Science with and for Society

Policy Brief

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CITIZEN SCIENCE POLICIES IN THE EUROPEAN COMMISSION: research agendas towards issues of concern to citizens

Summary

Citizen Science (CS) is a concept and term that is emerging in both the policy agenda of the European Commission and the research community. It is one of the five strategic orientations of the new Work Programme 2018-2020 of "Science with and for Society" (SwafS) in Horizon 2020 and also increasingly seen as an integral part of both Responsible Research and Innovation (RRI) and Open Science. This policy brief aims to acquaint NCPs and SwafS stakeholders with the Citizen Science concept.

There is no universally accepted definition of Citizen Science (see Box 2) and the term is used to describe either a **method** (allowing traditional scientific research practices to reach larger scales), or a **movement** (that democratises the scientific research process by for example restoring public trust in science, re-orienting science toward societal challenges, and installing democratic governance of science), or a **social capacity** (as a knowledge-producing capacity of society and a path to evidence-based decision-making)[1]. However, it generally **involves scientific work undertaken by members of the general public, often in collaboration with professional scientists and scientific institutions**.

In the context of Horizon 2020 the use of the term Citizen Science is dominated by the policy agendas of Responsible Research and Innovation and Open Science. Thus the definition of Citizen Science used in the new SwafS Work Programme 2018-2020 is a broad one incorporating more aspects of public engagement in science.

The policy brief provides a short and concise overview of Citizen Science including goals and challenges, policy implications and recommendations.

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1 Eitzel, M.V. et al., (2017). Citizen Science Terminology Matters: Exploring Key Terms. Citizen Science: Theory and Practice. 2(1), p.1. DOI: *http://doi.org/10.5334/cstp.96*

Box 1. Recommendations

1. **Include more topics and funding for Citizen Science in Horizon 2020.**
   Citizen Science is important both for the EC's Strategy on 3 O's: "Open Innovation/Open Science/Open to the World – a vision for Europe" and the Responsible Research and Innovation (RRI) agenda. The EC should ensure that enough money and Call topics are flagged as "Citizen Science relevant", and include in the topic texts provisions for incorporating both citizen science actors and concepts in the proposals.

2. **Define Citizen Science as a term clearly.**
   Citizen Science should not be seen as a panacea. It is on the one hand a scientific approach or a research method like any other, and/or on the other hand can be seen as a process of democratising research by including the public in different phases of a projects life cycle. Clear communication of the definition of Citizen Science in the framework of Horizon 2020 and the ERA is needed by the EC, since Citizen Science is an established term and a mix up with general "public engagement" (to which CS can contribute) should be avoided.

3. **Engage more with the existing and active Citizen Science community.**
   For a method of involving citizens and stakeholders in research process, the development of the concept in Horizon 2020 has not been very inclusive so far. There is an active community of citizen science practitioners in Europe that should be involved more in the identification of flagged topics (see Recommendation 1) and the definition of future topics in Horizon 2020 and beyond.

   More effort should be taken to also involve the existing community in upcoming Calls of Horizon 2020. This is a task for both NCPs and the EC.

1. Why Citizen Science?

Involving public participation in science is the approach of Citizen Science – which can gain benefits at different levels for science and for the researchers, for society in general and for the single participant individually. Science and Society will be inspired by new approaches and ideas. Furthermore and the meaning of research and its results – often treated as a closed shop – will be made more transparent and accepted. And it is fun!

"Citizen Science has the potential to bring a wide variety of benefits to researchers, citizens, policy makers and society and across research and innovation (R&I) cycles. It can make science more socially relevant, accelerate and enable production of new scientific knowledge, help policy makers monitor regulatory implementation and compliance, increase public awareness about science and ownership of policy making, and increase prevalence of evidence-based policy making." (SwafS work programme 2018-2020, p. 39)

Amongst various advantages that Citizen Science brings the main ones are:

- **Citizen Science increases scientific literacy and critical faculties**, so the public can discern between fake news and scientific facts like climate change or evolution, or contribute to increased consciousness among citizens of social conditions that influence their life and well-being

- **Citizen Science can democratise the research process**. By conceptualising Citizen Science as part of Open Science and therefore interlinked with Open Innovation and Open to the World (3Os), over the coming years, citizens will be playing an expanded role in scientific research and will contribute more actively to defining the research agenda, and can contribute to strengthen the social voices of the most vulnerable, stigmatized and often marginalized citizens in public policy, effectively helping to democratise science.

- **Citizen Science generates new knowledge and enables new forms of research**. As a method of "crowdsourcing research" by using "idle brains" of the citizens Citizen Science offers new potential in areas where it would be impossible to get all the information/data, for example by collecting data "for free" in an unconceivable amount and providing perspectives and experiences professional scientists otherwise would not have[2].

- **Citizen Science can motivate young people to follow scientific careers**. When pupils get in touch with science at an early age they are more likely to continue being interested and willing to intervene in science when it comes to choosing their careers.

- **Citizen Science can expand the skill set of researchers.** By engaging with citizen scientists (academic) scientists will learn a range of new skills especially in the area of science communication.

2. What is Citizen Science?

Even the White Paper on Citizen Science for Europe produced by the project Socientize[3] agrees on the fact that there is no single definition of "Citizen Science". A series of definitions (see Box 2 below) reveal the dynamics of this research approach which evolves continuously. So maybe a better approach to defining the term "Citizen Science" would be to define what is not citizen science. A helpful tool for drawing this conceptual red-line is the "Ten principles of citizen science" of the European Citizen Science Association[4] (ECSA) (see Box 3). They give an overview of the possibilities and benefits and are flexible enough to be adopted and applied in different project situations and disciplines. They can also be taken as "key objectives for Citizen Science".

The EC's Strategy on the 3 O's: Open Innovation/Open Science/Open to the World – a vision for Europe[5] focuses on "open science" in a "*new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools*." In this chapter Citizens Science is strongly seen as a part of the vision of opening up the research process.

Another vision of the 3 O's is "*to encourage the inclusion of non-institutional participants, in other words the general public, in the scientific process*." Several initiatives such as Galaxy Zoo or Zooniverse have already shown that it is possible for academic and other partners from society to be equally involved in scientific research.

Interlinkage of the keywords 'Citizen Science', 'public engagement and involvement' and 'Responsible Research and Innovation':

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2 An excellent example is an article that has seen a lot of public attention recently, regarding the dramatic decline of insect biomass, carried out by amateur entomologists: Hallmann CA, Sorg M, Jongejans E, Siepel H, Hofland N, Schwan H, et al. (2017) More than 75 percent decline over 27 years in total flying insect biomass in protected areas. PLoS ONE12(10): e0185809. *https://doi.org/10.1371/journal.pone.0185809*

3 *http://socientize.eu/?q=eu/content/download-socientize-white-paper*
4 *https://ecsa.citizen-science.net/*
5 *https://publications.europa.eu/en/publication-detail/-/publication/3213b335-1cbc-11e6-ba9a-01aa75ed71a1*

Box 2. Definitions

Citizen Science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources.

(White paper on Citizen Science, http://socientize.eu/?q=eu/content/download-socientize-white-paper)

Citizen Science is "scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions."

(Oxford English Dictionary List of New Words, 13.09.2014)

Citizen Science is "the collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists."

(Oxford English Dictionaries, https://en.oxforddictionaries.com/definition/citizen_science)

Citizen science describes the engagement of people in scientific processes who are not tied to institutions in that field of science. Participation can range from the short-term collection of data to the intensive use of leisure time in order to delve deeper into a research topic together with scientists and/or other volunteers. Although many volunteer scientists do have a university degree, this is not a prerequisite for participating in research projects. However, it is important that scientific standards are adhered to. This pertains especially to transparency with regard to the data collection methodology and the open discussion of the results.

(Green Paper CS Strategy 2020 for Germany, p. 13, https://www.researchgate.net/publication/ 303804239_Green_Paper_Citizen_Science_Strategy_2020_for_Germany

Citizen Science […] covers a range of different levels of participation: from raising public knowledge about science, encouraging citizens to participate in the scientific process by observing, gathering and processing data, right up to setting scientific agenda and co-designing and implementing science-related policies.

(EC, Horizon 2020, Science with and for society Work Programme 2018-2020, p.30)

The National Co-ordinating Centre for Public Engagement defines[6]: "*Public engagement describes the myriad of ways in which the activity and benefits of higher education and research can be shared with the public. Engagement is by definition a two-way process, involving interaction and listening, with the goal of generating mutual benefit.*" Interaction, listening, generating mutual benefit - this is what responsible research and innovation does - so public engagement constitutes a necessary part of Responsible Research and Innovation (RRI).

On the scientific level of public engagement the concept of Citizen Science is now establishing itself. As the EC acknowledges in its Strategy on the 3 O's: Open Innovation/Open Science/Open to the World – a vision for Europe, "*Citizen Science is often linked with outreach activities, science education or various forms of public engagement with science as a way to promote Responsible Research and Innovation.*"

So the definition of Citizen Science in Horizon 2020 is broader and interlinking all keywords. Citizen Science is thus seen in Horizon 2020 as a "movement" rather than a method, while ECSA in its 'ten prin-

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6 *https://www.publicengagement.ac.uk/ explore-it/what-public-engagement*

ciples' refers to Citizen Science as a method. Citizen Science can also be seen as a social capacity, when myriads of citizen scientists are engaged in the research process, enabling evidence-based decision making that leads to transformative research and thus addresses societal challenges. A very good overview of such terminological aspects is offered by Eitzel, M.V. et al., (2017, Citizen Science Terminology Matters: Exploring Key Terms. Citizen Science: Theory and Practice. 2(1), p.1. DOI: *http://doi.org/10.5334/cstp.96)*

3. **How** to do Citizen Science?

Traditional circle of research vs new ways

Involving the public is nothing new that universities/academic researchers need to start doing - there is a long history of those activities since Benjamin Franklin or Charles Darwin[7] (maybe even without being noticed thus so far) – traditional topics include applied life sciences and health research. But fortunately science is getting more and more inclusive in a growing range of disciplines. However as the popularity of Citizen Science grows, it creates large datasets (e.g. monitoring and observing, crowdsourcing, etc.) – just to name one of the challenges. So Citizens Science projects require appropriate planning throughout their project life cycle (see Box 3).

7 *http://www.cybertracker.org/downloads /2015-Our-Story/E-3-Citizen-Science-Silvertown.pdf*

Critical aspects/ challenges:

The following critical aspects/challenges should be considered before starting a CS project:

- Suitability of CS approach for the project

- Setting up the involvement of citizens (topic; method; special requirements: knowledge, equipment, time, legal/ethical; long-term commitment, etc.)

- Evaluation of the project[8]

- Terminology is important in terms of how participants feel about being involved in scientific research (how they are treated and how they see themselves)[9]

4. The Future of Citizen Science?

"Citizen Science can contribute to the Commission's goal of Responsible Research and Innovation, as it reinforces public engagement and can redirect research agendas toward issues of concerns to citizens."

"This kind of Citizen Science is increasingly on the agenda and it is planned that future work programmes of Horizon 2020 will continue to support relevant initiatives at EU level".

[EC, Strategy on 3 O's: Open Innovation/Open Science/Open to the World – a vision for Europe]

These statements show the EC´s strong engagement with Citizen Science and reflect their support for the work of NCPs.

8 see also: Citizen Science for all – a guide for citizen science practitioners, Bürger Schaffen Wissen (GEWISS), DE (2016) and Citizen science at universities: Trends, guidelines and recommendations – LERU (2016)

9 see also: *https://theoryandpractice. citizenscienceassociation.org/articles/10.5334/cstp.96/*

Box 3. Ten principles of citizen science

1. **Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding.**
   Citizens may act as contributors, collaborators, or as project leaders and have a meaningful role in the project.

2. **Citizen science projects have a genuine science outcome.**
   For example, answering a research question or informing conservation action, management decisions or environmental policy.

3. **Both the professional scientists and the citizen scientists benefit from taking part.**
   Benefits may include the publication of research outputs, learning opportunities, personal enjoyment, social benefits, satisfaction through contributing to scientific evidence e.g. to address local, national and international issues, and through that, the potential to influence policy.

4. **Citizen scientists may, if they wish, participate in multiple stages of the scientific process.**
   This may include developing the research question, designing the method, gathering and analysing data, and communicating the results.

5. **Citizen scientists receive feedback from the project.**
   For example, how their data are being used and what the research, policy or societal outcomes are.

6. **Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.**
   However unlike traditional research approaches, citizen science provides opportunity for greater public engagement and democratisation of science.

7. **Citizen science project data and meta-data are made publicly available and where possible, results are published in an open access format.**
   Data sharing may occur during or after the project, unless there are security or privacy concerns that prevent this.

8. **Citizen scientists are acknowledged in project results and publications.**

9. **Citizen science programmes 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.**

European Citizen Science Association (ECSA)

PRACTICAL RESOURCES AND INFORMATION

Relevant documents

- **EC book "Open Innovation, Open Science, Open to the World – a vision for Europe"**:

  Vision: *https://ec.europa.eu/research/openvision/index.cfm*

  Download: *https://publications.europa.eu/en/publication-detail/-/publication/3213b335-1cbc-11e6-ba9a-01aa75ed71a1*

- **10 principles – better than one definition**:

  https://ecsa.citizen-science.net/sites/default/files/ecsa_ten_principles_of_citizen_science.pdf

- **White Paper on Citizen Science for Europe**:

  Vision: *http://www.socientize.eu/?q=eu/content/white-paper-citizen-science*

  Download: *http://www.socientize.eu/sites/default/files/white-paper_0.pdf*

- **Terms and definitions**:

  https://theoryandpractice.citizenscienceassociation.org/articles/10.5334/cstp.96/

  https://www.publicengagement.ac.uk/explore-it/what-public-engagement

- **Citizen Science and RRI**:

  https://ecsa.citizen-science.net/blog/collection-citizen-science-guidelines-and-publications

- **Citizen science at universities: Trends, guidelines and recommendations - LERU**

  https://www.leru.org/publications/citizen-science-at-universities-trends-guidelines-and-recommendations

Relevant information portals

- ECSA – European Citizen Science Association - *https://ecsa.citizen-science.net/*
- Center for Citizen Science - *https://www.zentrumfuercitizenscience.at/en/citizen-science*
- German Citizen Science Platform - *http://www.buergerschaffenwissen.de/en*
- Spanish Citizen Science Observatory - *www.ciencia-ciudadana.es (only in Spanish)*

Project websites

- *https://www.zooniverse.org/*
- *http://www.citizen-science.at/* (only in German)
- *http://www.schweiz-forscht.ch/de/* (in German and French)
- *http://www.ibercivis.es* (only in Spanish)

Citizen Science projects in the framework programmes FP7 and Horizon 2020

From SwafS (examples):

- **RRI tools** – RRI TOOLS, a project to foster Responsible Research and Innovation for society, with society *www.rri-tools.eu*
- **NewHoRRIzon** – Excellence in science and innovation for Europe by adopting the concept of Responsible Research and Innovation *www.newhorrizon.eu*
- **DITOs** – Doing It Together science represents a step change in European public engagement with science and innovation *http://togetherscience.eu/*
- **SPARKS** – an awareness-raising project to show Europeans that they can get involved in science and that various stakeholders share the responsibility for scientific research and innovation *http://www.sparksproject.eu/*

From e-Infrastructures:

- **Societize** – Society as infrastructure for e-science via technology, innovation and creativity *www.socientize.eu*

From Societal Challenge 5:

- **LANDSENSE** – A Citizen Observatory and Innovation Marketplace for Land Use and Land Cover Monitoring *https://landsense.eu/*
- **GROW** – GROW Observatory *https://growobservatory.org/*
- **SCENT** – Smart Toolbox for Engaging Citizens into a People-Centric Observation Web *https://scent-project.eu/*
- **Ground Truth 2.0** – Ground Truth 2.0 - Environmental knowledge discovery of human sensed data *http://www.gt20.eu/*

From COST:

- **CA15212** – Citizen Science to promote creativity, scientific literacy, and innovation throughout Europe *http://cs-eu.net/*
- **ES1201 NETLAKE** - Networking Lake Observatories in Europe *http://www.netlake.org/*
- **IS1303 CHIP ME** - Citizen's Health through public-private Initiatives: Public health, Market and Ethical perspectives *http://chipme.eu/eng/home.aspx*
- **TD1202** – Mapping and the citizen sensor *http://www.citizensensor-cost.eu/*

Citizen Science relevant projects worldwide

- *https://en.wikipedia.org/wiki/List_of_citizen_science_projects*