



Mutual Learning Exercise

Citizen Science Initiatives - Policy and Practice

Final report

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Mutual Learning Exercise on Citizen Science Initiatives - Policy and Practice Final Report

European Commission

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Mutual Learning Exercise on Citizen Science Initiatives – Policy and Practice

Final report

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List of Abbreviations

CO: Citizen Observatory

CS: Citizen Science

CSA: Coordination and Support Action

CSI-PP: Citizen Science Initiatives - Policy and Practice

CSO: Civil Society Organisation

DG: Directorate-General

DG-R&I: Directorate-General for Research & Innovation

ECSA: European Citizen Science Association

ERA: European Research Area

EU: European Union

HEI: Higher Education Institution

MLE: Mutual Learning Exercise

NGO: Non-Governmental Organisation

PSF: Policy Support Facility

RFO: Research Funding Organisation

R&I: Research & Innovation

RPO: Research Performing Organisation

RRI: Responsible Research and Innovation

SDGs: Sustainable Development Goals of the United Nations

UN: United Nations

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ABSTRACT

Over the past decade, great advances have been made in applying innovative participatory and inclusive research practices across a wide range of domains. These have involved increasing numbers of citizens in monitoring, observing, and co-researching societal issues such as climate change impacts on the environment and public health, sustainable mobility, and plastic pollution in rivers and oceans. Important outcomes have been achieved, from fundamental scientific discoveries¹ to data that support evidence-informed policy².

These innovative and diverse practices, encapsulated in the umbrella term 'Citizen Science', are becoming increasingly recognised by the European Commission (EC) as essential to achieving the strategic aims of the European Green Deal. They are woven throughout the funding instruments of Horizon Europe, including the European clusters and missions, and the New European Bauhaus. Citizen Science is also being embedded by the EU Member States in their national science policies to involve stakeholders across the quadruple helix in Research & Innovation (R&I).

The field of Citizen Science is now entering a more productive phase, with real potential for helping to achieve the strategic ambitions of Member States. The Policy Support Facility (PSF) within the Directorate-General for Research and Innovation (DG R&I) therefore commissioned and supported a Mutual Learning Exercise (MLE) on Citizen Science Initiatives - Policy and Practice.

The main aim of the MLE has been to **identify and promote good practices, experience and lessons learned, in addition to policies and programmes for Citizen Science** among 11 participating countries (Austria, Belgium, France, Germany, Hungary, Italy, Norway, Portugal, Romania, Slovenia and Sweden). The MLE therefore aims to achieve **greater societal impact and increase trust in science** through the leveraging of collective societal capabilities and insights, and to enlarge the scope and impact of Research and Innovation through **increased societal relevance, responsiveness and transparency**.

The participating countries made great progress towards implementing new measures to support and sustain Citizen Science, with the MLE serving as an important source of motivation, information and exchange of good practices. These have included explicitly naming Citizen Science in the national ERA Action Plan (Austria), writing Citizen Science into national research programmes (Belgium and Romania), explicit inclusion of Citizen Science in the national action plan on Open Science (Slovenia), and the launch of new national practitioner networks or research centres for Citizen Science (Belgium, Germany & Hungary). The development of a national network dedicated to Citizen Science is also one of the actions proposed in the White Paper on the Transition to Open Science (2023-2030) in Romania.

¹ For specific examples, see the Citizen Science approaches within fundamental research recently profiled by the European Research Council <https://erc.europa.eu/news-events/events/showcase-projects-citizen-science>

² For specific examples, see: Schade, S., Pelacho, M., van Noordwijk, T., Vohland, K., Hecker, S., Manzoni, M. (2021). *Citizen Science and Policy*. In *The Science of Citizen Science*. Springer, Cham. https://doi.org/10.1007/978-3-030-58278-4_18; Turbé, A., Barba, J., Pelacho, M., Mugdal, S., Robinson, L.D., Serrano-Sanz, F., Sanz, F., Tsinaraki, C., Rubio, J.-M. and Schade, S., 2019. *Understanding the Citizen Science Landscape for European Environmental Policy: An Assessment and Recommendations*. *Citizen Science: Theory and Practice*, 4(1), p.34. DOI: <http://doi.org/10.5334/cstp.239>

In this Final Report of the MLE, we present a summary of the learning and recommendations generated throughout the year-long process³ through the lens of the backcasting approach to strategic planning. The Final Report serves as an inspiration, guide and resource for national policy makers and other key actors in the national science landscape.

Of all of these recommendations for action, the four most impactful recommendations that have been supported across all of the thematic topics of the MLE are to:

1. Ensure that Citizen Science practitioners - in academia (top-down), in society (bottom-up), in policy (collaborative) and in the private sector (collaborative) - are supported by a **national network of practitioners** to share knowledge, form partnerships, and further develop best practice.
2. Ensure that **dedicated funding instruments** can provide financial support to the places where it is most needed (especially to societal partners) in order to enable new initiatives to get off the ground and to provide ongoing funding or scaling-up funding for successful initiatives. These instruments should allow sufficient flexibility for co-creational approaches to be implemented.
3. Enable the **culture change** required to open-up science and the scientific process more fully to the participation of citizens, societal actors, and civil society organisations for the benefit of research quality, policy impact, and improved societal welfare.
4. Enable the establishment and ongoing iterative development of key **supportive infrastructure** such as data-gathering tools and platforms, data analysis and visualisation tools, data hosting and archiving, and domain-specific research infrastructures.



Figure 1: Quote from Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth on the importance of Citizen Science

³ The full repository of thematic reports, discussion papers, workshop presentations, and the MLE factsheet can be found on the PSF website: <https://ec.europa.eu/research-and-innovation/en/statistics/policy-support-facility/psf-challenge/mutual-learning-exercise-citizen-science-initiatives-policy-and-practice> .

1. Introduction

The vast and diverse range of activities, forms of engagement, goals, and specific contexts of Citizen Science initiatives make it challenging to provide a concrete and specific definition. A too-narrow definition of Citizen Science would also not be helpful, as it would limit the range of applications that are supported in practice but nonetheless may add great value⁴.

Given this plurality, especially arising from the wide range of disciplines within which Citizen Science is integrated and the varying levels of engagement and participation, it is essential that any action to embed Citizen Science practices within research and innovation policy remain flexible and adaptable to the specific context and research domain.

To aid key actors within the national research landscape with establishing funding or evaluation criteria, a set of common characteristics of Citizen Science projects have been developed by the European practitioner community, encapsulated in the European Citizen Science Association (ECSA)⁵. An additional useful reference is the set of criteria for listing projects on national Citizen Science platforms developed by the ECSA Citizen Science Networks Working Group⁶.

At the global level, Citizen Science is recognised as a key pillar within the movement towards Open Science as demonstrated by UNESCO recommendations⁷, to more fully democratise the processes of knowledge production, and more deeply enable universal and equitable access to scientific data and information. Furthermore, citizen-generated data are contributing to monitoring and achieving the UN Sustainable Development Goals⁸, such as for example Soil Health⁹.

At the European level, funding support for Citizen Science throughout the R&I framework of the European Commission has enabled innovative new methods to be tested, valorised, and scaled up for even greater impact. Citizen Science is now woven throughout the new European Research Area (ERA) in order to achieve greater societal impact and increased trust in science¹⁰. Active citizen and societal engagement in R&I has become a priority area for joint action in the EU¹¹ and it is a programme principle and operational objective of Horizon

⁴ Haklay, M., Dörler, D., Heigl, F., Manzoni, M., Hecker, S., Vohland, K. (2021). What Is Citizen Science? The Challenges of Definition. In *The Science of Citizen Science*. Springer, Cham.
https://doi.org/10.1007/978-3-030-58278-4_2

⁵ Haklay, M., Fraisl, D., Greshake Tzovaras, B., Hecker, S., Gold, M., Hager, G., ... & Vohland, K. (2021). Contours of citizen science: a vignette study. *Royal Society open science*, 8(8), 202108.
<https://doi.org/10.1098/rsos.202108>

⁶ Dörler, D., Heigl, F., Brounéus, F., Marika, C., Duerinckx, A., Gijssels, L., Grossberndt, S., Kragh, G., Luis, C., & Tiago, P. (2022). Criteria for listing citizen science projects on citizen science online platforms. Zenodo.
<https://doi.org/10.5281/zenodo.7249085>

⁷ UNESCO (2021). Recommendations on Open Science.

<https://unesdoc.unesco.org/ark:/48223/pf0000379949/PDF/379949eng.pdf.multi.page=20>

⁸ Fraisl, D., Campbell, J., See, L., Wehn, U., Wardlaw, J., Gold, M., Arias, R., et al. (2020). Mapping citizen science contributions to the UN sustainable development goals. *Sustain. Sci.* 15, 1735–1751.
<https://link.springer.com/article/10.1007/s11625-020-00833-7>

⁹ Head, J. S., Crockatt, M. E., Didarali, Z., Woodward, M. J., & Emmett, B. A. (2020). The role of citizen science in meeting SDG targets around soil health. *Sustainability*, 12(24), 10254.
<https://doi.org/10.3390/su122410254>

¹⁰ European Commission (2020). Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions - A new ERA for Research and Innovation. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:628:FIN>

¹¹ Council of the European Union (2021). Council Recommendation (EU) 2021/2122 of 26 November 2021 on a Pact for Research and Innovation in Europe. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2021.431.01.0001.01.ENG

Europe, which “shall promote co-creation and co-design through the engagement of citizens and civil society”. The recent Eurobarometer on Science, Technology and Society¹² shows a potentially large latent interest in participation in science across Europe, which aides increased support across government for the development and utilisation of Citizen Science and official uptake of citizen-generated data.

Furthermore, Citizen Science can be seen as contributing to European developments towards open and responsible innovation - representing both an important form of innovation in itself and a route to the development of sustainable forms of innovation. In terms of advancing science for the public good, the International Science Council's Task Group on Citizen Data¹³ view Citizen Science as:

1. “An important vehicle for democratising science and promoting the goal of universal and equitable access to scientific data and information”,
2. “A vehicle for addressing interlinked environmental and development issues that are of the highest concern to communities, which include environmental justice and equitable access to basic services such as clean water, food, education and health services”,
3. Having “the potential to contribute to SDG tracking through participatory data collection, standardised data collection across cities, and improved data accessibility for decision making and science”, and as
4. Having “two important contributions from an equity lens, namely in understanding community perspectives and generating data at local levels (which are critical for the Leave No One Behind focus of the 2030 Agenda), and in promoting the empowerment of communities to negotiate with authorities on service delivery¹⁴”.

Citizen Science practices also contribute to the quality and impact of research in **the academic context**¹⁵. The engagement of individuals and societal actors in scientific knowledge production makes it possible to investigate questions that might not otherwise be possible to research effectively, by filling in data gaps (in terms of geographical coverage, longitudinal studies over time, and granularity of the data), by adding local, traditional and lived-experience insights to more accurately understand complex issues, and by responding to societal issues that might not otherwise have the attention of researchers or policy-making bodies¹⁶.

This is also true of research conducted by **public bodies** for the improvement of national governance and policy making, where participatory approaches can improve both the insights and the outcomes of that research. See for example, the top ten benefits of Citizen Science

¹² Special Eurobarometer 516 – “European citizens’ knowledge and attitudes towards science and technology”. Fieldwork: April – May 2021. https://www.initiative-wissenschaftliche-medizin.at/fileadmin/user_upload/FHCampusWienSalutogenes/ebs_516_science_and_technology_summary_en.pdf


¹³International Science Council Task Group: Citizen Science and the Validation, Curation, and Management of Crowdsourced Data (with WDS). <https://codata.org/initiatives/task-groups/previous-tgs/citizen-science-and-crowdsourced-data/>.

¹⁴ de Sherbinin A, Bowser A, Chuang T-R, Cooper C, Danielsen F, Edmunds R, Elias P, Faustman E, Hultquist C, Mondardini R, Popescu I, Shonowo A and Sivakumar K (2021) The Critical Importance of Citizen Science Data. *Front. Clim.* 3:650760. <https://www.frontiersin.org/articles/10.3389/fclim.2021.650760/full>

¹⁵ See for example the LERU Report ‘Citizen science at universities: Trends, guidelines and recommendations’, Oct 2016. <https://www.leru.org/publications/citizen-science-at-universities-trends-guidelines-and-recommendations#>

¹⁶ See for example the European Research Council (ERC) -funded Citizen Science research projects profiled at an ERC Showcase event on November 29th, 2022. <https://erc.europa.eu/news-events/events/showcase-projects-citizen-science>

initiatives that have been identified by the Dutch National Institute for Public Health and the Environment (RIVM), and the Dutch Ministry of Health, Welfare and Sport, in Box 1.



1. Achieving more participation in research,

2. Facilitating research on a bigger scale by adding additional people,

3. Tapping into new sources of information, knowledge and perspectives,

4. Increasing citizen engagement in scientific research and building stronger connections between citizens and scientists,

5. Developing new research methods,

6. Improving openness and reliability of research,

7. Ensuring that citizens understand scientific research even better,

8. Ensuring that scientists and knowledge institutes understand current issues in society even better,

9. Focusing research on more relevant subjects and on citizens' priorities, and

10. Improving scientific literacy: citizens are increasing their own knowledge and understanding about science.

More Information: <https://magazines.rivm.nl/en/2018/10/citizen-science>

Box 1: The Top Ten Benefits of Citizen Science according to RIVM / VWS¹⁷

In terms of industrial development, Citizen Science represents a way of empowering new groups of actors to actively participate in processes of innovation and sustainable change. Since many Citizen Science initiatives are driven by a wish not only to understand but also to improve social and environmental conditions¹⁸ Citizen Science can be viewed as a substantial societal resource for the development of new products and services - but also collective action towards environmentally and socially sustainable practices. Citizen Science opens up new innovation possibilities via the inclusion of new groups of stakeholders as co-

¹⁷ RIVM (2018). *10 Benefits of Citizen Science*. RIVM Magazine, October 2018.

<https://magazines.rivm.nl/en/2018/10/citizen-science/10-benefits-citizen-science>

¹⁸ See for example the co-design of a citizen science application for urban climate resilience in the Citizen Sensing project: Neset, T-S., Wilk, J., Cruz, S., Graca, M., Rød, J.K., Maarse, M.J., Wallin, P., and Andersson, L., "Co-designing a citizen science climate service." *Climate Services* 24 (2021): 100273. <https://doi.org/10.1016/j.cliser.2021.100273>

researchers, such as in public health and health care, or in addressing grand challenges such as those of food security and agriculture¹⁹.

In addition, there are examples of new innovations and low-cost devices or crowdsourcing software that were invented within such initiatives, with clear commercial potential. The role of the industrial sector with regard to Citizen Science is often neglected by both academic researchers and policymakers. However, we see this as an important topic for future discussion and development.

1.1. Achieving the Potential of Citizen Science at the National Level

Within the national policy context, one of the most prominent benefits of Citizen Science approaches lie in their contribution to closing the gap between Science, Society & Policy, increasing scientific literacy²⁰, and strengthening trust in all directions²¹.

Citizen Science is tackling major societal challenges such as addressing and mitigating climate change impacts, planning for rapidly changing societies in climate-neutral smart cities, restoring our oceans and waters, leading the transition towards healthy soils, engaging patients as co-researchers in the prevention and treatment of cancer, and responding to crises such as the recent Covid 19 pandemic. These aims can best be realised by engaging all sectors of society - including citizens and societal actors - in collaborative and participatory approaches to understanding these issues better, and in co-creating common approaches and solutions for data-informed action.

In order to bring Science and Society more closely together in this way, national strategies for Citizen Science are essential, which can be anchored in the national strategy for Open Science, thus creating many of the enabling conditions for Citizen Science.

The MLE for Citizen Science can be seen as an exercise in bridging the gap between emergent best practices and the longer-term vision for realising the full potential of Citizen Science by embedding and sustaining participatory and inclusive research practices at the national level, within a supportive environment for Citizen Science in all of its forms.

1.2. Excellence in Citizen Science

As the scientific research community seeks to augment and extend the concept of 'Excellence', the focus is shifting to broader concepts of good science, good quality research, and the societal impacts and value of knowledge production. These concepts draw on the principles of Responsible Research and Innovation (RRI) that were also developed within the Horizon 2020 '*Science with and for Society*' (SwafS) programme²², the stated aims of the

¹⁹ Ryan, S. F., Adamson, N. L., Aktipis, A., Andersen, L. K., Austin, R., Barnes, L., Beasley, M. R., et al. "The role of citizen science in addressing grand challenges in food and agriculture research." Proceedings of the Royal Society B 285, no. 1891 (2018): 20181977. <https://doi.org/10.1098/rspb.2018.1977>

²⁰ Brandt, M., Groom, Q., Magro, A., Misevic, D., Narraway, C., Bruckermann, T., Beniermann, A., et al. "Promoting scientific literacy in evolution through citizen science." Proceedings of the Royal Society B 289, no. 1980 (2022): 20221077. <https://doi.org/10.1098/rspb.2022.1077>

²¹ Millar, E., Melles, S., Klug, J.L. & Rees, T., (2022) Stewarding relations of trust: citizen scientist perspectives on fostering community trust in science, Environmental Sociology, <https://www.tandfonline.com/doi/abs/10.1080/23251042.2022.2112888?src=&journalCode=rems20>

²² See: Richard, O., Bessant, J.R., and Heintz, M., eds. Responsible innovation: managing the responsible emergence of science and innovation in society. John Wiley & Sons, 2013. <https://onlinelibrary.wiley.com/doi/book/10.1002/9781118551424>

ERA, and are reflected in the Agreement on Reforming Research Assessment²³ promoted by the Coalition for Advancing Research Assessment (CoARA).

Two important sources for understanding excellence in the context of Citizen Science are the ECSA Ten Principles of Citizen Science²⁴, which provides a framework against which to assess new and existing Citizen Science initiatives with the aim of fostering excellence in all aspects of Citizen Science (see Box 2 below), and the set of 20 quality criteria developed in a co-creative process by the Citizen Science Network Austria²⁵ that list quality criteria for Citizen Science projects. Both of these are well aligned with the European Code of Conduct for Research Integrity²⁶, the most recent version of which addresses emerging challenges emanating from technological developments, open science, Citizen Science and social media, and forms a valuable framework for self-regulation across all scientific and scholarly disciplines and for all research settings.

Recent advances have also been made in the field of Citizen Science to develop a unified approach to identifying and assessing the impacts of Citizen Science, for example via the consolidated Citizen Science Impact Assessment framework developed within the Measuring Impacts of Citizen Science (MICS) project²⁷ or the ACTION²⁸ project. These impacts can relate to the quality of the research, and the types of research that have been made possible, at the domain level - but they also relate to the national level and the aims of national actors.



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, for example, to address local, national and international issues, and through

²³ See: the Coalition for Advancing Research Assessment <https://coara.eu/agreement/the-commitments/>

²⁴ Robinson, L. D., Cawthray, J. L., West, S. E., Bonn, A., & Ansine, J. (2018). Ten principles of citizen science. In S. Hecker, M. Haklay, A. Bowser, Z. Makuch, J. Vogel, & A. Bonn (Eds.), *Citizen Science: Innovation in Open Science, Society and Policy* (1 ed., pp. 27-40). UCL Press. <https://doi.org/10.14324/111.9781787352339>

²⁵ Heigl, F., Kieslinger, B., Paul, K.T., Uhlík, J., Frigerio, D. and Dörler, D., 2020. Co-Creating and Implementing Quality Criteria for Citizen Science. *Citizen Science: Theory and Practice*, 5(1), p.23. <http://doi.org/10.5334/cstp.294>

²⁶ European Science Foundation, and All European Academies. The European code of conduct for research integrity. European Science Foundation, 2011. <https://allea.org/code-of-conduct/>

²⁷ Wehn, U., Gharesifard, M., Ceccaroni, L. et al. (2021). Impact assessment of citizen science: state of the art and guiding principles for a consolidated approach. *Sustain Sci* 16, 1683–1699.

²⁸ Passani, A., Janssen, A. L., Hölscher, K. (2020). Impact assessment methodological framework. <https://zenodo.org/record/4432132#.Y7bADHbMI2x>

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 metadata 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.

Box 2: The ECSA Ten Principles of Citizen Science (currently available in 37 languages²⁹)

Other aspects of excellence include following Open Science practices such as the FAIR data principles, to ensure technical and capacity support to foster better accessibility, interoperability, and reusability of (citizen-generated) data through common research infrastructures and data portals; and the need for ethical governing bodies to think about how to extend the ethics of protection of research subjects to include the empowerment of citizens as citizen scientists, and how to harmonise the new role of citizens with the current procedures of ethical clearance designed for traditional research involving human subjects. (See for example the Sops4RI toolbox³⁰ the ProEthics framework for the ethical inclusion of Citizens in innovation processes³¹, and the PRO-RES Framework for Ethical Evidence³².)

Additionally, appropriate signals should be made across the R&I system - both at universities and beyond - about the importance, benefits, and potential of Citizen Science - for example geographical coverage that is not possible to achieve through other methods. This can be done not only through dedicated funding programmes, but also other mechanisms of support such as awards, recognition by national science academies, investing in common research infrastructures, and so on.

²⁹ ECSA (European Citizen Science Association). (2015). Ten Principles of Citizen Science. <https://doi.org/10.17605/OSF.IO/XPR2N>

³⁰ The SOPs4RI Toolbox is a structured collection of easy-to-use Standard Operating Procedures and Guidelines that Research Performing and Research Funding Organisations can use to develop their own Research Integrity Promotion Plans. <https://sops4ri.eu/toolbox/>

³¹ The PRO-Ethics Framework describes principles, guidelines, assessment criteria, good practice and proposals on regulatory environments for how citizens' engagement can be properly put in place without disregarding ethical principles of fairness, transparency, gender, privacy and sustainability. <https://cordis.europa.eu/project/id/872441/results>

³² The PRO-RES Framework encourages policymakers and their advisors to seek evidence for their decisions from research that has been conducted ethically, responsibly and with integrity. <https://prores-project.eu/>

Ensuring the support and leadership of top scientists is also important for achieving excellence in Citizen Science, underpinned by the reform of the systems for the assessment of research, such that diverse outputs, practices and activities that maximise the quality and impact of research are valued and recognised qualitatively as well as quantitatively.

I believe in a research culture that recognises a diversity of contributions to science and society; that celebrates high quality and impactful research; and that values sharing, collaboration, integrity and engagement with society, transmitting knowledge from generation to generation.

Mariya Gabriel

Commissioner for Innovation, Research, Culture, Education and Youth

Figure 2: Quote from Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth on excellence in scientific research

2. The Mutual Learning Exercise on Citizen Science

The MLE on Citizen Science Initiatives, Policy and Practice, has been supported by the Policy Support Facility (PSF) within the Directorate-General for Research and Innovation (DG R&I). The purpose of the MLE has been to facilitate the exchange of information, experience and lessons learned between the 11 participating countries, as well as to identify good practices, policies and programmes for Citizen Science at local, regional and national levels.

The MLE was structured around five specific topics identified by the participating countries:

- **Topic 1:** Introduction and overview of Citizen Science
- **Topic 2:** Ensuring good practices and impacts
- **Topic 3:** Maximising the relevance and excellence of Citizen Science
- **Topic 4:** Enabling environments and sustaining Citizen Science
- **Topic 5:** Scaling up Citizen Science

Representatives from Austria, Belgium, France, Germany, Hungary, Italy, Norway, Portugal, Romania, Slovenia and Sweden participated in the MLE, as shown in Table 1 below.

Country	Organisation
Austria	Austrian Research Promotion Agency (FFG)
Belgium	Royal Museum for Central Africa, Royal Belgian Institute of Natural Sciences, Belgian Science Policy Office (BELSPO)

Country	Organisation
France	Ministry of Higher Education, Research and Innovation
Germany	DLR Project Management Agency
Hungary	The National Research, Development and Innovation Office of Hungary
Italy	Ministry of Universities and Research, Directorate-General for Internationalisation and Communication
Norway	Ministry of Education and Research, The Research Council of Norway
Portugal	Ciência Viva
Romania	Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI)
Slovenia	Ministry of Education, Science and Sport
Sweden	Swedish Research Council, Vetenskap & Allmänhet, VA (Public & Science)

Table 1: Participants of the MLE on Citizen Science Initiatives - Policy and Practice

2.1. The Modus Operandi of the MLE

In order to facilitate the aims of the MLE programme, the chosen topics were explored through a series of workshop sessions hosted online and by the participating countries, as shown in Table 2 below.

Date	Workshop, City, Hosting Partner
18 & 24 January 2022	Topic 1 Meeting: Introduction and overview of Citizen Science; Online via Microsoft Teams
7 & 14 March 2022	Topic 2 Meeting: Ensuring good practices and impacts; Online via Microsoft Teams
7 & 8 June 2022	Topic 4 Meeting Part I: Enabling environments and sustaining Citizen Science; Vienna; Austrian Research Promotion Agency (FFG) and Federal Ministry of Education, Science and Research
12 & 13 September 2022	Topic 4 Meeting Part II: Enabling environments and sustaining Citizen Science; Budapest; National Research, Development and Innovation Office (NRDIO)
10 & 11 October 2022	Topic 3 Meeting: Maximising the relevance and excellence of Citizen Science; Ljubljana; Ministry of Education, Science and Sport, Slovenia
7 & 8 November 2022	Topic 5 Meeting: Scaling up Citizen Science; Berlin; German Federal Ministry of Education and Research
13 January 2023	Final Meeting; Brussels; Royal Belgian Institute of Natural Sciences

Table 2: Workshops held during the MLE on Citizen Science Initiatives - Policy and Practice



Figure 3: MLE participants group work during MLE meeting in Berlin, November 2022

Prior to each meeting, participants were provided with a survey to collect data, and pre-reading in the form of a Challenge Paper or Discussion Paper to aid discussions on the topic to be focused on in the workshop sessions. The Topic Experts prepared these surveys and pre-reading materials and worked with the host country to put together a programme to showcase local examples and best practice.

Due to health precautions during the Covid-19 pandemic, the first and second workshops were held online, with a number of interactive activities facilitated using online collaboration platforms. The remaining workshops took place in person following a two-day format consisting of discussions, presentations from visiting Citizen Science practitioners and other key actors in the local country, breakout group working sessions, and site visits.

Each topic meeting concluded with a Thematic Report to share the outcomes of those workshops, the best practice examples that were profiled, and to contribute further research to the discussion when this was called for. These documents, along with all workshop materials, can be found in the PSF repository³³ for this MLE, as illustrated in Figure 4.

³³ The MLE repository contains all of the Discussion Papers, workshop materials, and Thematic Reports <https://ec.europa.eu/research-and-innovation/en/statistics/policy-support-facility/psf-challenge/mutual-learning-exercise-citizen-science-initiatives-policy-and-practice>

Factsheet – Citizen Science Initiatives, Policy and Practice

An increasing number of citizen science projects and initiatives are being implemented across Europe. This rapidly emerging mode of research and innovation shows substantial potential in terms of achieving greater societal impact and increasing trust in science, by leveraging collective societal capabilities, by enlarging the scope of the R&I, and by increasing relevance, responsiveness and transparency.

[Download factsheet](#)

- + **Introduction and overview on citizen science**
- + **Ensuring good practices and impacts**
- + **Maximising the relevance and excellence of citizen science**
- + **Enabling environments and sustaining citizen science**
- + **Scaling up citizen science**

Figure 4: The repository of Discussion Papers and Thematic Reports of the MLE on Citizen Science

We encourage readers of this Final Report to view the individual Thematic Reports of each topic for a more complete presentation of the workshop insights, best practice examples, case studies, and conclusions resulting from these sessions, as well as a reflection of the deeper discussions that took place on those themes.

2.2. Scope and Purpose of this Final MLE Report

Transforming Citizen Science from an emergent field facing developmental challenges to a mature field of research and citizen practice has required perseverance and creativity. However, the achievements of the past years show that the field is now entering a mature phase that calls for deeper embedding and leveraging into the mainstream of research and innovation policy and practice.

Many of these achievements and best practices are highlighted throughout the Discussion Papers, Challenge Papers and Thematic Reports produced within this MLE. We do not seek to duplicate or summarise this work here but will occasionally refer the reader to a more detailed discussion contained in those reports.

This Final Report aims to serve as a guide and starting point for national-level stakeholders such as governmental ministries, Research Funding Organisations (RFOs) and Research Performing Organisations (RPOs) who have an important central role to play in enabling the enormous potential that Citizen Science has for science, policy and society, by building a supporting and sustaining environment for Citizen Science. Our intention is to aid the reader in identifying where they may be able to help to bring these changes about, and thus further advance the field of practice - and its realised impacts.

2.3. The Backcasting Approach

Due to the plurality of Citizen Science practices, and the importance of their cultural embeddedness within a specific research and innovation context, rather than offering a common roadmap for maximising the potential of Citizen Science, we encourage countries to co-create their own national vision for Citizen Science. No two countries will have the same 'footprint', and therefore should refer to their own national context and previous experience of participatory research practices. The Challenge Papers, Discussion Papers and Thematic Reports produced by the MLE can serve as inputs for this process.

The backcasting approach³⁴ (illustrated in Figure 4 below) is often applied as a planning approach for long-term complex issues that involve many aspects of society as well as technological innovations and culture change. Backcasting first looks ahead to define a desirable future end-state or vision, and then works backwards to identify the steps and solutions necessary to get there, starting from an assessment of the current situation, context, gaps, and needs.

This makes it a useful and highly relevant tool for developing a course of action to more fully embed and support Citizen Science at the national level, and was therefore introduced in the Final Meeting of the MLE as a useful tool to develop a context-specific strategic vision for Citizen Science within the relevant national research and policy-making landscape.

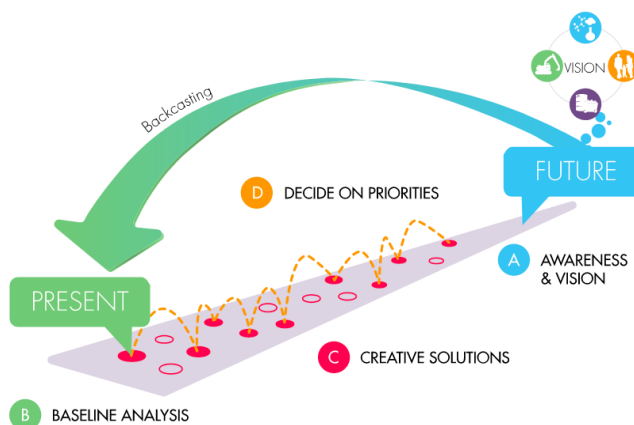


Figure 5: The backcasting planning approach as illustrated by The Natural Step³⁵

In the context of this MLE, we have explored the first step of the backcasting approach (**A = Aims & Vision**), which is to establish the long-term goals for Citizen Science as a practice, the value it can deliver, and the national vision for the partnership between Science, Policy & Society.

We have done this together with representatives from the participating countries in the MLE, resulting in the five key strategic aims and vision contained in Box 3 below. However, any

³⁴ Holmberg, J., & Robèrt, K. H. (2000). Backcasting—A framework for strategic planning. *International Journal of Sustainable Development & World Ecology*, 7(4), 291-308. <https://www.tandfonline.com/doi/abs/10.1080/13504500009470049>

³⁵ Our Approach: The Natural Step Framework (215) The Natural Step. <https://thenaturalstep.org/approach/>

application in practice should be collaboratively established together with key actors across the national science landscape and Citizen Science practitioners across the quadruple helix.

1. Embed Citizen Science as part of mainstream research, funding, education and innovation processes.
2. Integrate Citizen Science Data into mainstream processes for research, policy making and decision making.
3. Support Citizen Science Practices by identifying and addressing the needs of the wide range of different actors initiating, leading, and participating in Citizen Science.
4. Strengthen Citizen Science Networks and enable an active national community of Citizen Science practitioners who collaborate closely with other key stakeholders across the quadruple helix, exchanging knowledge and know-how, and furthering innovation in the field.
5. Make Knowledge Production Inclusive such that all stakeholders interested in the outcomes of scientific research and innovation have the opportunity to participate in open and collaborative processes of scientific knowledge creation, evaluation, and communication, in all domains of research.

Box 3: The five key Strategic Aims for a strong partnership between Science, Society & Policy

2.4. The Enabling Factors for Citizen Science

Another framework that has been developed throughout the MLE is that of the 'Enabling Factors' for Citizen Science, which describe the various forms of support that are necessary to build an enabling environment to achieve the five key strategic aims described above. These enabling factor categories, as also shown in Figure 5 below, are:

1. National Legal & Policy Frameworks,
2. Institutional Internal Policies & Culture,
3. Capacity Building & Networks,
4. Supporting (Data) Infrastructures, and
5. Societal Dialogue.

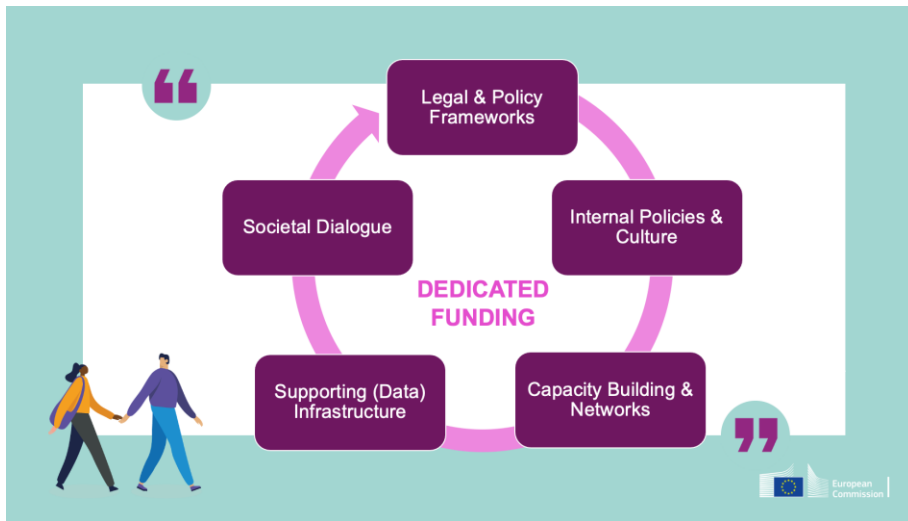


Figure 6: Categories of Enabling Factors for Supporting and Sustaining Citizen Science

For a deeper understanding of these factors and best practice examples, the Topic 4 Thematic Report '*Enabling Environments and Sustaining Citizen Science*³⁶' describes the enabling environments and the institutional and governance arrangements that can support Citizen Science, with a particular focus on the role of different stakeholders, including research institutes, funding bodies, public authorities, businesses and industry, and civil society organisations in promoting Citizen Science.

The companion 'How To' guide³⁷ to this Final Report contains a more detailed description of the backcasting approach, along with a step-by-step example of how it can be applied in practice, and a summary of the recommendations contained in each of the Thematic Reports of the MLE.

³⁶European Commission, Directorate-General for Research and Innovation, Mutual learning exercise on citizen science initiatives: policy and practice. Fourth Thematic Report, *Enabling environments and sustaining citizen science*, Publications Office of the European Union, 2022, <https://data.europa.eu/doi/10.2777/305248>

³⁷Available at: <https://ec.europa.eu/research-and-innovation/en/statistics/policy-support-facility/psf-challenge/mutual-learning-exercise-citizen-science-initiatives-policy-and-practice>



Figure 7: MLE participants working in breakout groups during the MLE Final Meeting in Brussels

3. Towards Citizen Science as a fully embedded Research Practice

Looking further into the future to set the national-level strategic vision for Citizen Science allows us to imagine a more ambitious future-state, widen the perspective of key actors across the national research and innovation landscape to include societal actors and citizens, and envisage what sustainability looks like at that future point.

This also sets the foundation for the necessary culture change needed to bring participatory research practices fully into the mainstream, and to strengthen the partnership between Science and Society and Policy.

3.1. Setting the Long-term Aims and Vision (Step A)

The first step of the backcasting approach within this MLE (Step A) has thus been to address the desired systems-integration between Science and Society and Policy, encapsulated in the five key strategic elements for Citizen Science³⁸, which are shown in Figure 6 below under (A) Aims & Vision.

³⁸ See the Topic 4 Discussion Paper for a range of recommendations from Project Reports, Policy Briefs, and Roadmaps produced by projects supported by the Horizon 2020 funding programme. https://ec.europa.eu/research-and-innovation/sites/default/files/rio/report/Discussion%20Paper%20Topic%204%20Enabling%20Environments%20FINAL_BT.pdf

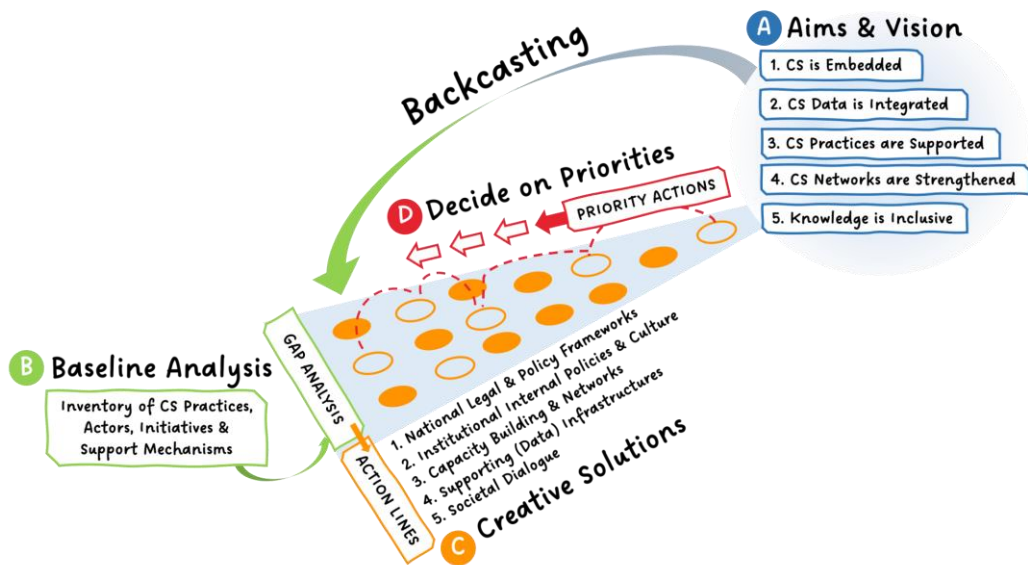


Figure 8: The MLE backcasting planning approach for developing a national strategic roadmap for Citizen Science.

Agreement on these aims should be reached via a process of dialogue and iterative development together with key members of the national science landscape and Citizen Science community.

3.2. Performing a Baseline Analysis (Step B)

The second step of the backcasting approach is to create a landscape review and/or inventory as a baseline (Step B) of the Citizen Science practices and support mechanisms already present and thriving in that country, across as wide a range of domains and contexts as can be found.

Recent developments in the field of Citizen Science to aid this process include the analytics and analysis framework developed by the Citizen Science Track project for monitoring the Citizen Science landscape³⁹, the standard for Public Participation in Scientific Research (PPSR) core meta-data model⁴⁰ for describing Citizen Science projects to ensure interoperability with other platforms (such as the EU-Citizen.Science platform⁴¹), the Citizen Science / Citizen Observatory description template developed within the WeObserve

³⁹ De-Groot, R., et al. "Developing a framework for investigating citizen science through a combination of web analytics and social science methods—The CS Track perspective." *Frontiers in Research Metrics and Analytics* (2022): 62.

⁴⁰ The Public Participation in Scientific Research (PPSR) Data Standard for Public Participation in Scientific Research. <https://core.citizenscience.org/>

⁴¹ The EU-Citizen.Science platform for sharing projects and resources for Citizen Science <https://eu-citizen.science/development/>, and the EU-Citizen.Science API <https://eu-citizen.science/swagger/>

project⁴², and the Joint Research Centre's inventory of Citizen Science activities for environmental policies⁴³.

The primary purpose of a landscape review is to **identify where the gaps and needs might lie**, so that further supportive mechanisms and infrastructure can be put in place, and a more robust enabling environment for Citizen Science be developed. The gaps analysis thus forms the baseline with regard to the strategic vision. An inventory of projects, resources and support mechanisms can serve a similar purpose, but when shared online (for example on a national Citizen Science platform) has the additional advantage of aiding knowledge exchange, discovery and networking amongst the practitioner community.

The secondary purpose of this process should be to **identify success stories to raise awareness of the impacts of Citizen Science** amongst actors in the national science and policy landscape, and further support and scale them up such that their impacts can be sustained over time, over larger geographic regions, with a higher diversity of participants. These then contribute to the development of the 'Creative Solutions' towards filling those gaps and achieving the strategic aims.

The scaling-up of successful Citizen Science projects remains a relatively under-addressed subject, despite the stated ambition to scale impactful initiatives, and the increasing number of Citizen Science projects, practices and initiatives developed successfully across Europe in the past years. There is still a tendency to focus on developing novel approaches in pilot format, rather than applying proven methods in new regions or contexts. As a result, there is still a need to gather empirical evidence of the success factors for sustaining and scaling up Citizen Science projects, such that their full potential value can be realised.

The Discussion Paper and Thematic Report '*Scaling up Citizen Science*⁴⁴ have therefore focused on developing a framework for discussing the meanings and dimensions of scalability, drivers, success factors and challenges for up-scaling Citizen Science projects and initiatives across Europe. The report highlights for example, that scaling up does not necessarily equal bigger projects, or greater geographical coverage, and should not be a goal in itself, but rather context specific to what is needed to extend impact. The eight key action areas for policymakers identified and described therein are to:

1. **Rethink the meaning of innovation in Citizen Science** acknowledging that the next innovation steps for the field of Citizen Science lie in the processes for reproducing, sustaining, and upscaling successful Citizen Science projects and initiatives⁴⁵.
2. **Adopt and promote a multidimensional, qualitative definition of scalability** which stems from the triangulation of proof of value, matter of concern and social/legal alignment and define specific evaluation criteria for selecting Citizen Science projects and initiatives to be scaled.

⁴² Gold, M., Wehn, U., Bilbao, A., & Hager, G. (2020). *EU Citizen Observatories Landscape Report II: Addressing the Challenges of Awareness, Acceptability, and Sustainability*. Zenodo. <https://doi.org/10.5281/zenodo.4472670> pg.44

⁴³ European Commission, Joint Research Centre (JRC) (2018): *An inventory of citizen science activities for environmental policies*. European Commission, Joint Research Centre (JRC) [Dataset] PID: <http://data.europa.eu/89h/jrc-citsci-10004>

⁴⁴ European Commission, Directorate-General for Research and Innovation, Mutual learning exercise on citizen science initiatives: policy and practice. Fifth Thematic Report, Scaling up citizen science, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/527361>

⁴⁵ Schade, S. 2022. Interview with Antonella Radicchi, June 29 2022 (via Zoom).

3. **Ensure responsible scaling-up** addresses the RRI dimensions⁴⁶ and ensure they are accounted for in the design and development of the projects/initiatives to align outcomes with the values of society.
4. **Commit to ‘People First’ (up)scaling processes**, acknowledging the importance of keeping people central and connected in the process of scaling Citizen Science projects and initiatives, and taking action to remove the systemic barriers impeding people from actively participating in science producing ‘contextualised knowledge’ at any level⁴⁷.
5. **Support a Responsible Scaling Ambition⁴⁸ in Citizen Science** by designing specific funding programs and mechanisms, diversifying the sources/types of funding, and ensuring the funding lines and sources can be visible to Citizen Science grassroots movements and bottom-up projects/initiatives.
6. **Support the implementation of different models (up-out-deep-down) and approaches/strategies (top-down/deliberate, bottom-up/accidental) of scalability**, acknowledging scalability in Citizen Science is context- and domain-dependent and should be responsible, inclusive and aligned with the logics of the projects/initiatives.
7. **Develop local/regional/national/European networks** to foster collaboration and initiate discussions about the cultural transformation/s and implications expected via the scaled projects, with an emphasis on the language issue and its cultural and scientific implications.
8. **Support the exploitation of citizen-generated data from (up)scaled Citizen Science projects/initiatives** integrating them in policies and policy making programs at the local/regional/national/EU level.

3.3. Identifying Actions towards the Strategic Aims (Step C)

As contained in more detail in the Topic 4 Thematic Report, the ‘Enabling Environment’ and ‘Enabling Factors’ framework that have been explored throughout the MLE have provided us with a structure within which we can describe the various forms of support that encourage, enable, support, and sustain Citizen Science practices, researchers and participants. These are the ‘Creative Solutions’ referred to in Step C, and their implementation can be organised in Action Lines, as shown in the backcasting Figure 6 above.

These enabling factors are inter-relatedly needed to enable the achievement of the five key strategic elements of an enabling environment, i.e., they map roughly but not directly one-to-one, as shown in Table 3 below. As a country defines its own strategic vision for Citizen Science, either can individually serve as a dedicated action line in and of themselves towards achieving a desired end-state where Citizen Science is fully embedded and supported in mainstream research and innovation processes.

⁴⁶ The RRI dimensions are: public engagement, open access, gender equality, science education, ethics, and governance. Source: <https://rri-tools.eu/about-rri>

⁴⁷ See also Irwin, A. (1995), *Citizen Science. A Study of People, Expertise and Sustainable Development*. Routledge; Skarlatidou, A., Haklay, M. (eds), 2021. *Geographic Citizen Science Design: No One Left Behind*, UCL Press. <https://www.uclpress.co.uk/products/125702>

⁴⁸ Adapted from the term “Scaling Ambition” from Maturano, J. M. (2020). *Responsible Scaling of Citizen Science projects for farmers: developing a SDGs-guided Toolkit*. Technical Report. IIASA.

Enabling Factors → Strategic Elements ↓	National Law & Policy	Internal Policy & Culture	Capacity & Networks	(Data) Infrastructures	Societal Dialogue
1. Citizen Science is Embedded	✓✓	✓✓	✓	✓	✓
2. Citizen Science Data is Integrated	✓	✓	✓✓	✓✓	
3. Citizen Science Practices are Supported	✓✓	✓✓	✓✓	✓	✓
4. Citizen Science Networks are Strengthened	✓	✓	✓✓	✓	
5. Knowledge Production is Inclusive	✓	✓✓	✓		✓✓

Table 3: The Five Strategic Elements of an Enabling Environment for Citizen Science, as they relate to the Enabling Factors (double checkmarks indicating the main factor, where multiple factors play a role)

As in the first step (A = Aims & Vision), agreement on the details of the actions required to address the needs of the practitioner community and fill gaps within the enabling environment should also be reached via a co-creative co-design process with key members of both the national science landscape and the Citizen Science community. For an example of such a process in action, Box 4 below describes the recent extensive consultative process conducted in Germany throughout 2021, which led to 94 recommendations for action for the further development of Citizen Science in Germany.



White Paper Citizen Science Strategy 2030 for Germany

The German Citizen Science community recently undertook a major consultation exercise to produce a White Paper Citizen Science Strategy 2030 for Germany⁴⁹ with the support of the Federal Ministry of Education and Research (BMBF) and the German Federal Environmental Foundation, which was compiled with the participation of 219 people from 136 organisations - from scientific institutions and research libraries to science shops, societies and private individuals - with a total of 1,343 contributions, 119 comments and 31 position papers from organisations and institutions.

⁴⁹ Bonn, A., et al. (2021). White Paper Citizen Science Strategy 2030 for Germany. Helmholtz Association, Leibniz Association, Fraunhofer Society, universities and non-academic institutions, Leipzig, Berlin. SocArXiv <http://osf.io/preprints/socarxiv/ew4uk>

This Citizen Science White Paper (produced in 2020) is the natural successor to the Green Paper for Citizen Science in Germany⁵⁰ that was produced in 2016 by the 'GEWISS' capacity building programme (standing for: BürGEr schaffen WISSen – Wissen schafft Bürger, i.e., Citizens Create Knowledge – Knowledge Creates Citizens), which aimed at strengthening Citizen Science in Germany. One of its 52 recommendations for action was the establishment of a national platform for Citizen Science in Germany, thus resulting in the launch of 'Bürger schaffen Wissen'⁵¹.

The survey found that the most effective support instruments for gaining expertise in Citizen Science were the knowledge-exchange with colleagues from other organisations facilitated by the network, knowledge-exchange with colleagues from one's own organisation, the experience gained from participating in a Citizen Science project, and the experience gained from organising or leading a Citizen Science initiative. Most respondents reported that what Citizen Scientists gain the most from participating in Citizen Science projects is new knowledge about the topic being investigated within the project content, and the feeling of making a difference together with others in the field of that topic.

These inputs led to the development of the 94 recommendations for action made in the White Paper, across 15 thematic priority areas for further supporting, sustaining and developing Citizen Science in Germany.

In 2021, Citizen Science was anchored in the German coalition agreement, stating "we will use Citizen Science to integrate perspectives from civil society more strongly into research".

In addition to the current Citizen Science funding guideline BMBF has created a Citizen Science competition for cities and municipalities in order to strengthen local networks. The funding of the national Citizen Science platform will be continued (2023-2025). Among others, a Citizen Science prize for excellent research will be launched and there will be increased focus on integrating Citizen Science multipliers and civil society organisations to mainstream Citizen Science.

More Information:

https://www.buergerschaffewissen.de/sites/default/files/grid/2022/10/17/White_Paper_Citizen_Science_Strategy_2030_for_Germany.pdf

Box 4: The German process towards co-developing the national strategy for Citizen Science, as a central pillar of Open Science.

The specific action areas that require attention in order to grow and sustain Citizen Science are presented in greater detail in the underlying Discussion Papers and Thematic Reports on the topics of the MLE, which also summarise the insights and recommendations that emerged during the dedicated workshop sessions on those topics⁵², but there are a number of cross-cutting requirements to all of them which are rooted in the broader debates on R&I and the role of societal engagement at large and Citizen Science in particular:

⁵⁰ Bonn, A., Green Paper. Citizen Science Strategy 2020 for Germany. Projekt" Bürger schaffen Wissen-Wissen schafft Bürger"(GEWISS), 2016.

https://www.buergerschaffewissen.de/sites/default/files/assets/dokumente/gewiss_cs_strategy_englisch_0.pdf

⁵¹ <https://www.buergerschaffewissen.de/>

⁵² See the MLE Repository: <https://ec.europa.eu/research-and-innovation/en/statistics/policy-support-facility/psf-challenge/mutual-learning-exercise-citizen-science-initiatives-policy-and-practice>

Firstly, **dedicated funding** to support, sustain and scale Citizen Science is needed across all of the categories of enabling factors, not just within research funding programmes. Investment is needed in the research infrastructures and technical tools and platforms that support Citizen Science, in human resources, training, education, and other forms of capacity building and knowledge exchange. Opportunities should be taken to also engage key stakeholders in the co-creation of these funding programmes and mechanisms (see the example of the PRO-Ethics pilots in Box 5 below).

Secondly, the system of **rewards and recognition** within the career pathways for academics, scientists, researchers, and other knowledge experts must be updated to include participatory and collaborative research practices, such that they are recognised as having value to both the quality of the science and to society, and thus need to be rewarded within the normal progression of a research career. This culture change goes hand in hand with reforming research assessment and the concept of excellence⁵³.

And thirdly, **knowledge sharing** of methods and best practice, and **awareness raising** of the impacts of Citizen Science should be supported within institutions and across the entire research landscape, such that the silos between research groups, departments, faculties, and external stakeholder groups can be bridged and brought more closely together in collaborative partnerships. This should include the establishment of and support for internal Working Groups, societal knowledge hubs such as Citizen Science in Public Libraries, and national Citizen Science Practitioner networks.

3.4. Identifying the Actors and the ‘Spheres of Influence’ towards the Strategic Aims (Step C)

During the explorations of the factors that contribute to an enabling environment for Citizen Science, and the longer list of specific recommended actions contained in Table 1, the MLE participants discussed which of these they themselves could play a role in putting into practice, either at the institutional level, or within their own department. By considering their own ‘Spheres of Influence’, they could express where they had an ability to create or implement these factors from their formal role or mandate or encourage their creation and implementation as advisors or facilitators.

This forms an important part of ‘backcasting’ Step C (Creative Solutions) and the development of actions and action lines towards achieving the national strategic vision, according to each actor’s role within the scientific landscape. For example, RFOs are uniquely placed to provide dedicated funding instruments for Citizen Science, but all actors can play a role in supporting multi-stakeholder engagement and Citizen Science practices, as shown in Table 4 below.

Actors may include the National Ministries for Science and Education, (but also Environment, Transport, Agriculture, Food, Health, and others), regional, local and other sectoral policy makers, RFOs, RPOs, Research Supporting Organisations (RSOs) such as eScience Centres and computing infrastructure providers, and Higher Education Institutions (HEIs), and Research and Technology Organisations (RTOs), who are operating closer to market needs.

⁵³ See for example the work of the Coalition for Advancing Research Assessment <https://coara.eu/>, and the Agreement on Reforming Research Assessment <https://coara.eu/agreement/the-agreement-full-text/>.

Spheres of Influence →	Ministries	RFOs	RPOs	RSOs	HEIs
1 (a) Embed Citizen Science as part of mainstream research and innovation processes	✓	✓	✓✓	✓	✓
1 (b) Embed Citizen Science as part of mainstream funding	✓	✓✓			
1 (c) Embed Citizen Science as part of mainstream education	✓	✓	✓		✓✓
2 (a) Integrate Citizen Science Data into mainstream processes for research, policy making and decision making.	✓✓	✓		✓	
2 (b) Build Citizen Science data and technology infrastructure	✓	✓	✓	✓	
3 Support Citizen Science Practices	✓	✓	✓✓	✓✓	✓
4 Strengthen Citizen Science Networks	✓	✓✓	✓	✓	✓
5 Make Knowledge Production Inclusive	✓	✓	✓	✓	✓

Table 4: Areas of recommended actions within the Strategic Aims, and the key actors within the national science landscape (double checkmarks indicating the stronger sphere of influence where several actors play a role)

3.5. Deciding on the Priorities (Step D)

The priorities for action in any given country will depend on the unique context of the scientific and policy landscape, and the stage of development of Citizen Science as a practice - they should therefore be set in collaboration with the relevant actors and the field of practice. These decisions form Step D in the backcasting process.

Despite this emphasis on local context, a number of needs have clearly emerged throughout the MLE process.

Of all of these recommendations for action, the four most impactful recommendations that have been supported across all of the thematic topics are to:

1. Ensure that Citizen Science practitioners - in academia (top-down), in society (bottom-up), in policy (collaborative) and in the private sector (collaborative) - are supported by a **national network of practitioners** to share knowledge, form partnerships, and further develop best practice.
2. Ensure that **dedicated funding instruments** can provide financial support to the places where it is most needed (especially to societal partners) in order to enable new initiatives to get off the ground and to provide ongoing funding or scaling-up funding for successful initiatives. These instruments should allow sufficient flexibility for co-creational approaches to be implemented.
3. Enable the **culture change** required to open up science and the scientific process more fully to the participation of citizens, societal actors, and civil society organisations for the benefit of research quality, policy impact, and improved societal welfare; and
4. Enable the establishment and ongoing iterative development of key **supportive infrastructure** such as data-gathering tools and platforms, data analysis and visualisation tools, data hosting and archiving, and domain-specific research infrastructures.

Dedicated funding is also particularly important for addressing the three aspects of sustainability that are particular to Citizen Science practices, namely: sustaining Citizen Science projects and initiatives over the mid to long-term, sustaining the wider uptake of Citizen Science data and multi-stakeholder engagement practices, and sustaining Citizen Science as a research practice within RPOs and HEIs (a topic that is covered in the Horizon 2020 projects TIME4CS and Incentive).

Realising the full potential of Citizen Science requires a culture change across the entire scientific landscape - not only to embrace the principles of Open Science, within which Citizen Science is one of the key pillars, but also to value and support societal engagement within future science policy and practice at the highest levels of government and science. It also requires an investment in addressing the **three main challenges of Citizen Science long-term sustainability**, namely:

1. **Sustaining Citizen Science projects and initiatives over the mid to long-term**, in terms of their ability to secure financial support for ongoing operations and the continued engagement of participants, access to supportive technical and capacity infrastructure, and a national network of practitioners to share knowledge and further develop the state of the art.
2. **Sustaining the wider uptake of Citizen Science data and multi-stakeholder engagement practices**, such that the broader aimed-for impacts of Citizen Science approaches for policymaking and decision-making can be achieved, and
3. **Sustaining Citizen Science as a research practice** within RPOs and HEIs, such that Citizen Science is
 - taught within the HEI curriculum as a valuable research approach,
 - supported within the context of research groups or operational scientific processes (for example via Citizen Science Support Centres),
 - recognised and rewarded within the career trajectories of the people initiating and/or undertaking such participatory research initiatives,
 - continuously progressing and innovating in its methods and domains of application, and
 - embedded in responsible research and innovation practices such that ethical considerations are adequately covered and approved.

4. Developments in the participating countries during the MLE

The MLE took place between the end of 2021 and the beginning of 2023, during which time the countries participating in the exercise made a great deal of progress towards implementing new measures to support and sustain Citizen Science in their home countries.

In this final section of the Report, we take the opportunity to showcase the new actions and achievements that have not otherwise been written about within the underlying Thematic Reports of the MLE, which profiled best practice examples from different participating countries.

Progress in Austria



I believe the work and reports of the MLE on Citizen Science come at a perfect juncture in European policy, where the national implementation of ERA Actions and the course setting towards FP10 meet the efforts towards a research assessment reform. Citizen Science stakeholders have now really valuable tools and knowledge to use this opportunity and establish Citizen Science at the centre of the debate in all three of those processes.

Michalis Tzatzanis

Participant from Austria



The MLE has been a great source of motivation, information, and exchange of good practices for the participants from Austria. It has also offered an excellent and timely opportunity to highlight the progress on Citizen Science so far in Austria, both to decision/policy makers nationally and internationally with the other MLE participating stakeholders/countries. This higher visibility of the Austrian accomplishments in Citizen Science, has motivated for example the Federal Ministry of Education, Science and Research (BMBWF) to co-finance the hosting of the ECSA European Conference 2024 in Vienna; and to include Citizen Science as one of 12 Actions in the Austrian ERA National Action Plan.

Lessons learned from the MLE as well as ongoing national efforts will be presented in a national dissemination event, in spring 2023, where the further steps in Austria will be discussed.

The fruitful participation of Austria in the MLE would not have been possible without the support of the central Citizen Science stakeholders in Austria, i.e.:

- the Citizen Science Network Austria (CSNA),
- the Center for Citizen Science of the Agency for Education and Internationalisation (OeAD),
- the Open Innovation in Science Center of the Ludwig Boltzmann Gesellschaft (LBG OIS Center),
- the Federal Ministry of Education, Science and Research (BMBWF),
- the Austrian Science Fund (FWF), and
- the Austrian Research Promotion Agency (FFG).

These were brought together in a “Task Force Citizen Science” that coordinated both the input of Austria in the thematic meetings and reports, as well as the country visit of the MLE participants to Vienna.

The MLE has also offered opportunities for international collaborations with other participants, who often solicited the expertise of the Austrian stakeholders, during the course of the MLE. For instance, the CSNA was invited to support the creation of a Slovenian Citizen Science network.

Finally, yet importantly, during the course of the MLE, the BMBWF decided and secured the national funding of the Plastic Pirates - Go Europe! project.

Progress in Belgium



Figure 9: MLE Citizen Science Group outside the Museum of Natural Sciences Belgium during the Final MLE Meeting in Brussels

Inspired by the MLE methodology, the Belgian participants decided to organise a similar MLE on a national level at the beginning of 2023. They invited representatives from the Belgian Federal Science Policy Office (BELSPO) and a selection of researchers from the federal scientific institutions (FSI's) with expertise and interest in Citizen Science.

The underlying aims were to 1) give an overview of Citizen Science practices within all FSI's through concrete examples from practitioners, 2) map the needs of ongoing and future Citizen Science projects and 3) collectively list solutions and discuss if and how the funding body (BELSPO) could meet some of these needs and concerns.

This event at the Belgian federal level also served to highlight the diversity of Citizen Science projects already happening at the federal research institutes, many of which were not yet known to other Citizen Science researchers or to BELSPO. It set the stage for the creation of a national network on Citizen Science, which could facilitate the exchange of best practices and foster new collaborations. The federal ministry of research took stock of experiences, projects, problems, needs and opportunities. It also took note of the reports developed in the MLE on Citizen Science and participated in several meetings of this network.

The activities of the MLE additionally broadened the international network and knowledge of the participating members of the Royal Belgian Institute of Natural Sciences and the Africa

Museum and enabled the federal Ministry of Science policy to include Citizen Science in its reflection for a new generation of research programmes expected at the end of 2023.

Progress in Germany



From Germany's point of view, the activities and workshops of the MLE have enabled a profound European exchange of experiences, policies and programs. We learned from each other and could expand our networks. We will consider the Thematic Reports in the future development of our initiatives.

Citizen Science has been systematically funded and supported by the BMBF with a variety of measures since 2013: the strategy on Citizen Science has been developed in two phases, contained in the 2016 Green Paper 2016⁵⁴, and the 2022 White Paper 2022⁵⁵, the national platform “Bürger schaffen Wissen⁵⁶” was established; two funding guidelines were published (2016, 2019); a guideline on legal framework conditions for Citizen Science professionals was developed⁵⁷, and participation competence has been fostered through training offered by the platform “Bürger schaffen Wissen”. (See Box 4 above)

This commitment in the field of Citizen Science will be continued after the MLE with a focus on the role of civil society and local cooperation between municipal, scientific and social actors. The discussion on the topic “Enabling Environments” during the MLE encouraged us to move in this direction.

Incorporating Citizen Science in the scientific recognition system is another important measure as the discussion on “Maximizing the Relevance” has demonstrated. The platform “Bürger schaffen Wissen” will therefore award a nationwide Citizen Science Prize for excellence in citizen science.

⁵⁴https://www.buergerschaffewissen.de/sites/default/files/assets/dokumente/gewiss_cs_strategy_englisch.pdf

⁵⁵https://www.buergerschaffewissen.de/sites/default/files/grid/2022/10/17/White_Paper_Citizen_Science_Strategy_2030_for_Germany.pdf

⁵⁶ www.buergerschaffewissen.de

⁵⁷<https://media.naturkundemuseum.berlin/eas/partitions-inline/1/0/404000/404043/03b4a60143f7078e62f28d045304d15e76194081/application/pdf>

Additionally, in order to strengthen the role of civil society actors and support impactful local alliances, a competition for cities and municipalities has been initiated. Building on this, we would like to further advance the development of regional structure and capacity. The Ministry is working on the idea to establish regional Citizen Science Centers in addition to the existing national Citizen Science platform.

Moreover, the MLE underlined the importance of data quality and data management. Only sound data management leads to an increase in impact and sustainable use of collected data. For this reason, we are funding the project “DMP-Tool” (11/2022-12/2023) to develop a data management plan tool that is specifically tailored for Citizen Science projects. In order to support the application of data management plans, training programs for Citizen Science actors will be offered.

Mutual learning and sharing perspectives, especially in the innovative field of Citizen Science, is key. We are therefore looking forward to the future development of participation in research.

Progress in Hungary



“

It was a fantastic journey to participate in the MLE working group. I learned and understood more about the position of Hungary among the EU countries, in the different aspects of Citizen Science.

The working group’s country visit in September had real impact on the Hungarian Citizen Science landscape. We have established the first mailing list community in Hungary that we would like to develop into a national Citizen Science observatory over time.

Katalin Urbán
Participant from Hungary

”

The first Hungarian national level Position Paper on Open Science was published in October 2021⁵⁸. This Paper was produced based on professional consensus and was created with the participation of the major stakeholders of the Hungarian science community. The Paper responds to the current paradigm shift in the world of science, which, in line with the recommendations of international science organisations and the relevant policy objectives of the European Union, summarises the principles and the fields of activity of Open Science that best serve the interests and development of Hungarian science. The statement also aims to draw the attention of the scientific community in Hungary towards the importance and timeliness of the new approach, its strategic issues, and the increasingly important role of Open Science in international cooperation.

Citizen Science is an integral part of the Position Paper, considered as an area of Open Science activities where researchers and research communities take the initiative to involve citizens, local communities and the wider society in certain research processes. The

⁵⁸ <https://nkfih.gov.hu/openscience/position-paper-on-open>

participation of citizens in the research ecosystem enables direct, active and participatory learning of scientific work, thus strengthening trust in science, shaping public opinion and increasing the scientific knowledge of citizens.

The signatories to this Paper believe that local and regional Citizen Science projects can play an important role in the mission of HEIs. Research projects based on the principles of Citizen Science can support social innovation, help improve well-being and enhance life for the local community. Citizen Science, in line with the European Union's cohesion policy, can contribute to reducing disparities between regions, thus supporting social renewal.

The success of Citizen Science projects requires a stable and predictable funding base over the long term, as well as a widespread, open access mode of dissemination of research results.

The first dedicated funding for Citizen Science projects called Mecenatúra was launched in 2021⁵⁹. The budget had to be increased due to the numerous applicants. By the deadline of 7 October 2021, a total of 648 valid proposals were received in the four sub-programmes, with a total funding request of nearly HUF 3.7 billion.

In view of the large number of proposals, the Ministry for Innovation and Technology has decided to increase the budget of the Science Patronage call by HUF 700 million for the four sub-programmes. In the third sub-programme funding Citizen Science projects (MEC_N_21) 33 researchers were awarded HUF 663 million for the period 2021-2023.

The country visit of the MLE working group took place in September 2022 in Hungary, focusing on Topic 4 of the agenda: Enabling Environments and Sustaining Citizen Science. The meeting was hosted by the National Research, Development and Innovation Office of Hungary, and co-hosted by the University of Pannonia in Veszprém and ELTE University in Budapest.

During the meeting, an exhibition of posters was organised to introduce successful Hungarian Citizen Science projects. Since the meeting, this exhibition has been travelling to further displays at other universities and research centres.

We also took the opportunity to establish the first mailing list of the Hungarian Citizen Science community that we would like to develop into a national Citizen Science Observatory over time.

⁵⁹ <https://nkfih.gov.hu/english/nrdi-fund/funded-projects-mec21>

Progress in Norway



This MLE has been very timely for Norway. Several of the recommendations in the final report are relevant.

A lot of the ongoing and future activities at the national level have been strengthened by participating in this MLE. We will use the lessons learned and the Backcasting method to decide how to move forward.

We are following up on some of the recommended enabling factors for citizen science, for example supporting activities to encourage skills development and awareness to ensure good practices.

Vibeke Helén Moe
Participant from Norway



Norway has a network for Citizen Science in place (the Norwegian national Network of Citizen Science⁶⁰ was established in November 2021, just preceding the start of the MLE), and we have a strategy for Open Science which also emphasises the role of Citizen Science⁶¹, with Citizen Engagement included in key policy documents such as the White Paper 'The Long-term plan for Research and Higher Education 2023–2032'⁶².

The MLE has enabled the Ministry of Higher Education and Research and the Research Council of Norway to work together on accelerating the efforts and pooling our resources in the follow-up of Citizen Engagement and Citizen Science.

For example, the Ministry is currently supporting a project that will produce guidance in Norwegian for researchers that would like to use Citizen Engagement and Citizen Science as a method in their research projects. An SME specialising in citizen engagement projects and the University of Oslo have been engaged to look into three specific projects that have used Citizen Science as a method. The project will involve interviews with citizen scientists and researchers. Results will include a set of guidelines in Norwegian for researchers as well as advice for policy makers and RFOs. We hope that this project can help raise awareness and interest. Perhaps this can also remove barriers to participation and can encourage best practices in Citizen Science.

Dissemination events will be planned for the publication of the guidelines and policy advice and will aim to encourage the mainstreaming of Citizen Science as a recognised research method and raise awareness in Norway about Citizen Science, in ministries, the research funding organisations and among researchers.

The guidelines can encourage more researchers to use Citizen Science as a method and make it easier for research organisations and research administrators to understand how to engage citizens. This is valuable on its own, but citizen engagement and Citizen Science is also important to spread research results and the uptake of science. Knowledge about this

⁶⁰ [Nasjonalt nettverk for folkeforskning \(forskningsradet.no\)](https://nasjonalt-nettverk-for-folkeforskning/forskningsradet.no)

⁶¹ nfr-policy-open-science-eng.pdf forskningsradet.no

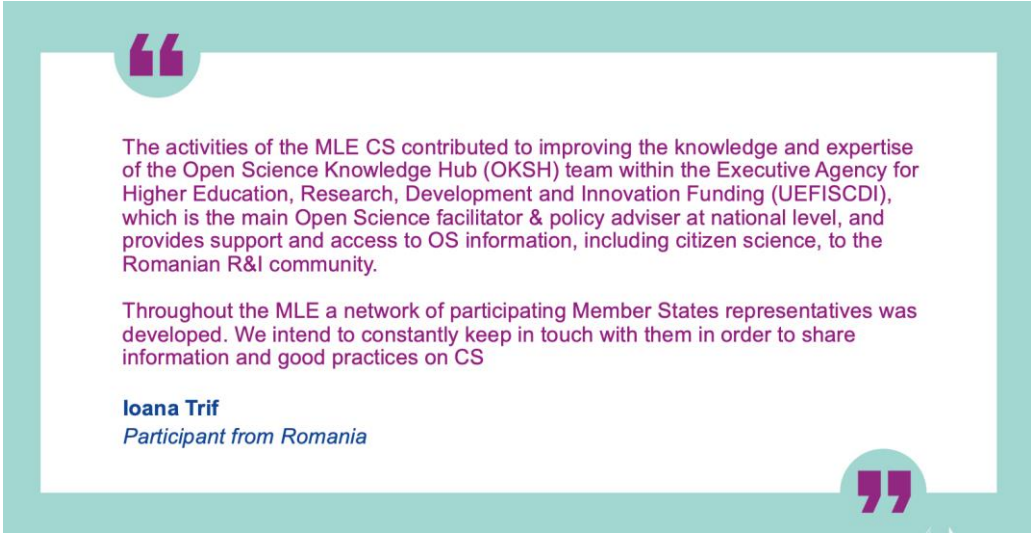
⁶² <https://www.regjeringen.no/en/dokumenter/meld.-st.-5-20222023/id2931400/?ch=3>

research method will encourage best practices and expand the number of research institutions that can use this method. Knowledge about citizen engagement and Citizen Science will also enable Norwegian researchers and citizens to take part in projects funded by for example Horizon Europe, particularly missions.

The Ministry will keep working on a common strategic vision for Citizen Science with the Research Council of Norway and look at how we can implement even more recommendations from the MLE. Participation in this MLE has been key to making the Research Council and the Ministry work together on this issue. For example, the Research Council of Norway is mapping existing Citizen Science projects in Norway, to compile an overview of the research environments that are currently using Citizen Science.

The Research Council is also participating in the ProEthics project and developing a pilot for testing and developing an ethical framework for users/citizens participation in research and innovation activities. As that project draws to a close, the Council will be responsible for dissemination, and is aware of the clear connections between the MLE and the topics of participation and ethics covered in ProEthics.

Progress in Romania



The activities of the MLE CS contributed to improving the knowledge and expertise of the Open Science Knowledge Hub (OKSH) team within the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), which is the main Open Science facilitator & policy adviser at national level, and provides support and access to OS information, including citizen science, to the Romanian R&I community.

Throughout the MLE a network of participating Member States representatives was developed. We intend to constantly keep in touch with them in order to share information and good practices on CS

Ioana Trif
Participant from Romania

Before the start of the MLE, Citizen Science was already included in the proposed Strategic Document regarding the Open Science Development Framework in Romania, which is the Green Paper on the Transition to Open Science (2022-2030). The participation of the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) representatives in the MLE has reinforced the importance of Citizen Science as part of this national strategic document.

Information obtained from the MLE (e.g., information presented regarding the results of the Special Eurobarometer 516-European citizens' knowledge and attitudes towards science and technology) has contributed to improving the presentation and description of the European context regarding Citizen Science as part of this national strategic document.

Additionally, two of the proposed actions dedicated to Citizen Science that are included within it are the development of a national network dedicated to Citizen Science at the R&I

community level in Romania, based on the model of those existing at the European level; and support for the development of specific Citizen Science capabilities/competencies of researchers and staff from academic and research institutions through capacity building activities (e.g. workshops, information sessions).

The Green Paper on the Transition to Open Science (2022-2030)⁶³ was put out for public consultation by the Open Science Knowledge Hub (OKSH) within UEFISCDI in the period August 16 – September 30, 2022 and the results of the consultation have contributed to the final version of the strategic document – the White Paper on the Transition to Open Science (2023-2030) that was published in December 2022⁶⁴.

At the national level, the transition towards open science is supported also by the national portal dedicated to open science (www.open-science.ro), developed by the OSKH team within UEFISCDI and launched in December 2022. Its aim is to connect and actively engage the Romanian RDI community to the open science dynamics and capacity building opportunities and also to be a resource for Open Science in Romania; Citizen Science will have a dedicated section within the national portal.

Citizen Science is one of the actions that will be supported and is included within the transition to Open Science and excellence in scientific research in Romania, as part of the National Strategy on Research, Innovation and Smart Specialization for 2022-2027⁶⁵ that was approved on 20 July 2022.

The National Plan for Research, Development and Innovation 2022-2027⁶⁶ which was approved by the Governmental Decision no. 1188 of 29 September 2022 is the main instrument for implementing the National Strategy on Research, Innovation and Smart Specialization for 2022-2027⁶⁷. Within the National Plan, the Science and Society Program was included with the aim to develop the dialogue between science and society by opening up the research and innovation system to citizens, civil society and end-users, by involving students and young people in innovative STEAM actions, as well as supporting specific innovative methods and methodologies in order to engage/ involve citizens in science.

⁶³ <https://www.open-science.ro/resurse/cartea-verde-a-tranzitiei-catre-stiinta-deschisa-2022-2030>

⁶⁴ The White Paper on the Transition to Open Science (2023-2030) was developed within the project Increasing the capacity of the RDI system to respond to global challenges. Strengthening the anticipatory capacity to develop evidence-based policies (SIPOCA592) financed by European Structural Investment Fund

⁶⁵ <https://www.old.research.gov.ro/uploads/comunicate/2022/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf>

⁶⁶ <https://www.research.gov.ro/wp-content/uploads/2022/12/hg-aprobare-pncdi-iv.pdf>

⁶⁷ <https://www.old.research.gov.ro/uploads/comunicate/2022/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf>

Progress in Slovenia



The MLE on Citizen Science came at just the right time for us to start riding the wave of citizen science”.

“The MLE on CS has been an exceptional experience with a very steep learning curve. However, the opportunity to bring joint European knowledge on CS into national practice and witness the development of a national CS ecosystem has made all the difference.

Petra Žagar and Tit Neubauer
Participants from Slovenia



Taking part in the MLE enabled the participants from Slovenia to build knowledge on Citizen Science, share valuable insights with respective experts and share practices and experience with other country representatives. The MLE took place in parallel to national efforts on developing a National Action Plan on Open Science, which presents the implementation of the Resolution on the Slovenian Scientific Research and Innovation Strategy 2030 (ReZrIS30), adopted early in 2022. Consequently, the participants of the MLE were able to transfer the ideas, proposals and practices presented during individual topic sessions into the national context, where they were further discussed with policy experts on Open Science and practitioners in Citizen Science. This transfer of knowledge and ideas would not have been possible without the dedicated work of the team at the Central Technical Library of the University of Ljubljana, that acted as an informal focal point on Citizen Science and had taken upon themselves to study, map and coordinate the field at the national level.

Early in the process of bringing the Action Plan on Open Science to life, the decision was made to add a separate chapter on Citizen Science, which would propose specific measures to be achieved until 2030. Since we are just beginning to acknowledge Citizen Science as a novel, but required, research method, the recommendations regarding the enabling environments are, therefore, quite helpful and useful, as some of the participating countries have already gone through a similar process. The experience gained through the MLE will not only help in the implementation of the measures in the National Action Plan but have, already during the course of the MLE, influenced, to some extent, the change in the perception of Citizen Science among colleagues at the responsible Ministry.

The measures introduced in the Action Plan include, among others, the establishment of a national Citizen Science network and a national web platform⁶⁸, mapping of existing Citizen Science projects, development of a Citizen Science toolkit and step-by-step instructions on developing a Citizen Science project, as well as, and perhaps most importantly, publishing the first targeted Citizen Science call for proposal in 2023, and continuing the calls on a biannual basis until 2030.

⁶⁸ <https://citizenscience.si/>

APPENDIX: Summary of Recommendations towards achieving the Five Strategic Aims for Citizen Science

Recommended Actions
1 (a) Embed Citizen Science in mainstream research practices:
Raise awareness of Citizen Science research practices and increase their acceptance
Recognise and reward Citizen Science practices in career trajectories & remove institutional barriers
Include Citizen Science practices in the qualitative evaluation and assessment of research excellence
Provide a central online repository of consolidated research and best practice
Facilitate knowledge exchange amongst researchers
Facilitate inter- and transdisciplinary collaborations
1 (b) Embed Citizen Science in mainstream funding:
Provide dedicated funding programmes for Citizen Science approaches in research and innovation
Include specific evaluation criteria in general calls
Launch calls for scaling up (or down, or out, or deep) ongoing projects
Support Citizen Science practices through incubator models, with graduated funding levels
Provide cascade funding models that can rapidly respond to local needs
Diversify the variety of funding models to also support grassroots participation and initiation
1 (c) Embed Citizen Science in mainstream education
Develop and deliver participatory Citizen Science lesson modules for hands-on STEM teaching
Develop and deliver Citizen Science as a research method module in higher education
Include Citizen Science methods in the provision of research training for PhDs and Postdocs
Systematically integrate community-engaged learning in higher education
2 (a) Integrate Citizen Science Data in policymaking
Integrate Citizen Science data within formal data monitoring platforms (environment, public health, mobility, urban planning, climate change, etc.)
Integrate citizen-generated data in national policy-making processes
Embed Citizen Science initiatives and citizen observatories into local and regional policy-making processes
Build common open (FAIR) data repositories and data platforms
2 (b) Build Citizen Science data and technology infrastructure

Recommended Actions

Provide and maintain Citizen Science data hosting, data analysis and data sharing platforms

Fund and support the ongoing iterative development of Citizen Science data gathering and analysing tools

Integrate Citizen Science methods and data into domain-specific research infrastructures

3. Support Citizen Science Practices

Identify different actors with a stake in research processes and/or outcomes, and address their needs in context

Provide skills development, training and research support across stakeholder groups

Provide centralised communications and community outreach support for researchers

Invest in the production of high-quality guidance and resources for the innovative application of new approaches and new domains of application

4. Strengthen Citizen Science Networks

Provide structural coordination and operations funding, including communications and community management for a national Citizen Science practitioner network

Facilitate knowledge-exchange, networking and partnership formation across the national community of practitioners

Facilitate the further development of best practice at the national level

Bring multiple stakeholder groups together, including civil society organisations, societal actors and citizens

Facilitate collaboration between Open Science networks, Science Communication & Public Engagement networks, and Citizen Science networks

5. Make Knowledge Production Inclusive

Provide opportunities to participate in open and collaborative processes of scientific knowledge creation, evaluation, and communication to the benefit of society and its members, in all domains of research.

Support societal dialogue to engage diverse stakeholder groups in discussions of research questions that impact them

Remove barriers to participation of non-traditional participants in research and innovation

Develop specific funding criteria for societal actors such as NGOs, local community organisations, faith-based organisations, etc.

Implement Responsible Research & Innovation (RRI) practices with particular attention for diversity & inclusion

Develop funding and project evaluation criteria that address diversity and inclusion

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This Final Report describes a strategic vision for Citizen Science at the national level based on the thematic topics discussed throughout the MLE and presents an approach to achieving those aims via ‘backcasting’. Recommendations for actions to be taken towards establishing an enabling environment for supporting, sustaining and scaling up Citizen Science are drawn from the Challenge Papers, Discussion Papers and Thematic Reports produced by this MLE. Rather than suggest one linear route for embedding Citizen Science in mainstream research, innovation and policy making processes, this Report recommends a more flexible, co-created, and context-specific - but also ambitious - approach that builds on the substantial foundation for cross-national learning and inspiration that this MLE provided.

Studies and reports

