RECOMMENDATIONS TO MAINSTREAM CITIZEN SCIENCE IN POLICY

ACTION

INTRODUCTION & METHOD

We could dwell on the different ways that citizen science initiatives, through their process of citizen involvement or through actual data collection. We could provide recommendations for citizen science initiatives to increase this impact and broaden their sphere of influence. We could also linger on how citizen science provides voice to communities in relation to those in government[1]. However, we have decided on a different route. Taking the next step is to think beyond single citizen science initiatives or platforms and to support citizen science to become more mainstream.

Our societies face many severe challenges – ranging from biodiversity loss to bad air quality and structural inequalities. Much research shows that to address such challenges, we need knowledge that goes beyond any one discipline and that goes beyond academia[2]. And we also need action and interventions that experiment with alternative ways of how these challenges can be addressed. Citizen science, through its potential to bridge science, society and policy, is in a unique position to play a role helping our governments and administrations to make sensible policies in relation to these societal challenges. However, citizen science does not yet live up to this potential. While being increasingly on the agenda, citizen science remains at the margins of both science as well as policy – for many also a 'black box' with unclear benefits and challenges[3] . While there are many challenges, including conflicting interests or goals of policymakers and citizen scientists, or concerns about data quality; there are also many benefits, such as the empowerment of citizens, or better decision making or solution pathways.

Therefore, this document provides recommendations for the mainstreaming of citizen science for policymakers, policy workers, citizen science actors, and scientists, in this way capturing the broader policy ecosystem within which citizen science initiatives are embedded. We provide both, (1) specific recommendations specific to five European countries: Italy, Netherlands, Norway, Spain & UK; and (2) general recommendations on themes that emerged from the recommendations across those five countries.

The creation of these recommendations took place through an iterative and co-creative process that involved more than 110 policymakers, policy workers, citizen science actors, and scientists in five national masterclasses on citizen science, one in each of the five European countries. They were validated during one overarching citizen science policy masterclass at the European level with 75 participants. These masterclasses were preceded by a context scoping including document reviews and a total of 13 interviews and 2 focus groups. They were followed up by a survey allowing participants to prioritise recommendations, which was filled out by 47 out of 111 participants. This co-creation activity during the masterclass was highly valued by these participants and rated with a 4,13 on a 1 to 5 scale.

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[1]Different good examples on this are: Fritz, See, Carlson, et al., 2019; Göbel, Nold, C., Berditchevskaia & Haklay, 2019; Turbé, Barba, Pelacho, et al., 2019; Vohland, Land-Zandstram Ceccaroni, et al., 2021.
[2]For example: Funtowicz & Ravetz, 1994; Hisschemoller & Hoppe, 2001; Rotmans, 2005.
[3]Shanley, Parker, Schade & Bonn, 2019; Schade, Pelacho, van Noordwijk, et al., 2021.

In the following, we first introduce the 'Benefits & Challenges' of mainstreaming of citizen science, we then present the overarching recommendations along three main themes: ensuring a healthy citizen science ecosystem, integrating citizen science in policy, and creating collaboration between citizen science and policy. This is followed by country-specific recommendations for Italy, the Netherlands, Norway, Spain (Barcelona area) and the United Kingdom.

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BENEFITS & CHALLENGES

What are the benefits and challenges to mainstream citizen science, especially for policy? The benefits and challenges below have been found to be the main ones from our literature review[4] prior to the organisation of the masterclasses.

BENEFITS

There are five main benefits to mainstreaming citizen science:

1. Information, data or knowledge is not always easily accessible, and can be expensive for full time or professional scientists to gather. Citizen science can provide timely, cost-effective and diverse data, information or knowledge.
2. Citizen science provides an opportunity to make (more) voices heard and ask societally relevant questions. It thus provides the opportunity to increase the societal relevance and acceptance of policy measures resulting from it.
3. Because citizen science helps to collect more data and knowledge, and through closer involvement of citizens, it contributes to better decision-making, solution pathways and policy implementation.
4. Citizen science can strengthen democracy and partnerships. It can be a way to experiment with participatory forms of democracy, and enables citizens to make their voices heard in policy-relevant debates and processes.
5. Citizen science can enhance the empowerment of citizens for political participation and self-organization. Through citizen science, citizens can acquire the interest, confidence and knowledge to get involved in policy debates and developing new skills.

CHALLENGES

There are seven main challenges to mainstreaming citizen science:

1. A lack of awareness about the benefits of citizen science, or even about the breadth and diversity citizen science has to offer.
2. A mismatch between citizen science data and policy questions, for example because of different time cycles or mismatching data infrastructures.
3. Concerns about the quality of the data resulting from citizen science. The robustness, reliability and representativeness of the citizen science approach is not always evident.
4. A mismatch between citizen science and the broader science and innovation system. Citizen science is not always accepted as a scientific research method.
5. Conflicting interests or goals of policymakers, citizen scientists and researchers from citizen science projects.
6. A lack of inclusive and transparent citizen science processes. Prerequisites for citizens to participate limits diversity.
7. Divergent legislation and cultures across science and governance levels can hamper the spread of knowledge and uptake of citizen science.

[4]Main sources: Haklay, 2015; Nascimento, Iglesias, Owen, Schade & Stanley, 2018; Göbel, Nold, Berditchevskaia & Haklay, 2019; Hecker, Wicke, Haklay & Bonn, 2019; Shanley, Parker, Schade & Bonn, 2019; Ponti & Craglia, 2020.

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OVERARCHING RECOMMENDATIONS

These overarching recommendations are to mainstream and align citizen science with policy and are the cross-cutting themes and recommendations we encountered in five European countries (Italy, Netherlands, Norway, Spain & UK). The order of the recommendations does not indicate any hierarchy between them.

A. Ensuring a healthy citizen science ecosystem

1. Fund citizen science in the science system

Fund citizen science with the goal to mainstream citizen science as a scientific method.

How?

Develop funding specifically targeted to citizen science projects, in order to embed citizen science in the science system. Citizen science is different from other scientific methods, in that it requires relatively high start-up costs. Funding also needs to be long-term, to keep citizen scientists engaged once on board, and should consider compensation of non-university actors to allow for equal participation. The funding criteria for citizen science should specifically address quality criteria of good citizen science, the integration of citizen science data in existing data schemes and the connection with societal challenges like linking to the Sustainable Development Goals. Funding schemes in general should stimulate and reward scientists and research that use participatory methods and co-design, like citizen science. On a European level, funding could be particularly aimed at countries in which citizen science is not yet mainstream.

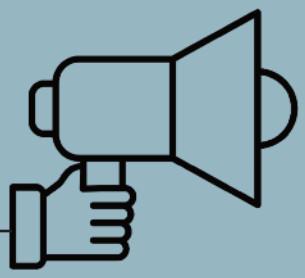
2. Set up national/regional citizen science networks

Set up national/regional citizen science networks or platforms to connect citizen science actors and facilitate knowledge exchange.

How?

Such a network can take the form of an online platform at a national or regional level, which could be provided by government and/or scientific institutes but also managed by citizen science actors more bottom-up. On such a platform or network, people can develop and exchange knowledge on best practices, project design, community involvement and engagement, list ongoing projects and research, and align efforts between projects. In addition to the online component, regular events and meetings can promote the network and facilitate the exchange. In places where some of these networks already exist, try to connect with the networks and make connections between networks.

B. Integrating citizen science with policy



3. Promote citizen science as relevant for policy

Promote and create awareness of how citizen science can be used in policy to convince policymakers to adopt citizen science.

How?

Promoting and creating awareness by disseminating knowledge, stories, and examples can make policy makers aware of what citizen science can do for policy. This includes making explicit which policy levels and departments can make use of citizen science, and what the benefits and challenges are when doing so. Examples or best practices can highlight what different types of citizen science answer different types of policy questions. This promotion and awareness raising could be done by setting up a central connection point across departments within government, optionally also connecting different policy levels. This connection point ensures oversight but can also actively search for synergies between efforts to adopt citizen science and promote specific policy field connections with citizen science. It could also directly fund citizen science that supports specific policy goals, and link funding aimed at public engagement and funding for (scientific) data collection.

4. Establish an open data platform

Establish an open data platform to share and integrate citizen science data to inform policy and establish it as a legitimate policy mechanism.

How?

Embed citizen science as a policy mechanism by establishing an open data platform for policy and citizen science. This platform can integrate and sort data streams resulting from citizen science into (existing) standards in policy and thereby include citizen science to inform policy objectives on different policy levels (national, regional, and local). It can be helpful to dedicate different platforms to specific fields. Moreover, such an open data platform helps to exchange best practices and even define data standards, instruments, and management protocols because not for all stakeholders 'open data' might be a priority. Semi-public independent scientific organisations like a national statistical bureau or an institute for the environment or public health can assist as a third party in validating the citizen generated data and thereby providing a 'quality stamp'. This enhances the legitimacy and helps to embed citizen science to inform evidence-based policies.

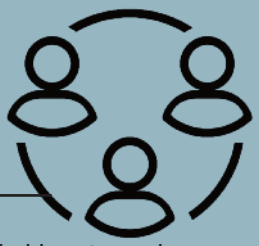
C. Creating collaboration between citizen science and policy

5. Take time for co-creation

Take time to co-create shared goals, expectations, and standards when using citizen science in policy to allow for co-ownership & alignment of efforts.

How?

Mutual understanding and trust is crucial in collaborations between citizen science and policy. It helps to create a common language, for example through adopting shared frameworks like the Sustainable Development Goals. It also helps to make explicit expectations for collaborations, by agreeing for example on a role division, the goals & ambitions of the project, what you do and do not co-create, and the policy objective & impact. It also is important to have a diversity of participants and to have good facilitation to make sure all voices are heard. Next, take time to co-create a research question that is interesting for all parties and to have a common understanding of the underlying problem or challenge, especially at the start of the project. Make the topic relatable and relevant to citizens and be flexible to allow for individual interests and citizen leadership. It can be helpful to label these as experiments to allow for space to develop new forms of collaboration and methods.



6. Develop a local platform for exchange

Develop a local platform to connect policymakers with citizen science actors and other stakeholders to exchange questions, initiatives & needs.

How?

A local network or platform connects the relevant stakeholders for policy and citizen science, like advocates in policy departments, citizen science platforms, funding organisations, participants of citizen science projects and civil society. Such a platform can act as a "marketplace" where questions, initiatives, and needs from both parties can be exchanged. For example, (local) policy makers could share governmental planning and priorities in policy, and the services or budgets that are available from policy. From the other side, citizens, researchers, civic society organisations and other citizen science actors could share their priorities, needs, and questions along with the knowledge and services they can provide. Such exchange can help to open policy, and to adopt citizen science as a tool for active citizenship, participation or changing behaviours. Such platforms for exchange could be connected to existing public institutions with a scientific link, like libraries, museums, universities, and public schools. This exchange is usually better at the local level, where it is easier to meet each other, to be informed and have regular interactions.

COUNTRY RECOMMENDATIONS

The country-specific recommendations for Italy, the Netherlands, Norway, Spain (Barcelona area) and the United Kingdom below are to mainstream and align citizen science with policy. The order of the recommendations does not indicate any hierarchy between them.

ITALY

1. Increase the recognition of citizen science in academia:
Assure training on citizen science to students and researchers in different disciplines, promote and recognize the value of multi/interdisciplinary research activities and update research career evaluation metrics by acknowledging the value of citizen engagement in science. Develop an ad hoc position within the academia for citizen science experts that could do citizen science, promote it across different departments/faculties and support other researchers in doing citizen science. Promote citizen science as a valuable research method by acknowledging it in research funding programs.

2. Create citizen science counters in public research bodies and environmental agencies:
Create synergies with research bodies and environmental agencies. Public research centers and environmental agencies play a crucial role in the national research landscape and are recognized as trusted data providers by decision makers. They manage national databases and validate data. Some of them have citizen science dedicated structures and staff within the organisation but some others may have difficulties in carrying on citizen science activities as they would like/could do. For this, a strong cooperation between the citizen science community and experts in those organisations is requested to support the latter in doing citizen science projects, and facilitate the dialogue between citizens-scientists and policy makers. In some cases, the institution of official citizen science offices/counters within those organizations could be a viable option. Those offices/counters would have dedicated staff, expert in citizen science, able to support resident researchers in doing citizen science projects, coordinate their effort and facilitate the dialogue between citizens-scientist and policy makers

3. Promote scientific culture and a culture of "data" (open and FAIR):
Citizen science is a valid means for promoting scientific thinking and trust in science among citizens and local communities. This needs to be reinforced with dedicated actions, among others: the dissemination of good practices, the actual use and re-use of citizen-generated data, the creation of physical spaces in which citizens and researchers could meet, do citizen science projects and where researchers could answer citizens questions and provide scientific training. At the same time, a culture of open and FAIR data should be promoted at all levels of society, including among decision makers.

4. Official recognition of the emerging national association of citizen science Italia:
The citizen science Italian network is going to soon become a legal-recognized association. This association can act as an intermediary between several citizen science projects and related teams and public administration and bodies. The Italian Ministry of Research should recognize the association as a point of reference for citizen science in Italy so as to start a mid to long term dialogue on citizen science-policy-making collaboration.

5. Develop ad hoc research funding schemes promoting and supporting citizen science:
Assure dedicated funds to citizen science activities, making funding also possible for non-academic actors and supporting both new and on-going projects. Promote a dedicated funding stream supporting networking, synergies and data sharing across different citizen science projects.

NETHERLANDS

1. Adapt research funding schemes:
Recognize, facilitate, and promote the use of citizen science as a research method by adapting research funding schemes: reward participatory methods, also develop more long-term funding schemes, recognize the high startup costs of citizen science, make funding also possible for non-university actors.

2. Develop a national citizen science community:
Facilitate the citizen science community through an online national platform for knowledge development and exchange and connecting citizen science stakeholders. The connection of stakeholders includes the exchange of policy with citizen science, between local needs of policy and civil society and science, and between citizen scientists. In such a community, science, policy and society can meet to develop trust and to experiment with (new) methods and collaborations.

3. Exchange & disseminate knowledge:
Exchange & disseminate knowledge on citizen science by providing an overview of ongoing projects, the benefits of citizen science, a list of collaborations that can be used by citizen science, examples of the different impact and goals it can serve, how (data) quality can be assured and examples of citizen science projects and their impact. In this way, stories about the benefits and impact of citizen science are shared and can help to convince policymakers or skeptical colleagues to adopt citizen science as a method.

4. Promote citizen science as co-creation practice:
Citizen science as a research method can be an important tool for policy to facilitate participation and co-creation. It is a powerful tool to involve citizens in the policy cycle and in public policy, which already happens for example in environmental monitoring and management. But to really embrace co-creation, policy and/or research questions should ideally be formulated together with citizens at the start of the process to allow for real contribution. Or even let citizens be in the lead. To allow for a good process, make explicit collaboration expectations.

5. Enhance the legitimacy of data:
Enhance the legitimacy and acceptability of citizen science generated data. Firstly, by adapting standardized data management techniques by using an array of statistical techniques to increase the representativeness of citizen science data and to make them useful for wider policy and science uses. Secondly, by creating a 'quality stamp' for citizen science data via an intermediary - like a semi-public independent-scientific organization as the RIVM or CBS - so the data of a citizen science project are seen as legitimate by both science and policy.

6. Develop a market:
Develop a market in which (local) needs and initiatives of policy and civil society can connect with citizen science methods, from where participation & co-creation in existing/new citizen science projects can take place.

7. Actively work on policy linkages:
Translate and disseminate the existing knowledge on citizen science to make explicit what policy levels and departments can make use of what kind of citizen science. It can help to work with examples, and to develop a cross-departmental governmental position on the use of citizen science for policy to provide policy makers with a contact point.

NORWAY

1. Make topics relatable and communicate impacts:
When involving citizens in citizen science, it is important to make topics and projects "relatable", i.e., people finding the topics relevant and having a relation to their life. Also connect them to what the impact of the project is on. For example, policy has been, to empower participants of the project, keep them engaged, and motivate others to participate in the future.

2. Involve people via different 'hats':
Connect policymakers and scientists to citizen science not only via their professional 'hat' in organizing citizen science, but also via their citizen 'hat' for participating in citizen science to open the ivory towers of both policy and science. Involve more and also more diverse groups of people in citizen science to accelerate this process.

3. Showcase citizen science uses in policy:
Showcase examples of how citizen science is used in policy, by showing how different forms of citizen science address different policy questions. This enhances the credibility and legitimacy of citizen science and informs different actors of how citizen engagement has co-shaped policy processes.

4. Platform for citizen science-policy exchange:
Establish a platform for exchange and dialogue between policy and citizen science. Actively connect this platform to different silos existing in government, at the national and local level. Questions from both parties can be put central there, like policy needs, priorities and questions, but also services and budgets available from policy, questions around data management, social engagement and connecting to sustainability issues.

5. Sustainable Development Goals as common framework:
Use the SDGs as a framework to connect (bottom-up) citizen science and policy. Also use the momentum that sustainability and the SDGs currently have to connect citizen science.

6. Connect at the municipal level:
Create connections between citizen science and policy at the municipal level where the topics are relatable, where it is easy to meet each other and to be informed about governmental planning.

7. Connect via public institutions:
Establish collaboration between citizen science and policy through public institutions with a scientific link, such as museums, libraries and public schools. These institutions can also help including a more diverse set of stakeholders, like residents who normally do not participate in planning processes.

8. Fund and award citizen science in science:
Propose and include citizen science as a research method in scientific funding schemes from the national research council to achieve public participation in research. This can be a specific call on citizen science, or by making citizen science part of regular calls. Make sure to adapt the funding to the cycle requirements of citizen science, where usually more time and thus funding is needed at the start of a project. Award scientists that use participatory methods like citizen science.

9. Create a citizen science platform:
Create a citizen science platform for the citizen science community to connect ongoing projects, network, exchange best practices, project designs, community involvement & engagement. This platform could be managed by Norway's governmental data forum.

10. Use data.norge.no for citizen science data:
Use the data platform data.norge.no to integrate, sort and analyse data flows resulting from citizen science. Also, best practices on, for example, existing tools and data management protocols can be exchanged there.

SPAIN (BARCELONA AREA)

1. Barcelona: from projects to network:
Citizen science in Barcelona is ready for the next step, which the Citizen Science Office should support: from experimenting and starting pilots with citizen science projects, to consolidating projects and actively connecting the citizen science network. This could be done by finding synergies between projects, evaluating projects, and investing in long term citizen science projects (prolong current ones or start new ones).

2. Citizen science for societal impact:
Generate new narratives on how citizen science as a policy tool can help to empower policymakers to generate more societal impact by engaging with citizens and science in a systematic way. This would expand the narrative of 'open science' to 'open policy'. For example, citizen science as a tool to think about changing behaviours or imagining possible urban futures. Open policy is also related to active citizenship, the realization that everyone is a citizen and creating real changes and societal impact created through bottom-up processes.

3. Take time for problem identification:
Take the time to first identify the relevant problems and challenges for both policymakers and citizens, before co-creating knowledge together. This takes time, as policy and citizens need to have some sort of common language and need to align interests. It can help to work locally, as for both parties it is easier to relate to each other and it is easier to work agile. The problems & challenges should be detected on both sides: what are the problems policymakers are facing, what data detect these or are needed, and can citizen science play a role in solving them? On the citizen side: What are the local problems citizens face, perhaps based on complaints available to the municipality or by connecting to neighborhood councils?

4. Develop a marketplace for challenges:
Develop a 'marketplace' where the problems and challenges of both policymakers and citizen science projects or activities can be collected, shared, and where synergies can be found. This marketplace can be an online platform, for example the existing participatory platform DECIDIM could support and facilitate this process. But it can also be developed through physical events or through existing physical public spaces like libraries, civic centers, schools, universities, etc.

5. Stimulate co-ownership with policymakers:
Stimulate the co-ownership and co-creation of citizen science projects with policymakers to really align it with policy needs and objectives. To allow for co-ownership and co-creation, there needs to be commitment from both sides, alongside trust and a good level of communication.

6. Develop a shared data platform:
Develop an open data platform between policymakers and citizen science projects to allow for aligned, common and transdisciplinary data structures. Trust in citizen science generated data increases when its procedures are standardized. It is also needed to allow for validation of data to inform evidence based policies.

7. Open government and scientific funding:
Actively connect governmental and scientific research funding with societal challenges and promote citizen science as a research method to do so. For example, this can be done in government by opening portions of large contracts for utilities and services of the government for citizen science-based activities and products. And by scientific research funding through an annual funding program for citizen science at the local (Barcelona) level.

UNITED KINGDOM

1. Gather evidence of citizen science impact:
Gather evidence of the diverse types of impact that citizen science generates in a coherent way. Including the purposes citizen science serves, the people that are involved in it and the benefits it provides for different government departments. Such evidence can be shared in a best practice document, compiled to help policy makers to engage with citizen science.

2. Clearly define the policy objective:
Clearly define the policy objective when using citizen science as a research methodology or policy instrument and define which (policy) impact it should achieve.

3. Go beyond data gathering:
Don't just make use of citizen science for gathering data to prevent only limited benefits for policy. Allow for flexibility to tap into individual interests. Experiment with giving citizen science the freedom to collect what they want, in line with their interests, without imposing top-down requirements that inhibit engagement. This more bottom-up citizen science usually works better at a very local scale and needs the right balance between strong and broad connections.

4. Funding requirements for data & inclusivity:
Funding requirements should include a broader set of factors related to data and inclusion when funding citizen science. Data factors include data protocols, how citizen science generated data are verified and the integration of results into existing (data) structures or schemes. Inclusion factors relate to involving a diversity of actors, rewarding co-design with citizen scientists and compensation of volunteers.

5. Allow direct governmental funding:
Allow governmental organisations to directly fund and engage with citizen science, relevant to their policy requirements.

6. Connect public engagement and data collection:
Connect government projects and funding aimed at public engagement on the one hand, and (scientific) data collection on the other, to maximize the benefit of citizen science for policy.

7. Openly share public data needs:
Identify and openly share data needs and/or gaps of public agencies (and scientists), and engage citizen scientists to collect these data in alignment with their interests.

8. Increase the diversity of actors:
Increase the diversity of actors involved in citizen science to make the projects stronger and more relevant. This can be fostered on different levels: within the project when including citizens, in the project team, at the interface with policy and in funding.

9. Develop a national citizen science association:
Develop and sustain a national citizen science association outside of policy that bridges policy makers at all levels to other stakeholders connected to citizen science (like funding organizations, advocates in policy departments, and participants of citizen science projects). This should ensure that policymakers and citizen scientists do not have to reinvent the wheel repeatedly, and that they know what the on-going citizen science projects are, preferably also clustered on policy domains (like environmental monitoring).

10. UK Department of Citizen Knowledge:
Establish a UK Department of Citizen Knowledge, which should act as a single cross-department point within government to guide and align citizen science efforts. Although it would be a more top-down approach to citizen science, it could benefit policymakers in bringing advocates of citizen science together and have one point of contact.

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