EU CONEXUS
Research for Society

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017436

# EU-CONEXUS Research For Society

## "GUIDELINES ON PARTICIPATORY SCIENCE"

2022

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# Introduction

The goal of this document is to provide researchers and all stakeholders in the project's scientific community of the EU-CONEXUS RESEARCH FOR SOCIETY an overview of basic guidelines that form the basis for planning, organizing, and implementing participatory and citizen science projects such as collegial projects, action projects, education projects, co-created project, collaborative projects, conservation projects, contributory projects, investigation projects, virtual projects, contractual projects and volunteer computing (Schaefer and Kieslinger, 2016). Involving non-scientists in scientific research and projects is not a very new idea. However, in recent decades, greater efforts have been made to involve "ordinary" people in various research projects in different areas of science, and this trend is growing rapidly. The participatory approach to learning, design, decision making, communication, methods, and more has become part of the general movement promoting ideas and actions for inclusive development and social change (Hajnal Ward, 2020). In this document some key terms related to this topic are defined and some basic guidelines in this field are given.

To begin, it is necessary to define the term participatory science. Heaton et al. (2016) define participatory science "as the engagement of non-professionals in scientific inquiry, whether by contributing resources, asking questions, collecting data, or interpreting results". In addition to the term participatory science, the term citizen science is also used. Citizen science describes the situation in which "the public openly participates in the process of knowledge production in close interaction with the academic community (although not always), with greater or less public engagement of the public from only data collection to analysis and co-creation" (Figueiredo Nascimento et al., 2016). Another definition from the EU-Citizen.Science platform defines citizen science as "any activity that involves the public in scientific research and thus has the potential to bring science, policy makers, and society at large together in an impactful way. Under citizen science, all people can participate in many stages of the scientific process, from designing the research question, to collecting data and gathering volunteers, to interpreting and analyzing the data, to publishing and disseminating the results. Citizen science is also an approach to scientific work that can be used as part of a broader scientific activity" (EU-Citizen.Science).

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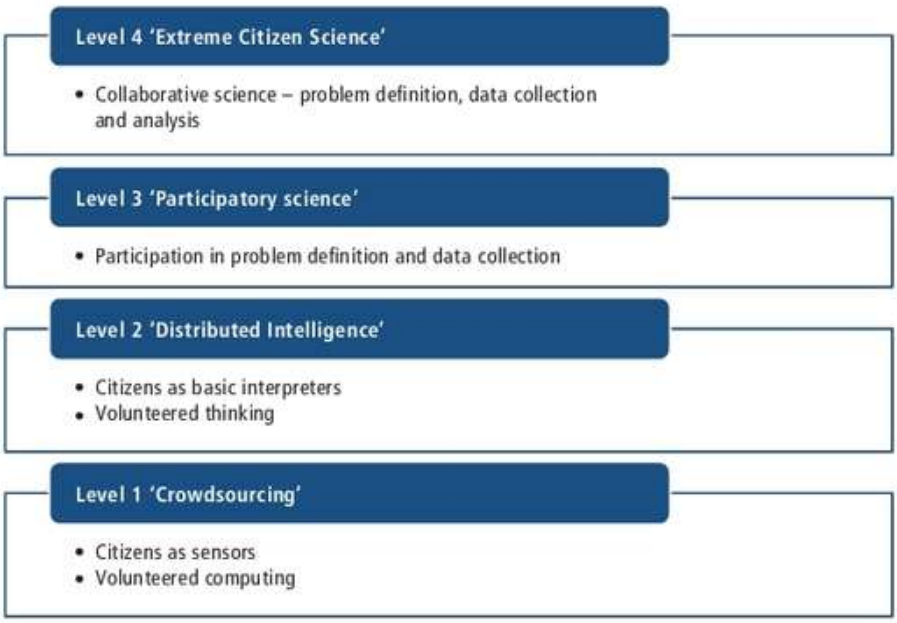
Given all the definitions that were mentioned, **participatory science can be seen as different activities which involve different groups of non-academics in the scientific research process in the academic community. The level of engagement of those non-academics can vary from involvement in all phases of the scientific research process to their engagement in just some of its specific parts (such as data collection or interpretation). It has many benefits, not also for the academic community, but also for the public that is involved, especially as it reduces the gap between them and make science and research more available for a wider audience.**

It can be concluded that participatory science and citizen science are very often used as synonyms, but Haklay (2018) gives a classification of levels of participation in citizen science that shows a difference between these terms (Figure 1). In this classification, Level 1 is the basic level of participation, while Level 4 is the most complex. Level 3 is defined as "Participatory Science" and includes participation in problem definition and data collection. In addition, "Extreme Citizen Science" includes data analysis and can be described as collaborative science.

Figure 1. Level of participation in citizen science




Source: Haklay, M. (2018). Participatory 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* (p. 52-62). UCL Press.

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**For the purposes of this document, both terms participatory science and citizen science are used**. The EU-CONEXUS RESEARCH FOR SOCIETY working group recommends the term Participatory Science, but most published documents on this topic use the term Citizen Science. Therefore, both terms are used to avoid possible misinterpretation. The European Citizen Science Association (2015) has defined **ten key principles that underline good practices in citizen science**, namely:

1. "Citizen science projects actively involve citizens in scientific endeavors that generate new knowledge or understanding. Citizens may be contributors, collaborators, or project leaders and play an important role in the project.
2. Citizen science projects have a real scientific outcome. For example, answering a research question or providing information for conservation action, management decisions, or environmental policy.
3. Both professional scientists and citizen scientists benefit from participation. Benefits include publication of research results, learning opportunities, personal enjoyment, social benefits, the satisfaction of contributing to scientific knowledge, e.g., solving local, national, and international problems, and thus the potential to influence policy.
4. Citizen scientists can participate in several phases of the scientific process if they so choose. This may include developing the research question, developing the methodology, collecting and analyzing data, and communicating the results.
5. Citizen scientists receive feedback from the project. For example, how their data is used and what the results are in research, policy, or society.
6. Citizen science is viewed as a research approach like any other, with limitations and biases that should be considered and controlled. However, unlike traditional research approaches, citizen science offers the opportunity to increase public involvement and democratize science.
7. Data and metadata from Citizen Science projects are made publicly available and results are published in an open access format. Data may be shared during or after the project unless security or privacy concerns prevent it.
8. Citizen scientists will be acknowledged in project results and publications.

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9. Citizen science programs are evaluated on their scientific results, data quality, participant experience, and impact on society or policy.
10. Leaders of Citizen Science projects consider legal and ethical issues related to copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of all activities."

All these principles are implemented in citizen science projects, but there is a need to educate both researchers and other stakeholders in the scientific community and public, and to make science and research accessible to a broader audience. In this sense, it is important to point out that projects are set of tasks that have to be done to achieve a defined goal or purpose. One of the definitions states that it is "a unique endeavor undertaken to create a unique product, service or result" (Meredith et al., 2017). Therefore, participatory or citizen science projects can take different forms, largely depending on the purpose of the project, level of engagement of the specific audience and the result that it has to achieve. Projects can be also different services, or different events, such as presentations, workshops, meetings etc.

## Idea generation and planning of participatory science projects

Participatory and citizen science projects can be organized individually or in teams, and different types of institutions can carry out these projects. Since the partners of the EU-CONEXUS RESEARCH FOR SOCIETY project are universities, it is important to highlight the type of institutional support that is required at all stages of the planning and implementation process. Although individual researchers may start or participate in participatory and citizen science projects, it would be necessary for the university to oversee the projects that researchers start or participate in, not just for evidence, but to be a support system. It would be recommended that at least one person (or office/department/organizational unit) be responsible for such projects. Researchers preparing project documents for grant applications need organizational support or legal advice.

Another very important aspect is institutional support in the form of technical support and infrastructure (e.g. equipment, website design, etc.) or funding for such projects. Also for dissemination of results (publication of results or marketing activities) and evaluation.

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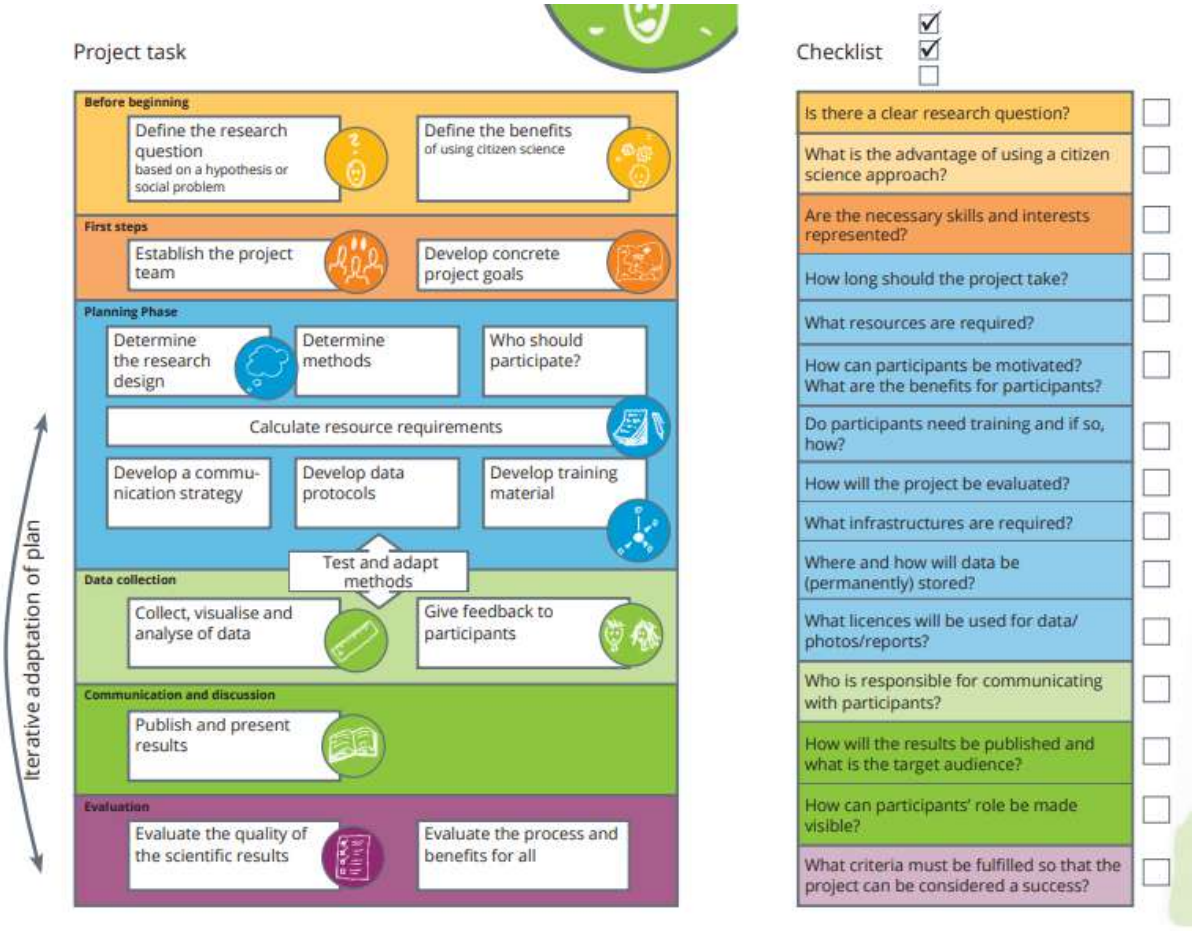
The EU-CONEXUS RESEARCH FOR SOCIETY project aims to foster participatory and innovative partnerships with industry and civil society, as well as interactions with communities, stakeholders, and the broader society on Smart Urban Coastal Sustainability (SmUCS) issues (e.g., travel, energy, food resources, environmental impacts, biodiversity, societal behaviour) through collaborative projects, joint data collection, and sharing of results.

The project also aims to improve collaboration among partner universities and establish participatory science projects at the international level among EU-CONEXUS Alliance partners. To achieve participatory or citizen science goals, some steps need to be followed. Figure 2 shows an overview of the project tasks that are important in the planning process of participatory or citizen science projects.

Figure 2. How to plan a citizen science project




Source: Pettibone, L. et al. (2016). *Citizen science for all: A guide for citizen science practitioners.* https://www.buergerschaffenwissen.de/sites/default/files/grid/2017/11/20/handreichunga5_engl_web.pdf

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Figure 2 illustrates six basic steps that are important in planning participatory or citizen science projects. From the perspective of the EU-CONEXUS Alliance and the EU-CONEXUS RESEARCH FOR SOCIETY project, where the focus is on Smart Urban Coastal Sustainability themes, the steps can be explained as followed:

1) As with any research project, it is important to define the research questions before beginning. It is also important to define the benefits of planning and organizing the research project as a citizen science project. In this sense, involving a specific (or a broader) audience in the research can have several advantages, such as reducing costs, covering a larger geographic area, disseminating the research results, etc.

   In the context of the EU-CONEXUS Alliance, where the different partner universities form a strong partnership, covering different fields of science, it would be important to define a transdisciplinary research project based on topics related to the SmUCS. In that way, the research project would cover a wide area (different countries), including different cultural and social aspects and characteristics of the population of each country. This would be especially useful in the terms of research projects related to sustainability (ecological, economic and socio-cultural) in urban and coastal areas.

2) The second step should be to form a project team and define the project objectives. The benefit of the EU-CONEXUS Alliance is especially visible in the context of expertise of the researchers working on each of the partner universities. Within an international alliance-based research project, each institution could name at least one researcher with the needed expertise in a specific field.

3) Then, in the planning phase, the roles of the team members need to be defined according to their specific knowledge and skills. This is especially crucial for interdisciplinary projects. In the planning phase, it is important to define all elements of the research, such as the research design and methods, but also who should be involved in the project. This depends on the duration of the projects and the available resources and infrastructure. It is also important to know what motivates participants to engage in project activities, whether they

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have the knowledge and skills to participate, or whether additional education or training is needed. Communication strategies, data protocols, and training materials must be determined during this phase. Given the fact that the EU-CONEXUS Alliance has a lot of resources and infrastructure on disposable this would reduce costs of the research project. Another important fact is that the all materials would be translated and could be used in different countries.

4) In the data collection phase, data are collected, visualized, and analyzed, and feedback is provided to participants. By creating a digital platform, participants could enter data by themselves. The visualization and analysis could be done by different experts from different universities.
5) At the end of each research project, the results should be disseminated and the project activities evaluated. Since the project involved different participants, their roles need to be visible. The EU-CONEXUS Alliance is a strong platform for the dissemination of different research results, as it covers different universities and fields of study, which can bring to a wide reach of the project results. Also, it covers different geographical areas and different languages. Additionally, it is important to mention that the online open journal, which will be launched within the EU-CONEXUS RESEARCH FOR SOCIETY project, will be an important platform for the publication of research related to SmUCS topics.
6) This is an iterative process, and each research project has its specific elements to which all these specific roles must be evaluated and adapted if needed.

As it can be seen, the EU-CONEXUS Alliance is a great opportunity for participatory or citizen science projects.

## Funding opportunities and examples of participatory science projects

The beginning of any project is very costly. Therefore, it is necessary to plan in advance the resources needed. This is especially important when the researcher or research group is looking for funding opportunities (e.g., grants).

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Haklay et al. (2020) note that "pure financial support to a project, such as crowdfunding, subscription fees and donations, is not considered citizen science, as no participation in any phase of the scientific research takes place" (p. 5). In addition, Haklay et al. (2020) also state that it is possible to charge citizens a fee to participate in the project (e.g., to fund data measurement kits), but this should be consistent with participatory or citizen science. It should also be considered that some citizen groups might be excluded from participating in such projects if they require a financial contribution. Another aspect that should be mentioned is that organizers of participatory or citizen science projects could offer some incentives to participants, for example in the form of small payments. But when researchers or research groups use this form of incentives, the culture, country, and context should be considered.

There are different types of funding opportunities for participatory or citizen science projects at the national level, but also at the European level through different funds. An excellent example is the European Researchers' Night, which is financed within the Marie Skłodowska-Curie Actions. The aim is to increase awareness of the impact of science on everyday life, to boost public recognition of researchers' work and to spark interests of young people in science and research.

Additional examples of participatory or citizen science projects mentioned in the following table (Table 1). The table provides an overview of participatory or citizen science projects from the EU-CONEXUS Alliance countries: Croatia, France, Greece, Lithuania, Spain, and Romania.

Table 1. Examples of participatory science projects in EU-CONEXUS Alliance countries

| Name of Participatory Science Practice | Organizer | Type of Participatory Science Practice | Target audience | Type of audience engagement | Link (website) |
|---|---|---|---|---|---|
| Seminar on the involvement of citizens in science | Lithuanian Research Development and Innovation Liaison Office in Brussels (LINO) | Seminar | Researchers | **NA** | https://lino.lmt.lt/en/renginiai/seminaras-skirtas-pilieciu-itraukimo-i-moksla-klausimams/ |

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|---|---|---|---|---|---|
| Science Soup | Volunteers (students, researchers) | TV is shown and publicized by radio and TV channels: LRT Plus, LRT.lt, Delfi, 15min.lt/mokslasit, Technologijos.lt | Citizens | Science popularization shows, promoting science on social networks and otherwise. Science Soup is about the world's most exciting inventions by scientists, incredible experiments, research, projects, the latest technologies, revolutionary ideas and challenges for human progress | http://mokslosriuba.lt/kartumesgalime/laidos/ |
| European Researchers' Night 2021 | Lithuanian Research Council | Event, which displays the diversity of science and its impact on citizens' daily lives in fun, inspiring ways | **NA** | **NA** | https://ec.europa.eu/research/mariecurieactions/event/2021-european-researchers-night |
| Change the lesson to a lecture | Klaipėda University | Lessons | Students of secondary schools | KU researchers conduct lessons on different topics for secondary schools | https://www.ku.lt/blog/prasidejo-registracija-i-projekta-iskeisk-pamoka-i-paskaita-siemet-formatas-hibridinis/ |
| National Science festival "Spaceship Earth" | Science festival is being supported financially by the EU Structural funds. This project is part of a bigger effort – Creation of the National Science Popularization System, coordinated by the Lithuanian Academy of Sciences. | During series of diverse hands-on activities (lectures, demonstrations, excursions, exhibitions, which in 2021 exceeded 400) each September more than 30 000 participants visit all main universities, science centers, laboratories of the biggest technological companies. | Students of schools | Main aims of the festival: to foster scientific culture in society and to encourage young audience – especially schoolchildren to pursue careers in science. | https://www.mokslofestivalis.eu/about-us/ |
| Document on Participatory Science | Ministries of Culture | Strategic documentation | Public | **NA** | https://hal.archives-ouvertes.fr/hal-02801940/ |
| VIGIE-NATURE | Citizens association | A participatory science program. By providing scientists with essential field data throughout France, volunteer observers are helping to improve our knowledge of ordinary biodiversity and the responses to global changes) | Public | Observation detection data entry in a database | https://www.vigienature.fr/fr/observatoire-des-oiseaux-des-jardins |
| Observatoire des Oiseaux des Jardins LPO | LPO: League for the protection of birds | *Oiseaux des jardins* is an observatory for the general public. By regularly transmitting their data, citizens can advance knowledge on biodiversity in their neighborhood. | Public | Observation detection data entry in a database | https://www.open-sciences-participatives.org/fiche-observatoire/96 |
| RNE - Réseau National Échouages | Pelagis Observatory | Tool for monitoring marine mammal strandings | Public | Observation detection data entry in a database | https://www.observatoire-pelagis.cnrs.fr/echouages/reseau-national-echouage/ |

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| | | | | | |
|---|---|---|---|---|---|
| Dialnet | La Rioja University | Document finder | Students and researchers | **NA** | https://dialnet.unirioja.es |
| Dialnet | La Rioja University | Document finder | Students and researchers | **NA** | https://www.csic.es/en/open-science |
| Dialnet | La Rioja University | Document finder | Students and researchers | **NA** | https://www.fecyt.es |
| Solar Decathlon Contest | EfdeN | Building Energy Efficient Houses | University Students and society | Research, Design and Construction | www.efden.org |
| FIIFest Contest | Faculty of Building Services Engineering | Building Introductory Innovative Building Services | High School students | Research, design, and execution | instalatii.utcb.ro |
| Science and Technology National Contest | Elie Radu Highschool | Science and technology applications | High School students | Research, design, and execution | https://www.liceul-energetic-elie-radu.ro |
| Festival znanosti (Festival of science) | Universities in Split, Zagreb, University of Rijeka, University of Zadar and University J.J. Strossmayer Osijek in cooperation with the Technical Museum of Nikola Tesla and the British Council, and under the auspices of the Ministry of science and education | Series of events, lectures, presentations etc. | Primarily children in kindergarten, primary and secondary school students, and university students, but also a broader audience | Different workshops, presentations, demonstrations etc. | http://www.festivalznanosti.hr/2021/ |
| Civil Science in the Field of Glagolitics | Centre for Research in Glagolitism of the University of Zadar and Department of Information Sciences of the University of Zadar and State Archive in Zadar, Croatia. | Crowdsourcing transcription of manuscripts written in cursive form of the Croatian Glagolitic script | The target group of citizens who would be involved in the campaign are the members of Zadar Glagolitic Association – they are skilled in reading local Glagolitic manuscripts, they play an active role in promoting Glagolitics within the community, and they are highly motivated in reading local Glagolitic manuscripts | It was decided that in the first phase, amateurs would be encouraged to transliterate texts, while in the next project phases, the task will be expanded to mark and resolve personal names and toponyms. | https://glagolab.unizd.hr/?locale=ls&lc=en |

Source: EU-CONEXUS RESEARCH FOR SOCIETY partner institution inputs, December 2021

Most of the examples are based on projects that include different types of events with different target groups, especially children or students. There are also projects based on observational data recognition in the field of natural sciences or crowdsourcing transcription of manuscripts in the field of social sciences. To promote interdisciplinarity, multidisciplinarity and transdisciplinarity in the countries mentioned and in general, it is advisable to create joint participatory or citizen science projects.

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## Conclusion

Initiatives and projects based on participatory or citizen science are of great benefit not only to the scientists conducting the research, but also to all other stakeholders involved. Such projects bring science to a broader audience, create positive perceptions, and narrow the gap between academia and the people it serves.

Preliminary data from partner institutions in six countries have shown that participatory or citizen science projects are most often organized as single events, but institutions should promote citizen science projects at a much more engaged level. There are so many ways that citizens can be involved in such projects, from simply participating in data collection and analysis to participating in defining the research problem and developing the research methodology. Non-academics might have a different perspective on the research problem and contribute to a more creative and comprehensive approach to the research problem.

To create a more participatory or citizen science environment, researchers, as well as non-academic staff, should be educated about the benefits and opportunities of such projects. It is also necessary to provide funding at each institution to support such projects. In addition, it is important to have supporting institutions that provide information on the required infrastructure or legal advice.

A prerequisite for a successful participatory or citizen science project is well-developed information and communication technologies, including websites, various apps, tools, equipment, etc. Therefore, each institution should try to ensure that all of this is available, but also that non-academics can participate in these platforms and tools.

Given all the mentioned information, it can be concluded that the EU-CONEXUS alliance is not using enough the opportunities of participatory or citizen science, especially in terms of joint international projects among the partner universities. But this could be a great potential and opportunity to create joint research projects and disseminate research results among different countries. One of the opportunities where this could be implemented is the organization of events for citizen involvement. Within them partners will perform various activities aiming at the promotion of science and the project involving citizens of different age in participating and getting to know better the topic of SmUCS. Different activities will be

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organized to raise public awareness of the importance of scientific research for society in a fun and easy way and to break down prejudices that often exist towards the scientific research community, with inclusion of people with disabilities. Further steps could be then directed towards to the implementation of joint research projects with the focus of SmUCS topics.

For implementation of joint participatory or citizen science projects, it is first necessary to educate researchers about the benefit of participatory and citizen science, but it is even more important to create a framework at the institutional level and the level of the EU-CONEXUS alliance for the implementation of participatory or citizen science projects. It is important to create a database of researchers who are interested in engaging in participatory science projects, data protocols and communication protocols should be defined, a platform for the organization and involvement of the participants should be created, possibilities for the dissemination of research results should be enabled etc. But another crucial aspect is to ensure funding possibilities on the EU-CONEXUS alliance level to facilitate and motivate participatory and citizen science projects.

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Pettibone, L. et al. (2016). *Citizen science for all: A guide for citizen science practitioners.* https://www.buergerschaffenwissen.de/sites/default/files/grid/2017/11/20/handreichunga5_engl_web.pdf

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## Useful links related to the topic:

https://ecsa.citizen-science.net/

https://eu-citizen.science/

http://www.togetherscience.eu/

https://actionproject.eu/