components:

- Card set with 5 different categories of cards:
    - 1) Personas
    - 2) Places
    - 3) Scenario
    - 4) Data
    - 5) SDGs

- Instructions Booklet (pdf)
- Accompanying slides for facilitator (pdf)

**3) Description of tool development and validation process**

This tool is comprised of a set of resources (see previous section above) developed to enable an individual or team to run a co-design workshop with a community to set up a new CO project. The development of the tool and the methodology involved a process of delivery, validation and reiteration with different groups of stakeholders at four different countries and two continents, including:

- **Designers at Academy for Design Innovation Management (ADIM) Conference,** London, 20th June 2019: The session received the ADIM 2019 Top III Workshops Award in London (see conference website: https://designinnovationmanagement.com/adim2019/).
- **Policy-Makers at GROW Policy Workshop,** Brussels, 3rd September 2019: This event was reported in GROW's public Deliverable 3.5 *Observatory Policy Interface*.
- **Citizen Scientists and Community Champions at GROW Insights Workshop**, Lisbon, 18th September 2019: A session as part of an Insight Workshop tested the tool with GROW participants and external scientists.
- **Environmental Ministers and Scientists at Transformations Conference**, Santiago de Chile, 15th October 2019: A one day workshop introduced the tool to a community who are well versed with emergency events - earthquakes - who were keen to consider what COs could bring to the management of this and other critical climate challenges in South America.

In all, groups co-designed and named 12 novel Citizen Observatories.

**4) How it has been used**

See previous sessions for details.

**5) Lesson learnt & Tips for adapting the tool to other projects**

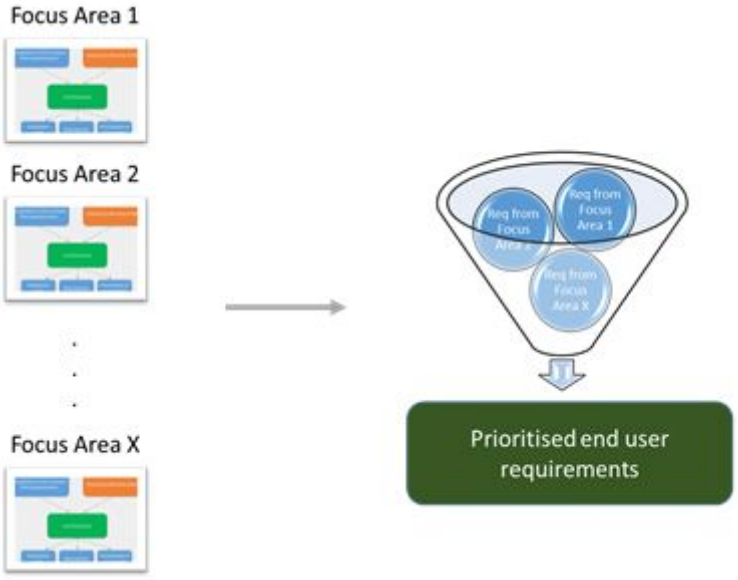
The following insights and tips emerged from the different sessions:

- Participating groups valued succinct and background information that supported a rapid understanding of the topic. The design process and resources can help groups of different stakeholders understand the premise, adopt roles, create scenarios, understand data flow and ideate a service in a constraint time.
- The purpose of the card set is to create dialogue, rather than to provide a highly accurate representation of a current or preferred reality.
- Quality of service propositions generated: The methodology allowed groups to generate high-level prototype services in a short session.
- The persona cards and role play encouraged an empathetic response to stakeholders' concerns and motivations. The tool was also designed to generate engagement through emotion: rather than designing a service chronologically, we recommend starting with prevention, placing teams in the scenario, a crisis situation, triggering an intense response that helps relate participants to a call to action more easily; teams can then consider pre and post crisis event scenarios.

- The introduction of the tool in the emergency phase of the timeline creates a powerful narrative to which teams are able to respond in role.
- During the sharing session at the end of the workshop, we recommend encouraging teams to present their CO idea in their personas, it brings humour to the room and allows everybody in the team to speak out loud and share their thoughts with the wider group.

**6)** The methodology applied is currently documented in detail in the following report: **doi: 10.33114/adim.2019.w01.476** and in **Section 1.1.5.2** https://discovery.dundee.ac.uk/ws/portalfiles/portal/40471956/D1.4_Mission_Outcomes.pdf

## 3.2 SCENT Participatory methods




**1) Background to tool**

Development of a participatory strategy, involving both citizens and public authorities with the aim of going beyond a mere research project to a sustainable and long-term citizen observatory

**2) Format and Project it was originally developed for:**

Participatory methods were utilised in the context of different phases of the SCENT project. The approach described is focused on the definition of the end-user requirements of the SCENT toolbox.

Relevant literature for the methods performed:

Greenbaum, T. L., 1997. The Handbook for Focus Group Research. ISBN 0761912533 ed. s.l.:Sage Pubns.

Zacharias, N. T., 2012. Qualitative research methods for second language education: a coursebook. Volume Newcastle upon Tyne: Cambridge Scholars.

Patton, M. Q., 2004. Qualitative research and evaluation methods. Thousand Oaks, Issue ISBN 978-07619-1971-1.

Taylor, L. &., 2002. Qualitative Communication Research Methods. ISBN 978-0-7619-2494-4 ed. s.l.:2nd edition.

**3) Description of tool development and validation process**

The definition of SCENT user requirements involves the following steps:

1. Questionnaires/semi-structured interviews for Identification of target groups
2. Online surveys/focus groups/workshops for the collection of end-user needs
3. Extraction, compilation and consolidation of user requirements

The process follows the so-called 'tree approach' that aims to reach conclusions, by determining cause-effect relationship and structures problems and challenges according to their levels of complexity and specificity. The problem analysis identifies the negative aspects of the current problematic situation and establishes the cause-effect relationship of problems.

**4) How it has been used**

The first step of the process involved the identification and compilation of a list of stakeholders and target groups relevant to the activities and scope of the Citizen Observatory. Following this, end user needs collection was performed through questionnaires and online surveys in three different levels. The first level targeted the policy makers, i.e. the stakeholder organisations in each region where the Citizen Observatory will be deployed, that are involved in the process of monitoring floods and flood risks as well as those that are obliged by law to deal with the flood consequences and effects. The second level of questionnaires targeted experts of the area, ranging from remote sensing and sensor equipment experts, flood modellers, local/regional and national authorities active in civil protection, civil protection NGOs, regional and national authorities responsible for the application of the EU flood related policy directive, as well as scientists working in data collection and analysis of parameters that may affect flooding (precipitation, water discharge, water level, surface velocity). Finally, the third level targeted citizens and volunteers are those that will be asked to participate in the citizen-science campaigns of SCENT in the third year of the project and use the SCENT tools.

Moreover, in order to ensure active participation of identified stakeholders towards the collection of needs and requirements, the focus group (FG) methodology was adopted. Focus group is a technique used to better understand how people feel or think about an issue, idea, product, or service. Focus groups are used to gather opinions. Participants are selected because they have certain characteristics in common that relate to the topic of the focus-group, hence homogeneity is key to maximizing disclosure among focus group participants. A focus group is composed of 7-12 people, being the optimal size to promote discussion and enable the facilitator to keep the group on task. Focus groups are structured

around a set of carefully predetermined questions – usually no more than 10 – but the discussion is free-flowing.

Based on the outputs of the abovementioned participatory methodology the end-user requirements were extracted and consolidated.

**5) Lesson learnt & Tips for adapting the tool to other projects**

An important consideration during this process is to ensure motivation and involvement of the stakeholders in the following phases of the projects such as the evaluation of the citizen-science tools developed, participation in citizen-science campaigns, support and communication of project activities through their networks.

The methodology can be easily applied in the context of other Citizen Observatories and/or citizen-science projects and initiatives.

**6) Link**

The methodology applied is currently documented in details in the following report: https://scent-project.eu/wp-content/uploads/2019/03/SCENT-D1.1_SCENT-Stakeholder-Analysis-and-End-User-Requirements.pdf

## 3.2 SCENT Evaluation of tools

**1) Background to tool and Format**

It involves a methodology and approaches for the interaction with the stakeholders towards the evaluation of the SCENT toolbox.

**2) Description of tool development and validation process**

The SCENT toolbox components were evaluated by the participants of the project's citizen-science campaigns through the use of questionnaires. In addition, an evaluation of the implementation of the entire SCENT toolbox took place, aiming to strengthen its utilisation and applicability in the field of advanced policy making for flood and land cover/ land use management. This evaluation was conducted on the basis of Key Performance Indicators and through questionnaires and structured interviews.

**4) How it has been used**

Following the conduction of each citizen-science campaign of the project, participants were being asked to provide their feedback in terms of the overall campaign experience (i.e. duration of the activities, inclusion of educational aspects, process for collection of measurements, formulation of teams, etc) as well as of the SCENT toolbox components that they utilised in the context of this process (i.e. usability of the apps, issues encountered, etc). The feedback received from each campaign through questionnaires and gave useful information in order to better facilitate the conduction of the following ones.

Further to this, the evaluation of the SCENT toolbox in terms of its applicability in the field of advanced policy making for flood and land cover/ land use management involved the following phases:

Step1: The first step involves the identification of the economic, social and ecological impacts of the SCENT implementation option in public policies. The effects that appear in the administrative framework, but also outside it, must be taken into account. Even though many of these impacts are indeed public policy goals, the focus should be on the potential unintended impacts and effects of the interaction between the various options. This analysis is complemented by the conduction of qualitative methods (i.e. online questionnaire) aiming to establish a better understanding of the applicability of the toolbox in the wider decision-making process.

Step 2: It involved a detailed quantitative analysis of important impacts. After conducting an extensive qualitative assessment in step 1, the expected benefits and costs are analysed in a quantitative and / or monetary estimation. Such an analysis can take several forms, depending on the methodology chosen such as Cost Benefit Analysis and/or multicriteria analysis. This evaluation is conducted taking into consideration a set of Key Performance Indicators (KPIs) that were identified in the beginning of the project and aim to assess the success of the demonstration campaigns, the project impact and the acceptance of the SCENT Toolbox from the user perspective.

**5) Lesson learnt & Tips for adapting the tool to other projects**

The evaluation activities per campaign facilitated the realization of improvements in terms of both the SCENT tools and the execution of the activities. Additionally, evaluation of the toolbox from a policy perspective, demonstrated the measurable impact of SCENT toolbox in the assessment of flood risks and flood patterns, the contribution of citizen-generated environmental information as well as the end-user acceptance of the system in terms of performance and ease of use.

**6) Link**

The methodology applied is documented in detail in the following report: (permanent link to be provided).

## 3.3 Community Level Indicators and Canvas

**1) Background to tool**

In citizen science participants sometimes struggle to understand how sensor data are relevant to their lives or how environmental data are connected to the challenges they face. To support this, we sometimes need other types of information to give context to the data that are being collected by sensors. This can be done by using Community Level Indicators (CLIs), which are objective measurements collected by the community. This additional information helps to make the invisible visible by connecting the dots between sensor data and real life.

CLIs is a term originating in Health studies. In the context of CS and participatory sensing, the Making Sense team (http://making-sense.eu/) incorporated CLIs to capture information that

complements sensor data and to better understand the sources and causes of environmental issues (Coulson et al., 2018).

**2) Format and Project it was originally developed for**

This canvas is available as a downloadable pdf with an A3 format recommended for group work or A5 or A4 for individual use when collecting data. The canvas was developed by the Making Sense project team (Making Sense 2017) and has been used in Spanish and English.

**3) Description of tool development and validation process**

As described by the Making Sense team, "CLIs are measurable and objective complementary information to sensor data. The concept assists in building awareness on a specific issue and helps track short to mid-term activities geared towards long-term change, which is useful in time limited initiatives. CLIs also shed light on long-term change as a result of actions or specific efforts" (Making Sense, 2017). The validation process was described in detail in Making Sense D5.4 *Community Level Indicators* (http://making-sense.eu/wp-content/uploads/2016/09/D5.4-COMMUNITY-LEVEL-INDICATORS.pdf) and D5.5 *Report and Assessment of Impact and Policy Outcomes Using Community Level Indicators.*

**4) How it has been used**

CLIs were used by the Making Sense community in Spain; a Barcelona-based group of local residents were suffering the effects of noise pollution due to the many people sitting in the square where they lived until late hours of the night. The residents planned to collect data on the level of noise in their homes using a sensor platform called the Smart Citizen Kit. The group also met up to discuss which other types of information they could collect to better understand the issue of noise pollution in their square. This discussion focused around collecting data of how people moved in and used the square. Other indicators, like how late local cafes and shops were open, were also discussed. Throughout the project, some citizens took photographs of the people in the square to keep a record of numbers and at which times people visited. Data on these indicators allowed residents to identify patterns that could affect and help interpret the levels of noise captured by the sensors.

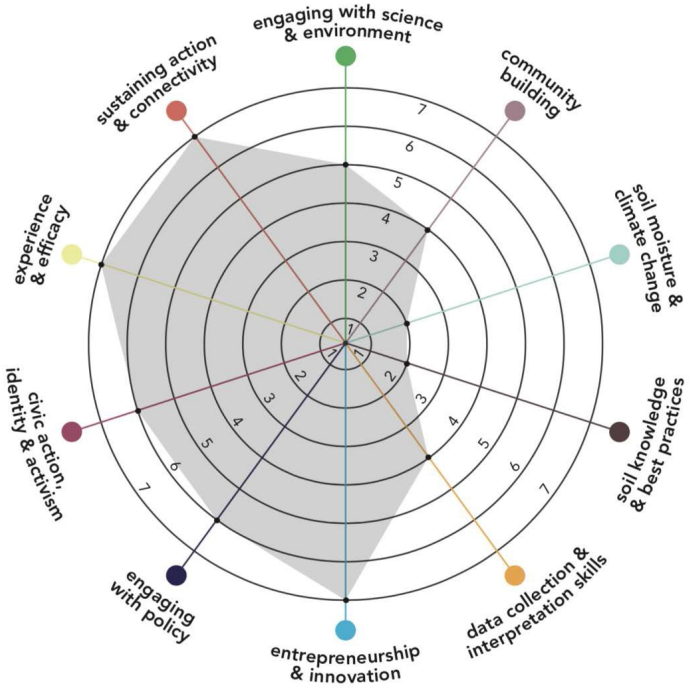
**5) Lesson learnt & Tips for adapting the tool to other projects**

CLIs are a multi-purpose tool that can be effectively used at different stages of a project: from determining what a problem is, to deciding what to measure and when, mapping progress towards agreed indicators at the end of a sensing period and finally utilising the framing of indicators and process data gathering to promote dialogue with decision-makers. Coordinators should be aware of the facilitation requirements and canvas resource needed to run CLI sessions, as well as the time and training required to collect data on CLIs beyond sensor data.

The CLI approach was designed for uptake in the GROW Observatory, however, instead a light weight tool (see 3.4) was employed when participation reached the point where face to face delivery of CLI's could not be implemented. The incorporation of this multi-dimensional evaluation canvas is discussed in the next section.

**6)** We are currently preparing this tool for full open access, in the meantime a report can be obtained for the most substantial description http://making-sense.eu/wp-content/uploads/2016/09/D5.4-COMMUNITY-LEVEL-INDICATORS.pdf

## 3.4 Holistic Co-Evaluation Tool for Citizen Observatory and Citizen Science projects




**1) Background to tool**

Demonstrating the impact of projects is a key gap in CO and more wider, the CS community. This gap can be overcome by measuring a whole range of dimensions, including social innovation with communities (e.g. education, etc), the environment, policy and change-making.

**2) Format and Project it was originally developed for**

A3 canvas for group work alongside a complementary method presented as an A4 document with additional questions to collate qualitative as well as a score for each dimension. This canvas was developed as part of the GROW Observatory.

**3) Description of tool development and validation process**

This framework focused on reflecting ten impact indicators related to a particular CS Mission within GROW. This visual canvas was based on the GROW Framework and built on the work and methodology of the Place Standard Tool (https://www.placestandard.scot/), a tool for assessing the quality of a place and designed in partnership by the Scottish Government, NHS Health Scotland, and Architecture and Design Scotland.

**4) How it has been used**

The evaluation canvas was developed to capture if/how participating in the GROW project impacted participants' knowledge, practices and interest about soil science, policy and environment. A canvas was developed for each of the 19 communities that took part in soil sensing activities with GROW.

**5) Lesson learnt & Tips for adapting the tool to other projects**

Some limitations have to be taken into account with regard to the data collection approach of this tool. First, it relies on self-report data. Respondents may paint an overly positive or negative picture about themselves in terms of their motivations, the impact on their knowledge, their attitude towards science independent of the actual change attributable to a project. Second, Community Champions representing wider communities might complete this tool based on their individual experience, whilst many are able to reflect and represent an overarching viewpoint, it cannot be reliably said to represent the collective experience of all participants.

Finally, measuring impact requires careful planning from the beginning of the project. So while this tool is categorised in the final Evaluation and Advocacy stage, it should be introduced at the beginning of projects and in conjunction with CLIs to assist COs in how to best map and measure the impact of their activities.

**6)** This tool is being prepare for full open access release, currently our detailed use and results relating to the method can be found in open access Section 2.5 Evaluating Impact from

Woods, M, Ajates, R, Gulari, N, Burton, VJ, van der Velden, NK & Hemment, D 2019, *GROW Observatory: Mission Outcomes*. University of Dundee. https://doi.org/10.20933/100001130 https://discovery.dundee.ac.uk/ws/portalfiles/portal/40471956/D1.4_Mission_Outcomes.pdf

# 4 Conclusions and Sustainability Plan for WeObserve Toolkit

This deliverable has provided an overview of tools that have been developed or are being developed by H2020 CO's and WeObserve. D3.3 formalises the approach to acceleration of uptake, sustainability and scale by continuing the effort to ensure tools are sufficiently catalogued and recorded to address: **specific** key gaps for CO's; be **replicable** ie open source and generalisable; and **useable** by **stakeholders** ie in plan language and accessible through a variety of formats, including mobile apps, downloadable pdfs, platforms and learning opportunities.

An update to these tools, including inclusion of all tools *In Focus and* the release of toolkits with open access status is ongoing until 30 November 2020. The deliverable summarised a the Toolkit Survey carried out in PR1, followed by an update of new tools in development since then.

A key task for WP3 is to ensure the sustainability of the WeObserve Toolkit for wider uptake and long lasting impact. Several measures are being implemented to achieve this goal:

**A) Toolkit promotion during the life of the WeObserve project:**

- Inclusion and promotion through the second iteration of the WeObserve MOOC that will run in September 2020
- Blog posts on WeObserve website
- Targeted relevant partners mailing lists: ECSA Newsletter, WAAG Society, IaAC
- WeObserve Roadshow events
- Oral presentations (confirmed) at ECSA 2020 Conference (https://www.ecsa-conference.eu/) and Living knowledge Conference (http://livingknowledge.org/)
- WeObserve Conference
- Addition of new WeObserve tools to the Toolkit section of the WeObserve website
- Promotion of new WeObserve tools via WeObserve social media
- Deliverable 2.8 *WeObserve Cookbook: Guidelines for creating successful and sustainable Citizens Observatories*, due in November 2020 will report on the latest sustainability plans for both the WeObserve Toolkit and Cookbook
- The final WeObserve report will provide the final agreed details of the Toolkit sustainability plan

**B) Toolkit promotion and sustainability after the end of the project:**

- Promotion and transfer of tools through relevant projects such as Measuring Impact of Citizen Science (MICS) and/or EU Citizen.Science learning platform.
- The WeObserve Consortium is exploring the possibility of running future iterations of the WeObserve MOOC on the FutureLearn platform without facilitation after the end of the project to continue to disseminate the content and tools. FutureLearn's model of MOOCs is changing and the platform team has been testing and monitoring engagement and completion on courses run with less/without educators' supervision with positive results so far. FutureLearn might be able to provide guidelines for running iterations post 30th Nov 2020 when the funded period for WeObserve ends.
- All WeObserve open access tools will continue to be available via Zenodo https://zenodo.org/communities/weobserve/ and other relevant repositories, such as UoD Discovery, and linked to associated WeObserve CO publications for wider impact.

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## Linked WeObserve deliverables

| Deliverable | Status |
|---|---|
| Deliverable 3.1 *WeObserve toolkits for building champion communities I.* | Public |
| Deliverable 2.8 *WeObserve Cookbook: Guidelines for creating successful and sustainable Citizens Observatories* | Public |

# Appendix 1: Tools shared during WeObserve Plenary, 31.1.20

| **Tools highlighted in grey below already appeared in 2018 Toolkit survey** | | |
|---|---|---|
| | | |
| **Digital Applications** | | |
| Soil Moisture app | Web page showing map of soil moisture levels | GROW |
| This report provides recipes for aligning CS open data to OGC standards (see wiki: http://external.opengeospatial.org/twiki_public/CitSciIE/WebHome) | deforestation monitoring | LandSense |
| Laco-Wiki | Web page/ web app validation tool for land cover and land use | LandSense |
| Quality assurance tool | | LandSense |
| GeoWiki | | |
| GROW Observatory app | Mobile app for sensor users to manage sensor data / EPD for any user (no sensor required) | GROW |
| Nature Alert | mobile ap | LandSense |
| City Oases | mobile ap | LandSense |
| Flood City Sense | mobile ap? | Flood City Sense |
| Photoquest Project | App (Inian) | LandSense |
| | | |
| **Co-creating COs for Social Innovation** | **CATEGORY 1** | |
| SDG mapping CS Tool | | WeObserve SDG CoP |
| Co-design methods template | | WeObserve Co-design CoP |
| Co-design for Climate Innovation | Card game that enables the design of new COs with groups of diverse stakeholders | GROW |
| Co-design methodology | | GT2.0 |
| Participatory methods | Methods for user requirement collection (questionnaire survey + handpicked interviews + focus groups) | SCENT |
| | | |

| | | |
|---|---|---|
| **Indicators/ Evaluation** | **CATEGORY 4** | |
| Impact Methods Template | Template to capture policy/governance impact from CS projects | WeObserve Impact CoP |
| Impact Story Template | Same tool as above? | WeObserve Impact CoP |
| Impact Story Canvas | in development | WeObserve Impact CoP |
| Benchmarking COs Framework | Framework developed by Margaret (check) for the WeObserve Landscape Report | WeObserve (Margaret) |
| Evaluation of CS campaigns | Evaluation of activities from the participants' perspective. Use of the feedback provided to improve subsequent experience and tools used. | SCENT |
| Citizen Observatory Description Template | Public Participation in Scientific Research (PPSR) - Core data model framework | WeObserve (Margaret) |
| GROW Co-Evaluation canvas | Canvas for co-evaluating a variety of project impact with participating communities across several dimensions | GROW |
| | | |
| **Data Quality & Visualisation** | **CATEGORY 3** | |
| Data Quality Module | Validation/Assessment of citizen generated data linked to a data visualization developed by GT2.0 | GT2.0 |
| Open Geospatial Consortium (OGC) Citizen Science Engineering Report | This reports provides recipes for aligning CS open data to OGC standards (see wiki: http://external.opengeospatial.org/twiki_public/CitSciIE/WebHome) | WeObserve CoP Interoperability |

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