eu-citizen.science

The Platform for Sharing, Initiating and Learning Citizen Science in Europe

Deliverable 3.1
Framework Report Describing Criteria and Rationale for Sharing and Selecting State of the art Citizen Science Resources

Reference

Please cite this work as:

Fraisl, D., Hager, G., See, L. (2020). *Framework report describing criteria and rationale for sharing and selecting state of the art citizen science Resources.* D3.1 of the EU-Citizen.Science project funded under the European Union's Horizon 2020 research and innovation programme GA No: 824580. Available at:

Document Identification Sheet

Project Ref. No.	824580
Project acronym	EU-Citizen.Science
Project Full Name	The Platform for Sharing, Initiating and Learning Citizen Science in Europe
Document Name	EU-Citizen.Science_D3.1_31032020.pdf
Security	Public
Contractual Date of Delivery	31.12.2020 (Month 12)
Actual Date of Delivery	18.03.2020
Type	Report
Deliverable number	D3.1
Deliverable name	Framework report describing criteria and rationale for sharing and selecting state of the art citizen science resources
WP / Task	3/1
Number of pages	35(54)

Authors	Dilek Fraisl, Gerid Hager, Linda See
Contributors	The EU-Citizen.Science Consortium
Review	Monika Mačiulienė (MRUNI) Fredrik Brounéus (Vetenskap & Allmänhet) Maria Vicente (MFCR)
Project Officer	Colombe Warin
Abstract	The aim of the EU-Citizen.Science project is to build a sustainable platform as a mutual learning space for citizen science in Europe through an inclusive and transparent approach. To achieve this aim, the project supports the development of a framework to identify, collect and share good quality citizen science resources and best practices. This deliverable (D3.1) "*Framework report describing criteria and rationale for sharing and selecting state of the art citizen science resources*" describes the set of criteria and actions for identifying good quality citizen science resources for the EU-Citizen.Science platform. It also explains the methodology of the criteria development process along with the challenges faced throughout. Finally, the report elaborates on the implementation of the criteria before and after the launch of the platform.
Keywords	Citizen science, Citizen science resources, Tools, Guidelines, Training resources

Table of Contents

Version Log

Version	Date	Released by	Nature of Change
V0.1	10/2/2020	Dilek Fraisl (IIASA)	Initial Outline
V0.2	27/2/2020	Dilek Fraisl (IIASA)	Core writing
V0.3	1/3/2020	Linda See (IIASA) Gerid Hager (IIASA)	Feedback
	10/3/2020	Monika Mačiulienė (MRUNI) Fredrik Brounéus (Vetenskap & Allmänhet) Maria Vicente (MFCR)	Review
V0.4	13/3/2020	Dilek Fraisl (IIASA)	Incorporating inputs from review
V0.5	17/3/2020	Dilek Fraisl (IIASA)	Final Draft for Submission

Definitions and Acronyms

CA	Consortium Agreement
CSA	Coordination and Support Action
Data	Information, in particular facts or numbers, collected to be examined and considered as a basis for reasoning, discussion, or calculation. In a research context, examples of data include statistics, results of experiments, measurements, observations resulting from fieldwork, survey results, interview recordings and images. The focus is on research data that is available in digital form. (European Commission, 2016)
Curation	Selection, preservation, maintenance and archiving of electronically stored data
EC	European Commission
ECSA	European Citizen Science Association
GA	Grant Agreement
H2020	Horizon 2020
IIASA	International Institute for Applied Systems Analysis
IPR	Intellectual Property Rights
Metadata	A description of data

Open Access	Access that is free to all and free of any restrictions
Open Data	Data that can be freely used, shared and built on by anyone for any purpose
PPSR	Public Participation in Scientific Research
Repository	A location in which data are stored or managed
RIA	Research and Innovation Action
RRI	Responsible Research and Innovation
SDGs	Sustainable Development Goals
TGMs	Tools, Guidelines and other Materials

Executive Summary

The aim of the EU-Citizen.Science project is to build a sustainable platform as a mutual learning space for citizen science in Europe through an inclusive and transparent approach. To achieve this aim, the project supports the development of a framework to identify, collect and share good quality citizen science resources and best practices.

This deliverable (D3.1) "*Framework report describing criteria and rationale for sharing and selecting state of the art citizen science resources (or TGMs – Tools, Guidelines or other Materials)*" describes the set of criteria and actions for identifying good quality citizen science resources for the EU-Citizen.Science platform. It also explains the methodology of the criteria development process along with the challenges faced throughout. Finally, the report elaborates on the implementation of the criteria before and after the launch of the platform.

1. Introduction

1.1. The EU-Citizen.Science Project

EU-Citizen.Science aims to build a sustainable platform and mutual learning space to mainstream citizen science as a means to address societal challenges of our time and for the future.

The platform will be the space where (i) initiatives, (ii) resources and (iii) outcomes that are relevant to citizen science are collected, curated, and made accessible to everyone, including volunteers, policy makers, media and academic institutions, among others. This ambitious agenda will be pursued through the following complementary activities:

- coordination of citizen science actions and leveraging of existing resources in the presently fragmented landscape of citizen science in Europe;
- engagement of quadruple helix stakeholders at all levels (local, national and European); and
- creation of a platform that will serve as a mutual learning space and a set of comprehensive training programs co-designed with and for different target audiences addressing their needs.

EU-Citizen.Science will adopt a transparent and inclusive approach in realizing the aforementioned objectives and promote interdisciplinary, cross-border, cross-sector collaboration. Its potential is expected to give rise to social innovation and new business models by stimulating new partnerships, and to promote effective, participatory and transparent decision making at various spatial and temporal scales within the EU.

Figure 1 below shows the goals, means of delivery and structure of the EU-Citizen.Science project. By consolidating activities, integrating knowledge and outputs, and increasing capacities at the local, national and global level, EU-Citizen.Science aims to build the platform that has the potential to be the "center" for citizen science in Europe and beyond. With 14 partners and 9 third parties from 14 European countries, and a variety of stakeholders representing networks, universities, CSOs, local authorities, natural history museums, and others, the project has the potential to achieve this goal.
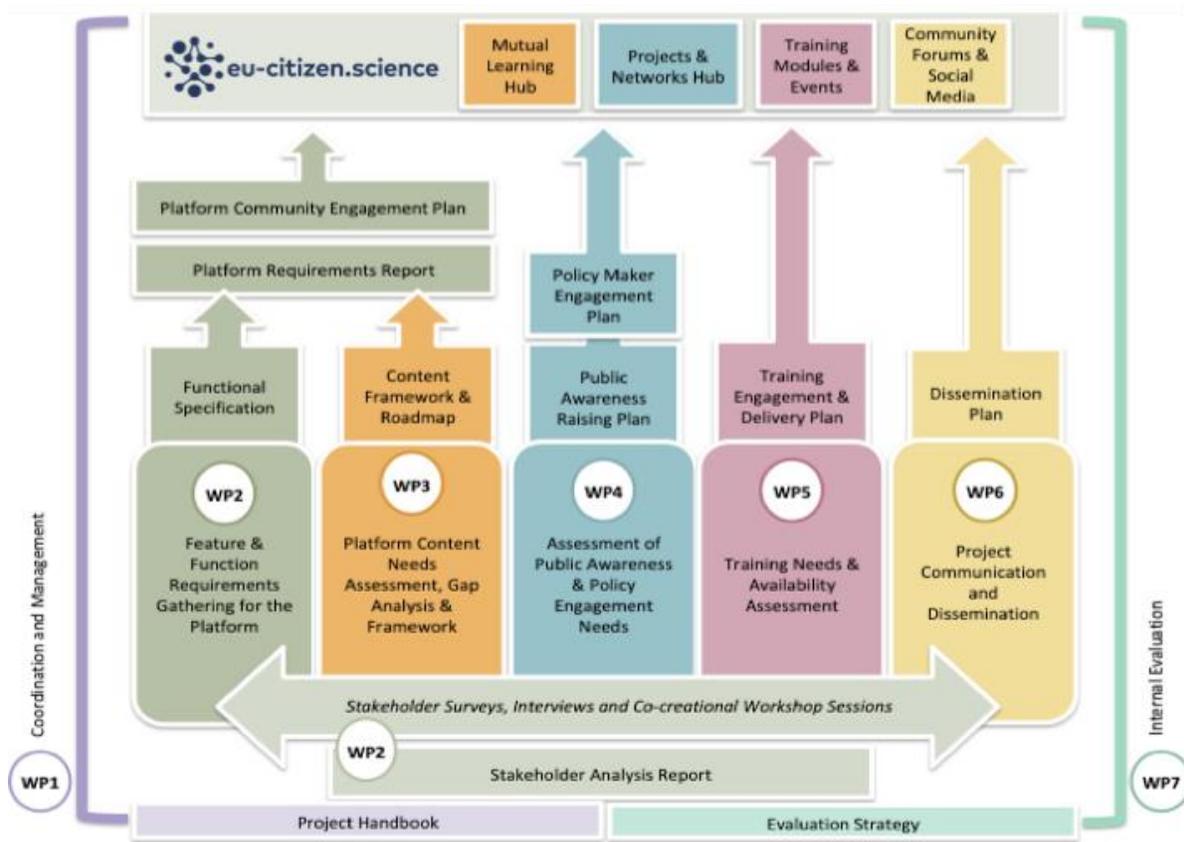
Figure 1: The goals, means of implementation and the structure of the EU-Citizen.Science project

1.2.   Work Package 3: Content – Framework, Quality Assurance and Curation

Work Package 3 (WP3) of the EU-Citizen.Science project aims to develop a framework to identify and facilitate the collection and sharing of high-quality resources and best practices of citizen science. These resources that the project describes as *"tools, guidelines, and materials (TGMs)"* could be written texts, diagrams and guidelines, toolkits, websites, videos, podcasts, publications, software, and more that are identified following an inclusive and community-driven approach.

The main objectives of WP3 are to:

- deliver criteria and a living quality roadmap that help define and identify:
  - citizen science resources and best practices, and
  - quality criteria that can be applied to the aforementioned materials for selecting them in the frame of the EU-Citizen.Science portal;
- curate current TGMs that could be useful to a broad set of actors from inexperienced users to professionals or from policy makers to career scientists that facilitate their engagement with citizen science.

WP3 consists of three essential tasks:

- Task 3.1 Criteria definition for collecting and sharing best practices in citizen science
- Task 3.2 Collating state of the art in citizen science: tools, guidelines and materials
- Task 3.3 TGM gap analysis and opportunity identification

Task 3.1 (T3.1), which results in this D3.1 "*Framework report describing criteria and rationale for sharing and selecting state of the art citizen science TGMs*", will feed into the other tasks of WP3. For instance, T3.2 of WP3 is about gathering TGMs for the platform using the criteria developed under Task 3.1. This effort will be documented through Milestone 7 (MS7), which is the *"TGMs on EU-Citizen.Science Platform"*. Furthermore, Task 3.3 *"TGM gap analysis and opportunity identification"* focuses on the gaps of the existing TGMs to provide recommendations to the citizen science community on where exactly the efforts need to be made to fill these gaps. The results of this task will culminate in D3.2 *"TGMs Gaps and Opportunities Analysis"*. The final deliverable of WP3 is D3.3 *"Review of Framework Implementation, defined in D3.1"*.

The results of Task 3.1 do not only provide the basis for WP3 but also for the whole project, as the criteria for TGMs underpin the EU-Citizen.Science platform.

In practice, the EU-Citizen.Science consortium is finding in practice that the term "TGMs" (tools, guidelines and materials) is unclear and may create confusion. Therefore, we now uniformly use the term *"resources"* to describe tools, guidelines and materials for citizen science.

1.3.   Purpose and Scope

The T3.1 and D3.1 aim to develop a set of criteria and actions to define and share good quality citizen science resources in Europe. The criteria are based on an integrated approach that is both expert- and community-driven. The idea is to create a quality assurance system that could support a living, well-balanced and sustainable high-quality repository.

The reason for criteria development is that there are many resources for citizen science in the literature. Hence, it may be difficult for a user, especially for a newcomer, to know where to start and which resources would be more useful for their context. As EU-Citizen.Science aims to mainstream citizen science to many stakeholders ranging from groups with no knowledge on citizen science to experienced professionals, the platform should address the needs of these diverse communities.

The purpose of this report and the related project task T3.1 is to develop criteria for identifying "*good quality citizen science **resources***", and NOT to create a quality criteria or standards for citizen science or citizen science initiatives, in general. For that reason, citizen science projects, although profiled on the platform, are outside the scope of the criteria developed as part of this task.

Nevertheless, we acknowledge that identifying the characteristics of citizen science is very useful, not only for creating the criteria for *"good quality citizen science resource*", but also for the citizen science community in general. Therefore, we agreed that these two initiatives (i) identifying the characteristics of citizen science,

and (ii) determining the criteria for citizen science resources should go hand in hand and feed into each other's processes. Both should be inclusive and community-driven. However, the former goes far beyond being an EU-Citizen.Science task or activity. Instead, it should be seen as a task for which the results would not only support the EU-Citizen.Science project, but also provide a framework on citizen science for the European and global citizen science community.

As mentioned above, as developing criteria for citizen science resources is the main focus of this deliverable, the methodology section below covers the processes for the citizen science resources criteria, which is as follows:

a. Participatory approaches and consultative meetings with expert input from the EU-Citizen.Science consortium (including the project preparation workshop, periodic project meetings and online meetings organized with projects partners, third parties and other Coordination and Support Action (CSA) and Research and Innovation Action (RIA) projects)
b. Screening of existing practices via a literature review
c. Review of relevant frameworks for criteria definition
d. Stakeholder and target audience needs analysis in WP2

2. Methodology of the Criteria Development Process

2.1. Participatory Meetings

Participatory meetings in the context of EU-Citizen.Science refer to an interactive way of capturing community knowledge by enabling participants to explore issues surrounding the topic and identify solutions. As part of T3.1 and D3.1, a range of face-to-face and online, content-outcome focused participatory meetings were held to gather information from the community throughout the criteria development process for citizen science resources.

2.1.1. Project Preparation and Proposal Writing Workshop

This workshop was held in Germany in February 2018 and was attended by 24 participants from 10 countries. Three working groups were created to discuss the framework, community building and training needs as well as the project concept and methodology. The workshop represented the first important step towards building a shared vision for the project among key stakeholders. Figure 2 provides some outputs from exercises undertaken during the workshop.

The main outcome of the meeting was an overview of the needs of the community in terms of citizen science resources, what is available in the literature on citizen science, and the gaps between these needs and existing resources, which shaped the project vision in general and WP3 activities in particular.

Figure 2: Images from the project preparation and proposal writing workshop in Berlin

2.1.2. EU-Citizen.Science Kick-off Meeting

At the EU-Citizen.Science kick-off meeting in Berlin on 20 February 2019, we held a knowledge sharing and planning workshop to discuss the potential criteria for identifying good quality resources and the next steps ahead for achieving this task. The workshop provided significant inputs to the citizen science resources quality work, as EU-Citizen.Science brings together the key players in the field of citizen science in Europe who collectively have considerable knowledge and expertise. At the workshop, we asked participants to divide into groups and answer three questions in a collaborative way:

1. Which citizen science resources do you consider to be of good quality?
2. Why do you think they are of good quality?
3. Considering the first two questions in the exercise, which criterion or criteria do you suggest for identifying good quality citizen science resources?

The results of this exercise were captured for use in developing criteria for T3.1 and gathering citizen science resources in T3.2. What the participants considered as important criteria to identify good quality citizen science resources varied from accessibility, readability, applicability, replicability and content, among others, which then fed into the criteria development process.

2.1.3. Consultation Meetings

In addition to the periodic project meetings and workshops, we set up separate meetings with the EU-Citizen.Science consortium partners and third parties to devise a plan to serve the needs and expectations of all project partners and the community. These meetings were held with the Natural History Museum Berlin (MfN), the European Citizen Science Association (ECSA), the Center for Social Innovation (ZSI), Austria (CSNA), University College London (UCL), the Ibercivis Foundation, the University of Natural Resources and Life

Sciences Vienna (BOKU) and the Citizen Science Network Austria (CSNA), among others. The meetings provided inputs from different WP leads of the EU-Citizen.Science project. In addition, they helped us identify areas of synergies within the project. For instance, UCL is leading WP5 on Training Needs, Assessment, Creation and Delivery, and one of the objectives of this WP is to gather training resources and identify training needs. Training resources are also part of citizen science resources, which is the subject of WP3. One of the most important contributions from different WPs to the criteria process included identifying the criterion on metadata, which is a cross-cutting theme in WP2, WP3 and WP5 as well as the whole platform, into which the activities of these WPs will feed.

2.1.4. EU-Citizen.Science First Project Periodic Meeting

At the first periodic face-to-face meeting in Vilnius on 12-13 September 2019, we had a three-hour workshop dedicated to the criteria work. The purpose of the workshop was to present the initial results of the criteria development process, which included a discussion on the following four scenarios along with their strengths, weaknesses, opportunities and threats (SWOT analysis):

Scenario 1: (i) Identify criteria for all types of resources (i.e., tools, guidelines, training resources and other materials) separately, including different criteria for each form of "other materials" (e.g., criteria for videos, criteria for publications, criteria for reports, etc.);

Scenario 2: (i) Identify criteria for all types of resources (i.e., tools, guidelines, training resources and other materials) separately as mentioned above, and (ii) determine a few overarching criteria that are applicable to all types of resources;

Scenario 3: (i) Identify a few overarching criteria that are applicable to all types of resources and, (ii) implement a rating system that allows the community to decide and provide feedback on resources that they consider to be of good quality;

Scenario 4: (i) Identify a few overarching criteria that are applicable to all types of resources, and (ii) a set of specific and supporting criteria that are applicable to all types of resources to provide a guideline on how to decide what "good quality" is, and (iii) implement a rating system that allows the community to decide and provide feedback on resources that they consider to be of good quality.

Following the presentation outlining the pros and cons of each scenario, the participants divided into different groups and further elaborated on each approach including the technical implications of adopting them for the platform, as well as their sustainability and workload required. This discussion continued through online meetings organized by the work package lead, IIASA, with participation from contributing partners of T3.1 and others from the consortium that were interested in joining the activity, which then became the "Criteria Task Force".

2.1.5. Online Criteria Follow-up Meetings

The objectives of the online meetings with project partners were to:

- decide which one of the above-mentioned approaches to adopt, considering the strengths and weaknesses of each scenario;
- identify the workflows and relevant definitions of the selected approach;
- run a test to assess the applicability of the criteria to some of the citizen science resources collected to date as part of the project;
- identify rooms for improvement based on the results from the test described in the previous objective; and finally
- determine the qualitative and technical steps required to implement the selected approach in the platform.

After a series of meetings, we reached a consensus on adopting scenario 4 described above. We then identified a two-stage process: (i) the steps needed to develop a starter set of resources and (ii) the steps needed after the platform is up and running. This approach was chosen as it combines both the expert and the community input – which directly aligns with the community-focused nature of citizen science and the EU-Citizen.Science platform – while at the same time providing a guideline and framework that is relatively easy to implement of what "good quality" means for citizen science resources in the context of EU-Citizen.Science.

The details of this approach, along with reasons for selecting it are discussed in detail in Section 3 of this deliverable.

2.1.6. Meetings with Third Parties and Other SwafS and RIA projects

EU-Citizen.Science has nine third parties that are linked to some of the project activities, particularly around the key milestones such as the platform launch, content creation of the platform, and criteria development. Their main role is to provide input, share ideas and feedback on the main project activities.

In EU-Citizen.Science, we acknowledge the importance of establishing and maintaining collaboration with other EU-funded running SwafS (Science with and for Society – EU Horizon 2020 program that addresses societal challenges) and RIA (Research and Innovation Actions – EU Horizon 2020 program that aims to establish new knowledge) projects on themes in common with EU-Citizen.Science. Regular information exchange to create synergies and avoid duplication, as well as sharing of knowledge and experiences are the main goals of this approach.

The EU-Citizen.Science project organizes regular meetings, both with the third parties and other SwafS and RIA projects, to ensure a broader consultation and outreach of the project activities. As part of these meetings, the criteria for citizen science resources and the development process were presented to both groups in different meetings several times to get their input on the activity. In addition, the document that describes the steps and the details for criteria implementation was shared with these groups for further and more

elaborated feedback. The feedback from these groups was then directly fed into the criteria development process.

2.2.   Screening of Existing Practices: Contextual Review

In order to identify the criteria for good quality citizen science resources, we conducted a focused contextual review. The purpose of this step was to understand what is available in the literature on "citizen science resources", and if there are any criteria defined to evaluate their quality. The idea was to build on existing knowledge and experience in the field. The upcoming sections summarize findings from the literature review on criteria development work that fed directly into the process.

We also reviewed the Citizen Science Network Austria (CSNA)'s Catalogue for Quality Criteria (quality criteria for the Österreich forscht platform), hackaday.io/lists and the scientix.eu platforms as practices that could be used as examples. For instance, the scientix.eu platform uses a community rating and comments system to enable resource users to become part of the quality process. However, these examples are not discussed further in this part of the methodology because mostly, their focus does not necessarily align with the task objective. For instance, the quality criteria for the Österreich forscht platform was developed to provide guidelines to the projects as to which criteria they should meet to be considered as a "citizen science project" and thus to be listed on the platform (Heigl et al., 2019). The criteria focused on the "quality of the citizen science initiatives" rather than the "quality of citizen science resources". Therefore, the criteria developed by CSNA are not directly within the focus of this deliverable, because they were created for a different purpose. Nevertheless, we considered the general idea and concepts of the aforementioned platforms and their technical implementation during both the criteria development process for citizen science resources and the identification of citizen science characteristics.

2.2.1.   Doing It Together Science Project Approach

Funded by the Horizon 2020 Research and Innovation Program of the European Union, the Doing It Together Science (DITOs) project aimed to raise awareness and public participation in citizen science (togetherscience.eu). As part of this effort, the project collected guidelines and scientific publications on citizen science to create a library for good practices in citizen science. The main focus of this exercise was the six components of Responsible Research and Innovation (RRI), which are (i) governance, (ii) science education, (iii) ethics, (iv) open access, (v) gender and (vi) public engagement. The goal was to explore how RRI is relevant to citizen science to identify synergies, and that RRI is a cross-cutting issue in the EU Horizon 2020 program.

The collection includes (i) guidelines and (ii) scientific papers and books that cover RRI areas and that are freely available online, and scientific publications that are both open source and not. The two lists created for guidelines and publications use the following legends to show the RRI key areas covered by the resources listed:

- ❑ E – Ethics
- ❑ GE – Gender Equality
- ❑ GO – Governance
- ❑ OA – Open Access
- ❑ PE – Public Engagement
- ❑ SE – Science Education

The DITOs team gathered the guidelines and publications listed on the above sites through a consultation process, where they asked ECSA members, DITOs consortium partners and the RRI Working Group of ECSA for suggestions as well as through desk research. They then adopted the RRI key areas as the key criteria to sort the review presented in this collection.

Figure 3 is a screenshot of the list that includes some of the guidelines and the RRI areas covered. For instance, the first guideline on the list shows that the "Green Paper Citizen Science Strategy 2020 for Germany" covers the "ethics", "governance", "public engagement" and "science education" key areas of RRI.

Selection of Guidelines that cover RRI Key Areas

RRI Key Areas Covered				Title	Author	Year	Language
E	GO	PE	SE	Green Paper Citizen Science Strategy 2020 for Germany	GEWISS	2016	English, German
		PE	SE	CS für alle - Eine Handreichung für CS - Beteiligte	GEWISS	2016	German
		PE		Storytelling für CS: Tipps zur erfolgreichen Konzeption und Durchführung eines Storytelling-Workshops	GEWISS	2016	German
E	GO	PE	SE	White Paper on Citizen Science for Europe	Fermín Serrano Sanz, Teresa Holocher-Ertl, Barbara Kieslinger, Francisco Sanz García and Cândida G. Silva	2014	English
		PE	SE	User's Guide for Evaluating Learning Outcomes in CS	Cornell Lab of Ornithology	2014	English
		PE		Introduction to the User's Guide for Evaluating Learning Outcomes from CS	Cornell Lab of Ornithology	2015	English
		PE		CS Framework Review: Informing a Framework for CSwithin the US Fish and Wildlife Service	Cornell Lab of Ornithology	2015	English
	GO	PE		Proceedings of the CS Toolkit Conference - June 20 - 23, 2007	Cornell Lab of Ornithology	2007	English
E		PE		Best Practices for Managing Intellectual Property in CS	Commons Lab	2015	English
E				Typology of CS Projects from an Intellectual Property Perspective	Commons Lab	2015	English
	GO			CS and Policy: A European Perspective	Commons Lab	2015	English
E	GO			Managing Intellectual Property Rights in CS - A Guide for	Commons Lab	2015	English

Figure 3: Screenshot of the list of guidelines that cover RRI Key Areas collected by DITOs

This approach helped us identify which of the RRI key areas are also common to citizen science. By building on the results of DITOs, we were able to capture synergies between citizen science and RRI quickly. This is further elaborated in the results section.

2.2.2.   SciStarter Tool Finder

The SciStarter Tool Finder aims to address the issue of the lack of access to citizen science tools, which could be a barrier to engaging in citizen science projects. The database offers a searchable inventory of software tools. The database helps project participants and scientists find the right tools for their purpose and context based on criteria such as the purpose of use and its cost. The database also incorporates feedback and reviews on the applications (Travers, 2019).

The tools database includes tools for setting up and implementing citizen science projects for water or air quality tracking, acoustic bat monitoring and soil testing, among others. The main audiences of the database are scientists, citizen scientists, and tool manufacturers. Any user can easily upload any tool, filling in the form after registering on the platform. Figure 4 is a screenshot from the landing page of the SciStarter Tool Finder.
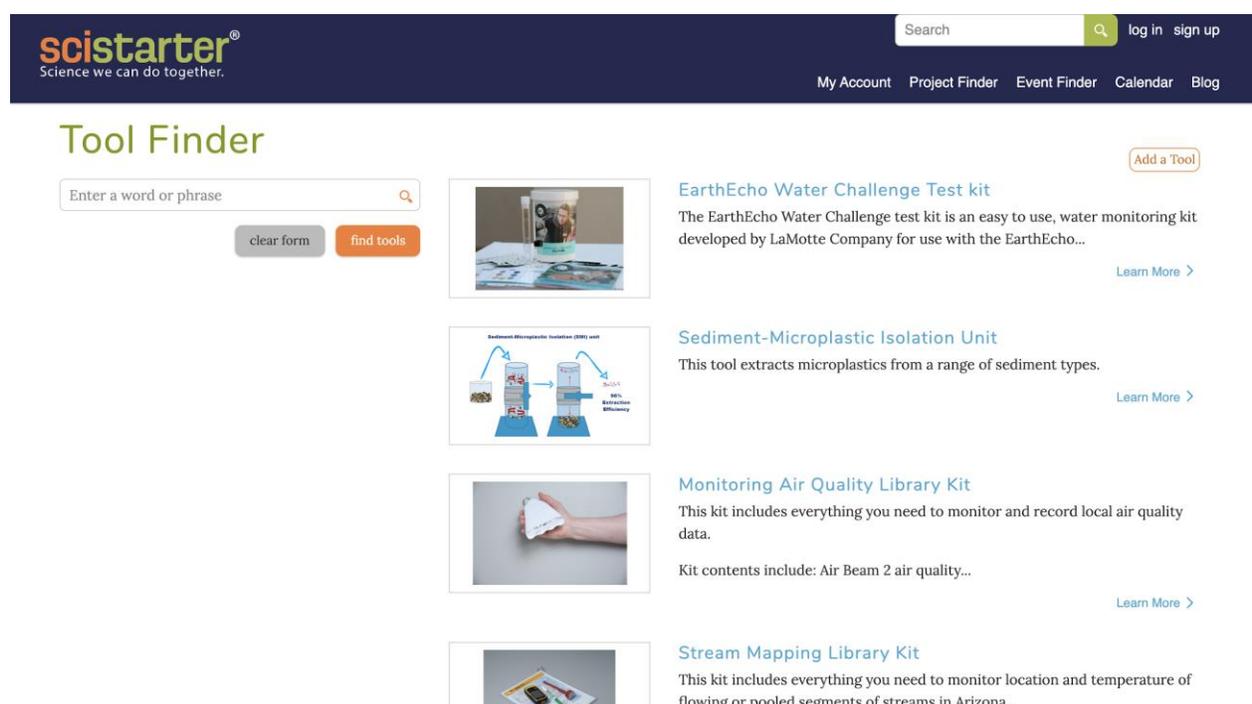
Figure 4: Screenshot from the landing page of the SciStarter Tool Finder

The SciStarter tools database uses a community-driven approach. The idea is to create a comprehensive hub for tools, and to empower the community through a simple and practical inventory to which they can contribute (Travers, 2019). The approach applied in Tool Finder helped us to form a perception of the community engagement aspect for the quality of resources in the EU-Citizen.Science platform.

2.2.3. Responsible Research and Innovation Tools

RRI Tools was a three-year project that aimed to foster RRI in Europe. Funded by the European Commission, the project developed a set of tools in the form of a catalogue that includes practical digital resources and actions aimed at raising awareness, training, disseminating and implementing RRI (https://www.rri-tools.eu/).

The catalogue brings together good practices identified through consultation with stakeholders and carried out by the project partners in Europe. Some of the EU-Citizen.Science consortium members included partners involved in the RRI Tools such as UCL. In addition, ECSA, one of the main partners of EU-Citizen.Science, worked together with the RRI Tools project consortium through signing an official agreement to explore how citizen science can enrich the RRI framework and to promote RRI considerations among citizen science communities. Therefore, we had good insights into the development processes of the RRI Tools project, which undertook a similar exercise on curating resources and best practices on RRI in the RRI tools platform. For the EU-Citizen.Science platform, we considered the lessons learnt from this project to collect and share citizen science resources. These included how to categorize and tag resources, what kind of information is collected on these resources, and how the community was engaged in the process, which is described in detail below.

2.3. Relevant Frameworks

After a careful review of relevant frameworks such as RRI, Open Science, SDGs, ECSA 10 principles, etc., we agreed to reflect the overall concepts and ideas from these different frameworks relevant to citizen science in our criteria development process. The 10 principles of citizen science cover the concepts and ideas of the other mentioned frameworks in a way that is directly related to citizen science. For example, the main purpose of the RRI framework is to ensure that science and innovation are inclusive and address societal expectations. RRI has six dimensions as mentioned in section 2.2.3, which are gender equality, science literacy and science education, open access, public engagement, ethics and governance. These concepts of RRI also have direct links to the Open Science agenda as it also aims to make science transparent, accessible, shared, collaborative and closer to society (Vicente-Sáez & Martínez-Fuentes, 2018). In addition, the UN Sustainable Development Goals (SDGs) also aim to address the biggest societal challenges of our time and the future. The aims of the aforementioned frameworks translate into a more concrete guideline in the 10 Principles of Citizen Science "for the field of citizen science". Hence, they are more applicable in practice to be embedded in the criteria work for citizen science resources.

More concrete examples would be that the 10 principles suggest that citizen science data and metadata are made public or the contributions from citizen scientists are acknowledged or program designs are evaluated for their wider societal or policy impact. This suggestion is also one of the principles of the Open Science movement and a dimension of RRI. Therefore, the framework of 10 principles of citizen science is included as an overarching criterion for citizen science resources, which is elaborated below.

Table 1 contains the 10 Principles of Citizen Science.

Table 1: 10 principles of citizen science

1. Citizen science projects actively involve citizens in scientific endeavor that generates new knowledge or understanding.
2. Citizen science projects have a genuine science outcome.
3. Both the professional scientists and citizen scientists benefit from taking part.
4. Citizen scientists may, if they wish, participate in multiple stages of the scientific process.
5. Citizen scientists receive feedback from the project.
6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.
7. Citizen science project data and meta-data are made publicly available and where possible, the results are published in an open access format.
8. Citizen scientists are acknowledged in project results and publications.
9. Citizen science programs are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.
10. The leaders of citizen science projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.

2.4.   Relations to WP2 Deliverables

There is a direct link between the criteria work carried out as part of T3.1. and WP2. This link to T2.1 has culminated in two deliverables in WP2:

1. Deliverable 2.1 (D2.1) Stakeholders, Network & Community Mapping Report, and
2. Deliverable 2.2 (D2.2) Multi-level Platform Engagement & Community Building Plan

D2.1 outlines the key stakeholders for EU-Citizen.Science as *"any person, group, or entity with a common interest or stake in the outcomes of the Project and the success of the Platform"*. The main stakeholder groups for the project are divided into six groups as (i) academia, (ii) the public, (iii) CSOs, Industry & SMEs, (iv) the press & media, (v) educators, and (vi) policy makers & funders. In order to more specifically focus on the actors

who will be relevant for the success of the Platform, the target Audiences of the platform have been identified as:

- Primary target audience that includes third-party partners; the immediate network of the *science of citizen science* professionals, and those undertaking similar initiatives to support citizen science in their home countries; and
- Secondary target audience, a broader community of "Science of Citizen Science" professionals; citizen science practitioners (scientists, DIY, CSOs, educators); citizen science consumers (science journalists, policymakers, funding bodies); future potential citizen scientists (who are still not aware of citizen science).

D2.2 describes the prioritization, a deep understanding of needs and expectations of main stakeholders and the key target audience of EU-Citizen.Science based on the results of D2.1 described above. D2.2 explores what would potentially motivate the target audience to engage with the Platform. The results show that the platform is expected to:

- present inspiring citizen science projects that are searchable by various criteria, such as country, thematic interests, stakeholder categorization, etc.
- feature citizen science initiatives that resulted in an impact and achievement on policy, community or society, to name a few
- support opportunities to network, collaborate and get in touch with peers
- consider the specific needs of "citizen science beginners" as well as "experienced practitioners" by curating resources such as "how to" start guides and other inspirational resources such as guidelines, toolkits, apps, etc.
- give citizen scientists and citizen science projects more visibility by, for example, publishing success stories of citizen scientists.

Task 2.1 and its resulting deliverables summarized above have fed into the criteria development process for (i) identifying relevant terms and their definitions such as "resources" and "good quality", among others; (ii) selecting categories for resources such as tools and guidelines; (iii) determining criteria and questions to define quality. All these steps are elaborated in the results section below.

3. Results

This section summarizes the results of the task undertaken by the EU-Citizen.Science partners on defining the criteria for identifying and curating high quality citizen science resources, following the methodology and steps described above.

3.1.   Relevant Definitions and Categories

The first step in identifying quality criteria for citizen science resources was to agree on what is meant by "citizen science resources" and "good quality citizen science resources'' in the context of the EU-Citizen.Science project.

We defined **citizen science resources** as "*resources and practices that could be used for help and support in the context of citizen science*". Citizen science resources can help an individual, a project or an organization to understand, implement and evaluate citizen science and citizen science practices, and demonstrate the value of citizen science to different audiences.

G*ood-quality citizen science resources* are "*resources that are easy to access, implement and adapt; well structured; clearly described; written with a clear language and ideally have an impact (e.g., on science, policy or society, etc.); and therefore useful to the citizen science community and beyond*".

Once we agreed on the definitions, the next step was to identify the categories of these resources. As the concept of resources is quite broad, a classification was required. Based on the EU-Citizen.Science project description and the needs and expectations of the community presented in the WP2 deliverables summarized in section 2.4 above, (i) tools, (ii) guidelines, (iii) training resources and (iv) other materials were selected as categories of resources in the context of the project. The definitions of these categories are described below:

> **Tools** are *"any software or hardware to help perform a particular task or work in citizen science initiatives (e.g. water quality equipment, air quality sensors, etc.)"*.

> **Guidelines** are *"a set of rules and instructions that could be helpful in designing, implementing or evaluating citizen science or initiatives relevant to citizen science. Guidelines are **written texts** such as reports, deliverables, briefings, etc.".*

> **Training resources** are *"some form of instructional material in relation to citizen science often related to 'how to do' citizen science. Some examples include MOOCs, (online) workshops, webinars, gamified training, quizzes, etc.".*

> **Other Materials** are *"resources other than "tools", "guidelines" and "training resources" that are about or relevant to citizen science".*

As other materials address a broad spectrum of resources, it would be difficult to identify how the overarching criteria could be applied and which specific and supporting criteria would be relevant to them. Therefore, the project partners agreed to classify other materials in seven categories described below:

> **Libraries:** *An organized set of resources such as databases, repositories, toolkits and toolboxes that bring together relevant documents for a particular purpose in citizen science initiatives.*

> **Scientific publications:** *Publications where scientific knowledge on citizen science is shared.*

Websites: *Websites, platforms, webpages where citizen science related content is published.*

Reports: *A document that presents information on citizen science or on topics relevant to citizen science.*

Audio: *Any resource with sound that includes citizen science related content such as podcasts, audio books, radio broadcasts, etc.*

Visuals: *Any resource that includes visual content such as videos, diagrams, figures, illustrations, etc.*

Miscellaneous: *Any resource that does not fit the definitions of the first 6 subcategories under "other materials".*

Note that these definitions are not designed to be exclusive, but just as guidance to help moderators to decide on the category for each resource, as one resource may fall under different categories and terms.

Additional consideration is that we agreed to handle citizen science projects differently than the citizen science resources within the platform. This is because these projects will not follow the same quality criteria structure as the categories of resources defined above due to their diverse and unique nature. Instead, citizen science characteristics described in section 3.2.1 will be used as a basis for selecting citizen science projects that will be listed on the platform.

Following the step where we identified the appropriate classifications and definitions for the platform, we defined the overall approach to determine the processes of implementation. We agreed on a combination of two methods: (i) a top-down approach to establish criteria to build a repository of resources and (ii) a more democratic, bottom-up approach to allow users to collaborate in the process of resource selection and inclusion. These steps are described in the following sections.

3.2.   A Top-down Approach to Criteria

As described in the methodology section above, we first identified the strengths, weaknesses, opportunities and threats (SWOT) of applying a detailed set of criteria in comparison to a few overarching criteria. We decided to (i) determine a few generic criteria that are applicable to all categories of resources, and then (ii) identify a set of "specific" and "supporting" criteria to provide guidelines for how to decide what "good quality" is, which was identified as part of a community building exercise undertaken by project partners, and finally (iii) implement a rating system and a feedback tool that allows the community to decide which resources are most useful for them. This approach was considered to be the best way to address the diverse needs and expectations of different target groups of the platform. This process is not meant to be a single solution, as different circumstances may require different approaches. Some guidelines that prove to be useful for one particular case or a target group may not work well in other cases or for other groups. Therefore, this whole process requires community ownership that facilitates and encourages user input, which will be elaborated in section 3.3 below.

An important advantage of the process identified here is that it is relatively easy to apply and implement during the EU-Citizen.Science project lifetime and beyond, as it could be introduced to the community to take ownership of the process at a later stage, which would make it more sustainable and dynamic. In this way, minimal overarching criteria were identified as "required" as well as a "suggested" criterion as part of the project for classifying citizen science guidelines and other resources.

3.2.1. Overarching Criteria for Citizen Science Resources

We have identified three overarching criteria that are applicable to all categories of resources: two required criteria and one suggested criterion.

Required Overarching Criteria:

The following two criteria will be used for all types of resources to be featured on the EU-Citizen.Science platform:

Criterion 1: The resource is about or relevant to citizen science

This criterion requires a shared understanding among the moderators of the EU-Citizen.Science platform regarding what counts as citizen science. The 10 Principles of Citizen Science, which have been well received and adopted by the global citizen science community, have remained as a broad and vague grouping of best practices that could be interpreted differently to what we consider citizen science. For that reason, we decided to develop a set of characteristics for citizen science that addresses the areas of ambiguities and explains the range of activities that could or could not be identified as citizen science. Our aim was to develop characteristics that allow different stakeholders and target audiences of the EU-Citizen.Science project and beyond to identify which of these are the most relevant to their own particular context and needs.

In terms of the methodology for the development of characteristics, we first identified areas of ambiguity about the classification of a project. We grouped them as ten factors including data sharing, incentives, degree of engagement, data sharing among many others, and over sixty sub-factors that could be relevant to an activity. We then set up a vignette study with 50 examples of activities that involved the public in one form or another in order to assess which of these factors affect the understanding of citizen science. Most of these examples were selected from the literature in addition to some others created specifically for this work. In the next phase, we selected five examples for activities in which there is consensus in the literature, and five for activities that are frequently mentioned as not citizen science such as a one-way public consultation. For the remaining cases, we identified sub-factors to provide a range of examples of potential public involvement in research. We used all these examples for a survey in December 2019, for which we received over 330 responses. Respondents included a wide variety of groups within the research community and outside such as those who identified themselves as citizen scientists. Their level of expertise also varied from participants with a long experience in citizen science or people who are new to the field. Therefore, we had a diverse representation and coverage of views that showed many different interpretations of citizen science. A significant amount of comments we received in the survey aided the process of interpretation of responses. The citizen science characteristics were developed to address and represent the richness of these views.

Our analysis showed that citizen science is a term that is used to describe a wide range of activities and practices. It could be understood by considering the characteristics of these activities and practices from different scientific disciplines including natural sciences, social sciences and beyond. The interpretation of what counts as citizen science can be different in these distinct disciplines. However, despite these differences, citizen science is an emerging area of research and practice, with evolving standards on which different stakeholders are developing methodologies, theories and techniques. It is therefore useful to establish some level of shared understanding across disciplines to clarify the expectations from a project that is called citizen science.

The near complete version of our analysis is included in this deliverable as an appendix (final version is planned to be made public in April 2020), as the main purpose of this deliverable is to present the criteria developed for citizen science resources, not the characteristics of citizen science, as mentioned before. However, due to the direct link between these two processes (characteristics being the basis for this criterion), we presented the process and the main results of the study above. These processes (characteristics of citizen science and criteria for citizen science resources) are currently running in parallel as two EU-Citizen.Science project initiatives and are informing one another.

Criterion 2: The resource has the following metadata available

Standard metadata are important for establishing a common approach to classifying and searching for resources in the EU-Citizen.Science platform, and to provide a framework for emerging resources. The metadata we require for the platform are not designed to capture all the details of each resource, but to provide shared aspects of diverse resources that are applicable to all domains.

We have recognized the need to make this definition and the metadata work simple and applicable to ensure its use and uptake and maintain a balance between the detail in terms of what we want to cover and how acceptable and easy it is to use by the target audiences of the platform. Therefore, following the standards from schema.org for a DigitalDocument, we identified a set of metadata to be applied to all resources. Table 2 shows the set of metadata for classifying citizen science resources.

Table 2 - The metadata for classifying citizen science resources in the EU-Citizen.Science platform

Basic information (required fields in bold)	Description
about	The subject matter of the content
abstract	A short description that summarizes the guideline

aggregateRating	The overall rating, based on a collection of reviews or rating
audience	An intended audience, i.e., a group for whom something was created
author	The author of this content or rating
datePublished	Date of first publication
inLanguage	The language of the guideline
keywords	Keywords or tags used to describe the guideline
license	A license document that applies to this content, typically indicated by a URL
publisher	The publisher of the guideline
image	An image of the guideline
name	The name or title of the guideline
url	The url of the guideline

Suggested Overarching Criterion:

The following criterion is a suggested one that the moderators of the platform are encouraged to use if the type and the characteristics of the resource allows a meaningful evaluation.

Criterion 3: The resource engages with the 10 principles of citizen science

Although updating is needed due to the constantly developing nature of the field of citizen science, the 10 principles of citizen science are widely accepted within the citizen science community as a general framework that provides guidance and direction for any scientific endeavour. Using adherence to these principles as a criterion is therefore encouraged to align with the general ideas embodied in the 10 principles of citizen science. The decision on whether a resource engages with the 10 principles of citizen science will be done in light of the interpretation by Robinson et al. (2018) together with the characteristics of citizen science as mentioned above.

The reason for this criterion to be a "suggested" one, instead of a "required" criterion, is that the 10 principles may be applicable for some resources, but not for all, depending on the type of resource (e.g., water quality monitoring equipment does not necessarily need to engage with the 10 principles) and the complexity of a resource for criteria implementation (e.g., a repository on citizen science may include many individual resources but it is impossible to check each and every one of them actively due to limited resources available in the project). Therefore, criterion three does not have to be applied to such resources, but instead only relevant ones. However, its active use is recommended for resources to which it could be applicable. EU-Citizen.Science definitions of categories and the peculiarity of the resource will be considered while making a decision on whether this criterion could be applicable to a resource or not. This decision will be made by the moderator or the user uploading a resource to the platform. This also holds true for identifying "relevant specific" and "supporting" criteria, the next step of the criteria process, which are described below.

We consider citizen science characteristics and 10 principles of citizen science as two different overarching criteria, even though the characteristics work is based on and refers to the 10 principles. The reason for that is the criterion one is about identifying whether a resource is about or relevant to citizen science. The criterion three however encourages the moderator to assess the content of a resource in terms of its engagement with the broader, fundamental principles of the field citizen science.

Only the resources that pass the first two criteria described above (required criteria) can proceed to the second step of the criteria implementation framework below, which is the evaluation against the "specific" and "supporting" criteria. Criteria three, does not need to be met for a resource to proceed to the next step, as it is a suggested criterion, as explained above.

3.2.2. Specific and Supporting Criteria for Citizen Science Resources

This step will initially be used as guidelines that will help moderators identify and decide on the starter set of resources that will be made available in the EU-Citizen.Science platform. The purpose of this step is to aid the curation of resources for the start of the project in order to create a "shared understanding" of what good quality is.

After applying the overarching criteria and only if the resource passes the first two criteria that are required, it can then reach this second step to be assessed against relevant "specific" and "supporting" criteria. Table 3 below shows the potential relevant specific and supporting criteria to help moderators identify which criteria could be more relevant to a specific category of resources.

Specific Criteria

We identified nine 'specific criteria' that are agreed by the project partners. The characteristics of a particular resource will be considered when making a decision regarding which of the nine criteria are relevant to it. The nine statements or specific criteria are classified under 5 quality aspects identified based on the results of the community needs and expectations that are described in section 2.4 above and the experiences of the project partners. These are as follows:

- Access to the resource
- Readability and Legibility
- Content
- Applicability
- Object

The answers to these statements range from 'strongly agree' to 'strongly disagree' on a five-point scale. If the total rating exceeds the threshold, which is 50% of the total highest points that a given resource could achieve based on the relevant questions that are applied to it, then it will be listed on the platform as a good quality resource. For example, if the resource is a guideline, it is highly likely that 8 questions out of 9 will be applicable to it (see Table 3 for the potentially relevant questions in each category of resources). As the rating is 1 for strongly disagree and 5 for strongly agree, the highest score that a guideline could potentially get is 40. Based on the process described here, if the total points of an assessed guideline is 20 or more, it will be listed on the platform.

Here are the nine specific criteria under the five quality aspects:

Access to the resource:

1. **The resource is easy to access** (e.g., the registration process).

Readability and Legibility:

2. **The resource is clearly structured according to the type of the resource** (e.g., if a scientific paper or a report, it includes an introduction, methodology, results, discussion and/or conclusions; or if a methodology document, it includes an introduction, audience description, step by step methodology, and an example)

3. **The resource has a clear language** (e.g., it is easy to read and understand for the intended target audience and it is concise - for example, if the intended user is a general audience, it is free from ambiguity, rare words and jargon - and even when they need to be used, their meanings are explained clearly)

4. **The resource pays attention to basic formatting** (e.g., titles, paragraphs and references are easy to capture; grammar and spelling is correct; legible font and adequate font size is used)

Content:

5. **The resource clearly describes its aims, goals and methods**

Applicability:

6. **The resource is easy to implement** (this touches on how the resource could be implemented, the context in which it could be useful, and it provides recommendations for its further use)

7. **The resource is easy to adapt to different cases** (it explains the limitations of the resource, the context in which it could be useful, and it provides guidelines or recommendations for its adaptation to different cases)

Object:

8. **If the resource is an audio object, it is clearly audible** (no interruption, no background noise, etc.)

9. **If the resource is a video, an image or illustration, the quality is good enough** (e.g., clear and sharp)

The five-point rating system for the answers to these criteria is shown in Figure 5.

| Strongly disagree (1 point) | Disagree (2 points) | Neutral (3 points) | Agree (4 points) | Strongly agree (5 points) |
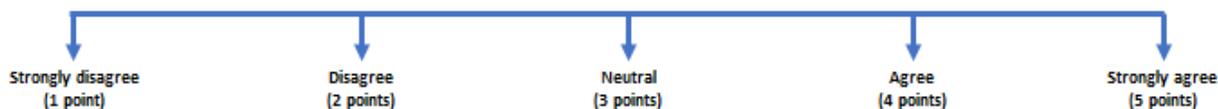
Figure 5: Answers and rating for the specific criteria

Supporting Criteria:

'Supporting criteria' include two evaluation and two impact related statements or criteria. The supporting criteria include only suggested criteria to help moderators make a decision regarding whether a resource should be listed on the platform but are not included in the rating of the specific criteria. Instead, the moderator is encouraged to consider them to strengthen their argument on whether the resource should be on the platform. In other words, supporting criteria will only be used to aid moderators in better evaluating the quality of a resource (particularly if/when in doubt). Therefore, the answers to these questions will not be added to the calculations of the specific criteria described above.

We classified the supporting criteria as two aspects for quality: evaluation and impact. Below are the questions for these aspects together with their answers:

Evaluation:

10. Was the resource used or is it currently being used in the context of citizen science or in a relevant initiative? (This could be answered based on the knowledge of the moderator/s and if the resource itself mentions this.)
    a. Yes, the results are positive (no score - supporting argument)
    b. Yes, the results are negative (no score - supporting argument)
    c. Yes, the results are not available or not known (no score - supporting argument)
    d. No, the resource is not used in a different context
    e. Don't know

11. Has the resource been evaluated before in terms of the content, methods and results? (This could be answered based on the knowledge of the moderator/s and if the resource itself mentions this.)
    a. Yes, evaluated with positive results
    b. Yes, evaluated with negative results
    c. Yes, evaluated with mixed results
    d. Yes, the results are not available or not known (no score - supporting argument)
    e. No, not evaluated
    f. Don't know

Impact:

12. Does the resource refer to an impact (e.g., on science, policy, society, etc.) that it had in the past and/or is currently having and/or it could have in the future?
    a. Yes, (reason to support the inclusion decision, if the result is good)
    b. No, (reason to exclude as this is a supporting criterion, but is just for info)
    c. Don't know

13. If the resource refers to an impact, has this been measured somehow?
    a. Yes, (reason to support the inclusion decision, if the result is good)
    b. No, (reason to exclude as this is a supporting criterion, but is just for info)
    c. Don't know

While we agreed on the need for implementing a framework that defines quality, we also shared the opinion on avoiding the application of very strict criteria is important. In the end, the purpose of this exercise is applying certain standards to define quality based on the community needs and expectations, but at the same time not being exclusive. Different resources may be helpful in specific contexts, and thus the quality of a resource could be context-dependent and subjective. Therefore, we also agreed to allow the community to define resources that are useful for them and to provide feedback on these resources as described in the following section.

Figure 6 illustrates the workflow that is described in the top down approach above for the starter set of resources that will be made available on the platform with its launch.
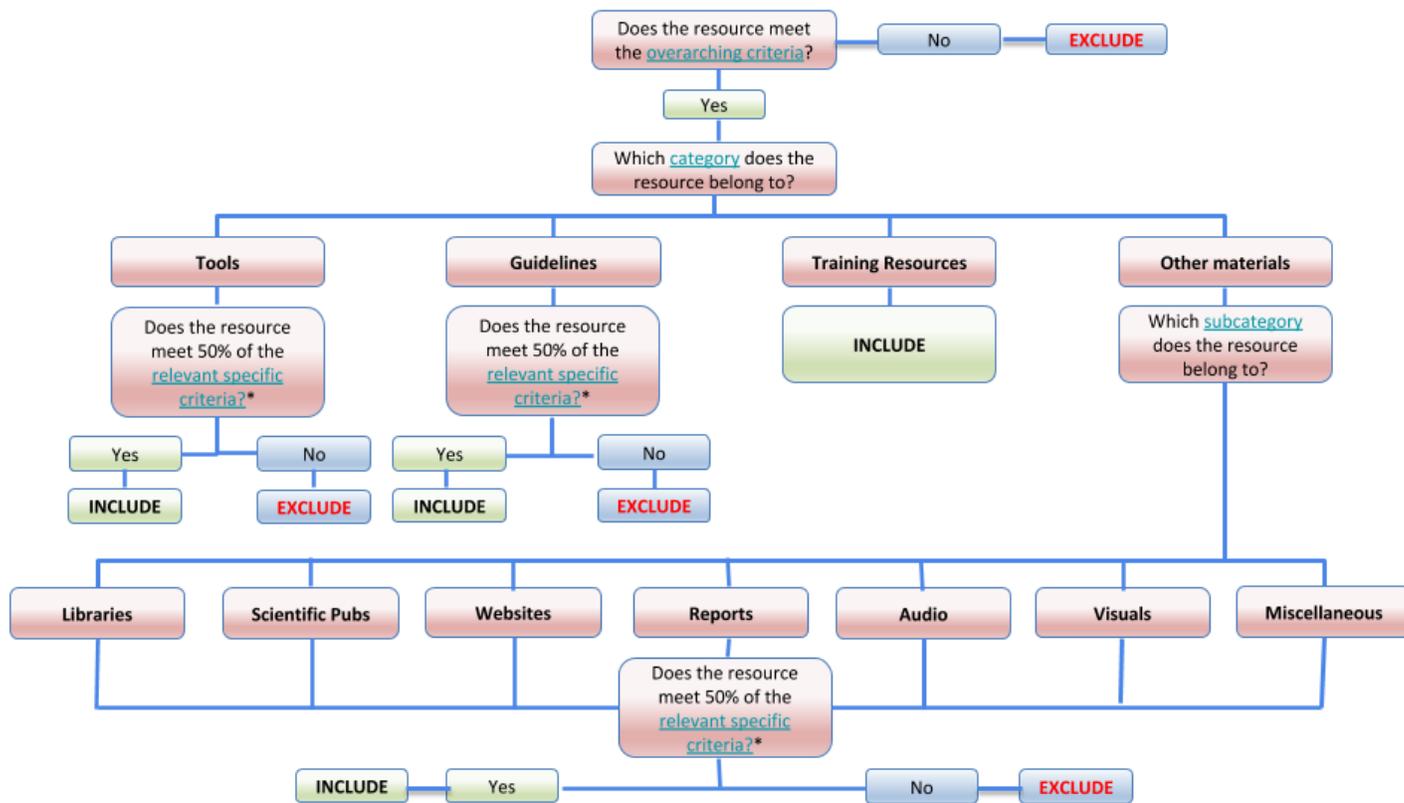
Figure 6: Quality Criteria Workflow

Table 3 shows specific and supporting criteria that could be relevant to each category of resources. Note that this is just a recommendation for moderators to facilitate their decision-making process. The moderators are encouraged to decide, based on the specific characteristics of a resource, which criteria could be applied to a particular resource, which are called "relevant specific criteria" and which are "relevant supporting criteria". After this phase, a resource will be included in the platform if it meets 50% of the "relevant specific criteria" identified by the moderator. The "supporting criteria", as mentioned before, are not mandatory to implement, but are designed to help moderators better evaluate the quality of a resource (particularly if/when in doubt).

Table 3: Relevant Specific and Supporting Criteria in relation to Figure 2

Relevant Specific and Supportive Criteria for Categories

	Specific Criteria									Supporting Criteria			
	Access	Readability			Content	Applicability		Object		Evaluation		Impact	
	1	2	3	4	5	6	7	8	9	10	11	12	13
Tools	x				x	x	x			x	x		
Guidelines	x	x	x	x	x	x	x		x*	x	x	x	x
Training Resources	NO SPECIFIC CRITERIA TO IMPLEMENT									NO SUPPORTING CRITERIA TO IMPLEMENT			
Libraries	x	x	x	x	x	x	x		x*	x	x	x	x
Scientific Pubs	x	x	x	x	x	x	x		x*	x	x	x	x
Websites	x	x	x	x	x				x*		x	x	x
Reports	x	x	x	x	x	x	x		x*	x	x	x	x
Audio	x	x	x		x			x			x	x	x
Visuals	x	x	x		x	x	x	x	x	x	x	x	x
Miscellaneous**													

In the table above, X* is only applicable when the resource has some figures, tables and/or other visuals. For example, when a scientific publication also has figures, this criterion is relevant.

For the sub-category "miscellaneous" under the category "other materials", we do not share any recommendations on which specific or supporting criteria could be applied due to the wide variety of resources that could fall under this subcategory. The moderator should decide on the relevant specific criteria based on the resource itself and then implement the 50% rule, as explained above.

The step on implementing the specific and supporting criteria is particularly useful in the context of T3.3 (Resources Gaps Analysis and Opportunity Identification) as the results will be used to identify what the gaps are in existing resources and how they could be improved.

The information on how this step will be used after the platform is up and running is elaborated in section 3.4 below.

3.3. A Bottom-up Approach to Criteria

To ensure an inclusive process that is led by experts but also the community, we combine top-down with bottom-up approaches for collecting and sharing high-quality resources for citizen science. Participants will be able to upload resources that they find useful to the EU-Citizen.Science platform using the same overarching criteria identified by project partners, and to rate the existing resources on the platform based on their own experiences with them. They can also leave detailed comments on the challenges or opportunities of using a particular resource.

While we are still in the process of identifying the technical implementation of the criteria, we are also aware of the limitations of the process of identifying the quality of citizen science resources. However, reaching a consensus on a process that is inclusive and bottom-up, and at the same time that meets the needs and the expectations of different target groups of the platform, is not an easy task. We are at the stage of implementing this process after a year of consultation to agree on the curated resources in the platform, once launched. It is important to highlight that this process is still not final, and needs improvements during the project lifetime and beyond, also considering the dynamic nature of citizen science.

3.4. Next Steps: After the Platform is up and running

After the platform is up and running, the overarching criteria will be implemented as described in section 3.2.1 above. At this stage, the community will be able to upload resources that they find useful by implementing these three criteria. The reason is that one of the aims of EU-Citizen.Science is to empower the community by building trust and have them take ownership of the platform including the implementation of the citizen science resource criteria process.

The bottom up approach will also be applicable for exactly the same reason. As part of this step, users of the platform will be able to rate, evaluate and provide feedback on resources that are made available on the platform.

The feasibility of actively using the second step of the top-down approach, which includes the implementation of specific and supporting criteria will be evaluated. Based on the amount of uploads from the community, we will assess:

- If the implementation of the specific and supporting criteria could still be handled within the project consortium, and/or

- If the community could be mobilized and engaged in implementation of this process (e.g., either while uploading a resource, the user could also evaluate the resource against these criteria as well, or we implement a "a community checkers system" where some community members could volunteer to check the uploaded resources against these criteria, and/or

- If leaving the criteria optional to answer while the users upload a resource would bring any added value.

The whole process will be transparent, and the described criteria development process will be made available on the platform not only to ensure transparency, but also to provide a basis and guidance to other existing and emerging platforms on citizen science at the local, national and global levels.

4.   Conclusion

This deliverable outlines the task carried out as part of WP3 of the EU-Citizen.Science project on developing a framework to identify good quality citizen science resources. The result of the process is an approach that integrates top-down and bottom-up perspectives that are both expert- and community-driven. This approach is chosen not only for ensuring quality, but also for its potential to foster a living, well-balanced and sustainable high-quality repository for citizen science resources. The approach has been well received by all project partners and beyond the project consortium as it addresses the diverse needs and expectations of different target groups of the platform, but at the same time empowers the community to take ownership of the process and be an active part in identifying and producing good quality resources. In time, the quality framework is expected to carry an important function of guiding and influencing how new resources are developed in line with its criteria.

Nevertheless, the agreed process has its own challenges, such as the complexity of implementation and the sustainability of the approach after the EU-Citizen.Science project comes to an end. Even though these two issues have been the main consideration since the start of the quality framework task, it is a steep challenge to come up with a result that meets the needs of a diverse audience with different expectations and to simultaneously build a community that will eventually assume ownership of the platform. Here, we need to have a certain level of flexibility in the processes to see how the community responds to these efforts.

Another learning from the process is that regardless of how simplified the process is, "quality" in general is a very subjective concept. People have different ideas and views on what constitutes quality, which makes it difficult to turn the process into a standardized methodology. In our efforts to develop a quality assurance process for citizen science resources, a further challenge has been to take into account the complexity of citizen science itself, as an emerging field. This also illustrates the importance of creating an active community who will keep developing the quality assessment processes as the field develops.

Considering all these points, the next step for us is to implement the results of this work when selecting the starter set of resources for the platform, which has already begun. We will then follow the reactions of the community very closely and keep improving the process based on feedback both in terms of the technical implementation of the process and its qualitative outcomes. The project provides the possibility to review and improve the criteria until almost the end of the project, and submit another deliverable on this topic, D3.3 Review of Framework Implementation defined in D3.1, in month 30 of the project.

REFERENCES

Auerbach, J, Barthelmess, E. L, Cavalier, D, Cooper C. B, Fenyk, E, Haklay, M, Hulbert, J. M, Kyba, C. C. M, Larson, L. R, Lewandowski, E, Shanley, L. (2019). The problem with delineating narrow criteria for citizen science. PNAS, 116 (31) 15336-15337. DOI: https://doi.org/10.1073/pnas.1909278116.

Coulson, S., Woods, M., Taylor, N., Cotton, C. (2019). *Develop infrastructure and WeObserve toolkits for scaling up citizen engagement in citizen observatories.* Deliverable 3.1 of the WeObserve project funded under the European Union's Horizon 2020 research and innovation programme GA 776740. Available at: https://www.weobserve.eu/wp-content/uploads/2019/05/D3.1-776740-WeObserve-Develop-infrastructure-and-WeObserve-toolkits.pdf

ECSA (2015). "Ten principles of citizen science". European Citizen Science Association. Available at: https://ecsa.citizen-science.net/engage-us/10-principles-citizen-science

General Information on "Doing It Together Science". http://www.togetherscience.eu

General Information on "SciStarter Tools Database". https://scistarter.com/tools

Heigl, F, Kieslinger, B, Paul, KT, Uhlik, J and Dörler, D. (2019). Toward an international definition of citizen science. PNAS, 116 (17): 8089–8092. DOI: https://doi. org/10.1073/pnas.1903393116

Travers, J. (2019 February 14). New citizen science tools database to discover and access the right instruments [Blog post]. Retrieved from: https://blog.scistarter.com/2019/02/new-citizen-science-tools-database-to-discover-and-access-the-right-instruments/

APPENDIX 1: Characteristics of Citizen Science

Near Complete Version

Work in Progress: Final Version is planned to be available in April 2020

Introduction

Citizen science is a common name for a wide range of activities and practices. It is possible to understand it by considering the characteristics of those activities and practices, which are described in this document. These are found in different scientific disciplines - from the natural sciences to social sciences to humanities - and within each discipline, the interpretation of citizen science can be slightly different. Yet despite these differences, citizen science is an emerging area of research and practice, with evolving standards on which different stakeholders are developing methodologies, theories and techniques. It is therefore useful to establish some level of shared understanding, across disciplines and practitioners, as to what to expect from a project that is set out to be citizen science one.

There is little doubt that a project with an open call to a wide range of volunteers to take part in either data collection or data analysis of a clearly defined research hypothesis will be recognised as citizen science. However, this is only one type within a large set of activities, practices and forms of participation, resulting in diverging views about what is - and isn't - citizen science. Because of these differences in disciplinary and cultural contexts, attempting to define a universal set of rules for exclusion or inclusion is difficult, and might even limit the advancement of the field.

Instead, this document attempts to represent a wide range of opinions in an inclusive way, to allow for different types of projects and programmes, where context-specific criteria can be set. The characteristics outlined in this briefing are based on views found across the citizen science and wider scientific community. Our aim is to identify the characteristics that should be considered when setting such criteria (for example a funding scheme), and we call upon readers to determine which subset of these characteristics is relevant to their own specific context and aims.

These characteristics build on (and refer to) the ECSA 10 principles of citizen science ("the 10 principles") as a summary of best practice - and projects are expected to engage meaningfully with them. Where it is especially pertinent, we refer to them in the characteristics below.

The following sections outline the characteristics of citizen science. These are grouped into five sections: core concepts; disciplinary aspects; leadership and participation; financial aspects; data and knowledge. Further explanation and background are provided in the "ECSA's Citizen Science Characteristics - Explanation" document. Note that we use the terms 'scientific research' and 'research' interchangeably - and we explain these terms from the perspective of citizen science practices.

Core concepts

Science and research. Citizen science practices cross disciplinary boundaries: some belong to fields widely acknowledged as scientific research, while others fall under the general term 'research', especially in the arts and humanities. Citizen science can describe many of these activities, especially when they comply with the 10 principles. We use 'scientific research' to refer to research in the sciences, social sciences, humanities and the arts.

What counts as scientific research? In common with scientific research in general, citizen science can address a topic that is basic or applied, inductive or deductive, local or global. In specific contexts, it is appropriate to identify a subset of activities (explicitly include environmental monitoring, or focus on hypothesis-driven research). To ensure rigour, the research should follow protocols and practices in line with the disciplines within which the research is framed.

Intention and framing. In many fields, but particularly medical and health sciences and social sciences, there is a subtle difference between citizen science activities and traditional practices that view participants as subjects of research, or as participants in a survey or workshop. Therefore, the decision to call an activity citizen science should include an articulation of which aspects justify this, for example by referencing the 10 principles.

Hypothesis-driven research, monitoring, and scientific database creation. Research in citizen science can take many forms, and the roles of the participants can include: collecting or analysing data to support or refute a hypothesis; monitoring environmental or health conditions; and creation of generic data within a domain to support a wide range of research questions (such as digitising art collections, observations or mapping). In a citizen science project, it can be appropriate to focus exclusively on some of these activities (for example only hypothesis-driven) in specific contexts, for example when this is required by funding agencies.

Roles and responsibilities. In citizen science, there are contexts in which it is appropriate for citizens and scientists to be considered as equal partners in the research process, and cases where the appropriate contribution is limited to data collection or providing resources. Contributors need to be aware of the act of participation, with the deliberate intention of being involved in the project. Transparency regarding the different roles and expectations in the process is recommended, and participants should be made aware that they are contributing to research. This is especially important if participants are only taking over small or micro-tasks that require little engagement, but the overall contribution to a clearly defined scientific process or research is important.

Subject or participant. In some disciplines, such as the medical and social sciences, the shift from being a research subject to becoming an active researcher should be clear. The nature of such studies means it is common that citizens themselves, their social behaviours, challenges and health issues are under examination. But citizens can also take an active role in, and even initiate, these activities. It is possible that the people who take part in such projects can be subjects and participants at the same time, depending on the intentions and framing of the research.

Ethics. The aims and intentions of citizen science projects and the research they involve should be communicated clearly and openly with participants and other stakeholders. If involvement is consensual and fully understood by participants, it may be considered citizen science. Special attention needs to be paid to transparency in community- or self-initiated projects that operate outside organisational ethical practices.

Disciplinary aspects

Disciplinary views. Citizen science is applicable across all scientific disciplines, alongside a variety of disciplinary traditions and research methods. For example, in the arts and humanities the research approach, problem formulation and methods of data gathering can defer from natural sciences, and it is important to acknowledge this variety. In the social sciences, participatory forms of citizens' engagement have been used extensively. For example, participatory action research (PAR) and related practices make it difficult to draw a clear line between these practices and citizen science. Any research that is framed as citizen science is likely to be explicit about how it needs to be assessed as such (for example by using the 10 principles) and should consider how participants are moving beyond being subjects of the research.

Medical sciences and human health. Projects investigating human health (physical or mental) can be difficult to assess as citizen science due to their varying levels of active engagement, the purpose of knowledge production, data sharing, the level of expertise required to assess medical information, and the involvement of commercial activities. In such cases, the organisational context needs to be considered: the same activity (for example, a trial of an intervention) can be done by a hospital or a commercial actor, and therefore could be assessed differently. While in other domains, sharing personal data is sometimes problematic, in the health domain it is almost a prerequisite to participation.

Leadership and participation

Individual project, Community-led project, and Scientist-led project. Citizen science projects can be led by scientists or can be carried out by a community to address a particular issue. Projects can also be run by an individual, who will carry out the whole project alone. All are potentially consistent with citizen science, and the decision on each project can be made by examining its context and practices.

Research-performing organisations, public bodies and institutions, non-governmental organisations (NGOs). Citizen science initiatives can be supported and run by different types of organisations. While commercial activities need special attention, activities that are run by public bodies (such as environmental monitoring) and NGOs (such as health charities) could be part of citizen science, and it is not mandatory to include professional scientists or research-performing organisations.

Degree of engagement. Active engagement that requires citizens' cognitive attention during participation in the research process is favoured over limited interaction. It is also preferable to engage citizens in several phases of the research process. Minimal participation, for example volunteers sharing computing resources or social media habits without actively engaging in the research itself or downloading an app that automatically collects data for scientific purposes, could still be considered as citizen science under certain conditions. Examples include when a project actively aligns with the 10 principles or supports the production

of scientific results that would not have been possible without the informed decision of volunteers to contribute.

Small scale vs large scale. Citizen science projects can include a single person carrying out a research project and sharing their knowledge on a non-traditional platform (such as a blog) while adhering to scientific standards (such as peer review). It can also consist of a small group of participants or be open to large-scale participation in various phases of the research process. Projects may aim to achieve large-scale participation, or to contribute significantly to knowledge through personal effort, depending on the context and the discipline. Depending on the aim of the project, all scales could be considered as citizen science.

Professionalism vs volunteerism. When citizen science is understood as a collaboration between professional and volunteer scientists, the question arises: what is "professional" and what is "volunteer"? Understanding of these terms varies widely and depends on context, culture and the field of enquiry. It includes aspects like professional skill sets, remuneration and timescales of involvement. For example, volunteers with a scientific education can still be volunteers when they apply their skills in their free time. They can engage in scientific activities full time and still be understood as volunteers under certain conditions (for example, when the effort is beyond their roles).

Science engagement and science education. Citizen science projects can have educational outcomes for participants involved in various phases of the research process. Intended learning outcomes for participants are a favourable aspect in citizen science. However, for a project to be classified as citizen science, educational goals or science engagement/outreach should not be the core focus, to ensure they do not overshadow the scientific goals. Hence, achieving higher awareness of and engagement with scientific processes can be one aim (intentional or unintentional) of citizen science projects - but should not be the main aim.

Commercial activities. If a direct commercial benefit is the main aim of an activity, and results from the use of data, for example via paid data services for the personal benefit of the person who shares the data and further commercial use beyond services for the data provider, it is generally not considered as citizen science. This also applies if motives for activities are perceived solely to support a marketing or business strategy, rather than supporting a unique research goal and a justified involvement of citizens. However, commercial activities that are in line with the 10 principles and are transparent could still be considered as citizen science.

Activism. Citizen science projects may include an intervention into the current state of affairs, such as local decision making. This might happen in activities that fall under banners such as Participatory Action Research, community science, or addressing environmental injustice. Concerns over motivational bias in the project results can emerge in such cases, and it is recommended to pay attention to the implementation and documentation of the relevant disciplinary standards to demonstrate rigour.

Financial aspects

Financial support for scientific research. Pure financial support to a project, such as crowdfunding, subscription fees and donations, is not considered citizen science, as no participation in any phase of the scientific research takes place. Careful consideration of the consistency with citizen science should be made if

the financial contribution is a prerequisite to a form of participation in the scientific research phase of the project.

Payment to take part in a project. Requesting financial contributions from citizens to participate in a project, for example to finance data-measurement kits, can be consistent with citizen science. But consideration should be made as to how this may affect social inclusion (such as excluding poorer participants) and bias participation.

Incentives to participants in an activity. Projects that incentivise participants can qualify as citizen science, but this is dependent on the context and form of relationship between project leaders and participants. Incentives could take different forms, such as small payments in crowdsourcing activities, or providing bikes to facilitate mobility in a place with high deprivation. However, the type or amount of the incentive should be taken into account before considering its consistency with citizen science. Acceptance of incentives/payments to participants in the citizen science context depends on the culture/country and the social/economic status of participants.

Data and knowledge

Data and knowledge generation. Scientific and academic research that include volunteers can include different forms of data and knowledge generation, including novel data generation, creation of new analyses, or production of new knowledge in written and other forms. The knowledge produced in such projects should adhere to disciplinary standards, such as ensuring peer review of project publications and materials.

Data ownership and use. Citizen science is commonly perceived and placed within the open science domain, such as by complying with open data-sharing, open access publications and full transparency of data ownership. There may, however, be cases in which data use is limited to certain stakeholder groups, the outcomes are not made public, or the publications generated are not open access, particularly with regards to privacy concerns. It is preferable for participants to own the data they generate, and they should be made fully aware of why, when and how it is used by others.

Local knowledge-sharing. Citizen involvement in producing and interpreting data gathered locally by community members, to raise local awareness and action, is a common model of citizen science. The active participation of professional scientists or researchers, and the sharing of results outside the local community, are not mandatory, as long as the project adheres to established research principles and practices.

Opportunistic vs systematic data collection. Different scientific research projects can use and benefit from datasets with a wide variety of characteristics. For some analyses, a systematic and rigorously created dataset is necessary, while in others opportunistic or partial information is fit-for-purpose. Citizen science can contribute to both. The specific context, research aims, and disciplinary practices of the project will determine where the activities fall on the spectrum of opportunistic to systematic data collection.

The use of **digital data-collection tools** in medical and social sciences can be seen as a social survey or as participatory data collection, and therefore part of citizen science. The intention and framing of the project, as well as adherence to the 10 principles, can help in deciding if such use is a citizen science activity.

Sharing personal and medical data. In medical and social sciences, the boundaries of citizen science and data-collection practices can be challenging. Sharing personal and medical data can be part of citizen science, but this depends on the framing and intention of the project, and a consideration of whether those taking part are subjects of research or participants who are shaping and carrying out different stages of the project. The inclusion of practices that are in line with the 10 principles can assist in establishing this.

APPENDIX 2 – Resource Information Form

eu-citizen.science

Resource information for the EU-Citizen.Science platform + moderation against the quality criteria

This form primarily consists of the metadata fields for describing Citizen Science resources, so that we can start populating the platform with good quality resources for the beta launch at the end of March.

This form also implements the Quality Criteria process for moderating resources that has been collaboratively developed and agreed on in T3.2. In this first phase, we are gathering our starter set of resources as a consortium using this form, and we will make our selection based on the scoring in the resulting spreadsheet.

This form therefore takes you through the agreed on steps for moderating, according to each of the criteria levels - in doing so, you are performing the task of a moderator, even though you are also proposing the resource. This will allow us to show how we made the selection according to our own criteria.

Once the platform is live, we will move into the second phase of resource gathering, which will open it up to the community as well, where they can propose more resources via the platform. Your feedback about the practical implementation of the moderation process during this phase will help us to fine-tune the moderation process in the next phase. Please provide your feedback at the end of the form.

NB** Please make sure that the resource you have selected may be made publicly available in this way, and that no embargoes or licenses are being broken.

* Required

Your name (so that we can follow-up with you about this resource if need be)

Your answer

STEP 1 – OVERARCHING REQUIRED CRITERIA

The following two criteria are required criteria. In this first phase, we are check-marking these criteria manually via this form, in order to show that we applied our criteria to our own selection of resources.

In the second phase, these criteria will be applied by the moderator who receives a submitted resource for approval to the platform, based on the information provided by the person submitting the resource.

Our reference points for determining whether a resource is about citizen science or relevant to citizen science, are the 'Characteristics / Contours' work currently in development, and the "10 Principle of Citizen Science" .

CRITERIA 1: Is the resource is about citizen science or relevant to citizen science *

☐ YES

☐ NO - Please select a different resource that does relate to Citizen Science

CRITERIA 2: The resource must have the following metadata.

Please fill in the fields below to provide a range of required and optional information about your resource.

TITLE: The title or name of the resource *

Your answer

AUTHOR: The author(s) of the resource. If the author is not known, then please name the project within which the resource was created, or the institution it was created by. *

Your answer

PUBLISHER: The publisher of the resource, if applicable. Otherwise please name the project within which the resource was created, or the institution it was created by, if not already entered above.

DATE PUBLISHED: Please enter the year (YYYY) that that this version of the resource was published.

Your answer

THEME: The thematic content of the resource (select as many as apply) *

- [ ] Introduction to CS
- [ ] Best practices
- [ ] Project management
- [ ] Research design and methods
- [ ] Engagement
- [ ] Co-creation
- [ ] Communication
- [ ] Event planning
- [ ] CS stories
- [ ] Empowerment
- [ ] Data quality and standards
- [ ] Instructions
- [ ] Link with formal education
- [ ] Regulations and ethics
- [ ] Impact
- [ ] Evaluation of citizen science
- [ ] Project sustainability
- [ ] Transferability
- [ ] Reflections on science
- [ ] Other:

ABSTRACT: Please briefly describe the resource (ideally in 500 words or less). *

Your answer

AUDIENCE: The audience(s) for which the resource is intended.

- [·] Researchers & Academics
- [ ] Educators
- [ ] Community Members & Citizens
- [ ] CS Project Leaders & Initiators
- [ ] CSOs & NGOs
- [ ] Policy & Decision Makers
- [ ] ALL Audiences
- [ ] Other:

KEYWORDS: Please provide keywords to describe the resource, separated by commas. *

Your answer

LANGUAGE: The language that the resource is written, recorded or filmed in (if multiple-language versions are available, please create a new resource listing for each language version) *

- [ ] ar-SA Arabic Saudi Arabia
- [ ] cs-CZ Czech Czech Republic
- [ ] da-DK Danish Denmark
- [ ] de-DE German Germany
- [ ] el-GR Modern Greek Greece
- [ ] en-AU English Australia
- [ ] en-GB English United Kingdom
- [ ] en-IE English Ireland
- [ ] en-US English United States
- [ ] en-ZA English South Africa
- [ ] es-ES Spanish Spain
- [ ] es-MX Spanish Mexico
- [ ] fi-FI Finnish Finland
- [ ] fr-CA French Canada
- [ ] fr-FR French France
- [ ] he-IL Hebrew Israel
- [ ] hi-IN Hindi India
- [ ] hu-HU Hungarian Hungary
- [ ] id-ID Indonesian Indonesia
- [ ] it-IT Italian Italy
- [ ] ja-JP Japanese Japan
- [ ] ko-KR Korean Republic of Korea
- [ ] nl-BE Dutch Belgium
- [ ] nl-NL Dutch Netherlands
- [ ] no-NO Norwegian Norway

- [ ] pl-PL Polish Poland
- [ ] pt-BR Portuguese Brazil
- [ ] pt-PT Portuguese Portugal
- [ ] ro-RO Romanian Romania
- [ ] ru-RU Russian Russian Federation
- [ ] sk-SK Slovak Slovakia
- [ ] sv-SE Swedish Sweden
- [ ] th-TH Thai Thailand
- [ ] tr-TR Turkish Turkey
- [ ] zh-CN Chinese China
- [ ] zh-HK Chinese Hong Kong
- [ ] zh-TW Chinese Taiwan
- [ ] Other: _____

IMAGE URL: Please provide a URL to an image file (.jpg or .png) that can be used to illustrate the resource, such as a cover image, a screenshot, a video frame, a relevant photo, or an image from within the resource. *

Your answer

RESOURCE URL: Please provide the URL to where the document is hosted by the publisher, or in a permanent repository such as Zenodo, OSF, the RIO Journal, or similar. *

Your answer

RESOURCE DOI: Please provide the Digital Object Signifier that is unique to your resource, generated by the Publisher, Zenodo, OSF, the RIO Journal, or similar.

LICENSE: Please indicate the license that applies to this resource, such as Creative Commons CC-BY. Please enter a URL link to the license if available.

Your answer

SUGGESTED QUALITY CRITERIA - The resource engages with the 10 Principles of Citizen Science

The third criterion is not required, but is suggested. We wish to ensure that the resources on the platform are well aligned with the 10 Principles of Citizen Science. However there are good reasons for projects to deviate from the Principles in some cases. This is guidance for moderators when considering a resource, and may be applicable for some resources, but not for all.

For example, a water quality monitoring equipment that falls under our "tools" category probably does not necessarily need to engage with the most or any of the 10 principles. Nevertheless, if the use of this tool produces results that fall within the 10 principles, then this can be a safe criterion to use. Another example, a resource that falls under our "libraries" sub-category under "other materials" category cannot be actively checked if it engages with the 10 principles, because they usually are repositories, toolboxes, toolkits, etc. that brings together many individual resources that is impossible to check each and every one of them actively. Therefore, criterion 3 does not have to be applied to those and other relevant ones. However, its active use is recommended for resources that it could be applicable.

Criterion 3: Does the resource engage with the 10 Principles of Citizen Science

○ Yes

○ No

○ Don't Know

RESOURCE CATEGORIES

For internal purposes, please indicate the Category of Resource. Please note, that we are not asking for Training Resources at this moment because that section of the Platform will go live in the second release in the summer, NOT this first release.

However, you are very welcome to share anything that you consider to be a great Training Resource now already! There may be examples of resources that fit in both categories, and it is good to flag this now to consider how we handle them.

CATEGORY: The category of resource *

○ Guideline (A set of rules and instructions that could be helpful in designing, implementing or evaluating citizen science or initiatives relevant to citizen science. Guidelines are written texts such as reports, deliverables, briefings, etc.)

○ Tool (Any software or hardware to help perform a particular task or work in citizen science initiatives or initiatives relevant to citizen science, eg. water quality equipment, air quality sensors, etc.)

○ Training Resource (Some form of instructional material in relation to citizen science often related to 'how to do' citizen science. Some examples include MOOCs, (online) workshops, webinars, gamified training, quizzes, etc. Media nonspecific)

○ Other (Other materials include websites, podcasts, videos (e.g. promotion, instructions for projects), libraries, toolboxes, figures, diagrams and texts, among others. The subcategories of other materials are libraries, scientific pubs, websites (platforms), reports, audio, visuals and miscellaneous.)

OTHER CATEGORY: If you selected 'Other' above, please indicate what other category the resource falls into. Other materials include websites, podcasts, videos (e.g. promotion, instructions for projects), libraries, toolboxes, figures, diagrams and texts, among others. The subcategories of other materials are libraries, scientific pubs, websites (platforms), reports, audio, visuals and miscellaneous.

○ Software Library (An organized set of resources such as databases, repositories, toolkits, toolboxes that brings together relevant documents for a particular purpose in citizen science initiatives such as the A collection of Citizen Science guidelines and publications, Living Knowledge Toolbox, etc.)

○ Scientific Publication (Publications where scientific knowledge on citizen science is shared, such as a journal article.)

○ Website / Webpage (Websites, platforms, webpages where citizen science related content is published such as the citsci.org, scistarter.org, geo-wiki.org)

○ Report (A document that presents information on citizen science or on topics relevant to citizen science)

○ Audio file / Podcast (Any resource with sound that includes citizen science related content such as podcasts, audio books, radio broadcasts, etc.)

○ Visual file / Video (Any resource that includes visual content such as videos, diagrams, figures, illustrations such as the FotoQuest Go promotion video.)

○ Other:

SPECIFIC QUALITY CRITERIA - Internal Moderation Checklist

Implementing the specific criteria is a required step for the starter set of resources. The following questions will guide you through your role as moderator of this resource for inclusion on the platform. Please indicate your level of agreement with the following statements about various quality aspects of the resource.

Not all of the questions will be relevant to the type of resource you are submitting. In those cases, simply skip the question.

1. THE RESOURCE IS EASY TO ACCESS (e.g. Strongly Agree (5) if completely open, no registration, such as a youtube video; Agree (4) if optional registration or one click access to the resource through a social media registration; Neutral (3) if average or undecided; Disagree (2) if it requires filling in a registration form; Strongly Disagree (1) if there is a complex registration process such as multiple steps to register or paid registration)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

2. THE RESOURCE IS CLEARLY STRUCTURED ACCORDING TO THE TYPE OF RESOURCE (e.g. Strongly Agree (5) if a scientific paper or report includes an introduction, methodology, results, discussion and/or conclusions; or a methodology document includes an introduction, audience description, step by step methodology, and an example; Agree (4) if it is clearly structured but the discussion doesn't reflect the introduction; Strongly Disagree (1) if is not clearly structured and very difficult to follow)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3. THE RESOURCE USES CLEAR LANGUAGE (e.g. it is easy to read and understand for the intended target audience and it is concise - for example, if it is intended for a general audience, it is free from ambiguity, rare words and jargon - and when they need to be used, their meanings are explained clearly)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4. THE RESOURCE PAYS ATTENTION TO BASIC FORMATTING (e.g. titles, paragraphs and references are easy to capture; grammar and spelling is correct; the font is legible and a sufficient size)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

5. THE RESOURCE CLEARLY DESCRIBES ITS AIMS, GOALS AND METHODS

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

6. THE RESOURCE IS EASY TO IMPLEMENT (e.g. it touches on how the resource could be implemented and the context that it could be useful and it provides recommendations for its further use)

1	2	3	4	5	
○	○	○	○	○	Strongly Agree

7. THE RESOURCE IS EASY TO ADAPT TO DIFFERENT CASES (e.g. it explains the limitations of the resource and the context that it could be useful and it provides guidelines or recommendations for its adaptation to different cases)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

8. IF THE RESOURCE IS AN AUDIO OBJECT, IT IS CLEARLY AUDIBLE (e.g. no interruption, no background noise, etc.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9. IF THE RESOURCE IS A VIDEO, AN IMAGE OR ILLUSTRATION, THE QUALITY IS GOOD ENOUGH (e.g. clear and sharp)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

SUPPORTING CRITERIA - Internal Moderation Checklist
The following evaluation and impact criteria are not required, but are suggested criteria. Their purpose is to further support the moderator in determining whether a resource is of good quality, and whether should be included on the platform or not.

Please answer these questions about your resource to the best of your knowledge.

10. Was the resource used or is it currently being used in the context of citizen science or in a relevant initiative? (This could be answered based on the knowledge of the moderator/s and if the resource itself mentions this.)

- [·] Yes, used with positive outcomes
- [·] Yes, used with negative outcomes
- [·] Yes, but the outcomes are not available or not known
- [·] No, the resource has not yet been used in practice
- [·] Don't know

11. Has the resource been evaluated before in terms of the content, methods and results? (This could be answered based on the knowledge of the moderator/s and if the resource itself mentions this.)

- [·] Yes, evaluated with positive results
- [·] Yes, evaluated with negative results
- [·] Yes, evaluated with mixed results
- [·] Yes, the results are not available or not known (no score - supporting argument)
- [ ] No, not evaluated
- [ ] Don't know

12. Does the resource refer to an impact (e.g. on science, policy, society, etc.) it had in the past and/or is currently having and/or it could have in the future?

- [ ] Yes
- [ ] No
- [ ] Don't know

13. If the resource refers to an impact, has this been measured somehow?

☐ Yes

☐ No

☐ Don't know

!! GOLD STAR !! Would you like to give this resource a gold star, for inclusion in the Curated List on the platform?

☐ Yes - this is a Gold Star resource, that should definitely be featured

☐ No - this is just a normal good resource

THANK YOU!!! Thank you for taking the time to provide as much metadata as possible for this resource, as well as for your time walking through all of the Quality Criteria moderation steps. Before you hit the submit button - do you have any thoughts or feedback for us on this process?

Your answer

Submit   Page 1 of 1