Green Paper on Citizen Science Virtual Workshop

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Date: 17th of October 2013. Starts:15.00 CET Ends: 17.30 CET

Motivation:

The aim of this workshop is to present some of the key open questions related with the citizen science in order to ease discussions that will shape future policy recommendations. We expect from participants to share their experiences, ideas and concerns.

Agenda:

- Welcome and presentation of speakers and visitors
- Digital Science vision for Horizon2020 and the role of citizen science
- Green paper on citizen science status
- Green paper on citizen science: Topical discussions and recommendations
- Workshop conclusions and next steps
- Back channel, share ideas and get support

Topics to discuss (issue, open questions, possible recommendations):

1. Definition and scope of citizen science
2. Awareness and motivation for active involvement
3. Openness
4. Facilitation and sustainability models
5. Impact measurement and evaluation

We present below a short introduction of the state of the art for each topic including some of open questions and possible policy recommendations for the European Horizon2020.

1. Definition and scope of citizen science

The term Citizen Science has been used to define a series of activities that link the general public with scientific research. General definitions for citizen science understand it as "a partnership between volunteers and scientists to answer real-world questions," (Rick Bonney, director of program development for Cornell University's Laboratory of Ornithology in Ithaca, New York, in (Cohn, 2008: p. 193)) or "Citizen science engages non-professionals in authentic scientific research" (p.291) (Dickinson et al., 2012: p. 291)

At the one end of the spectrum, the definition encompasses activities that involve citizens as rather passive contributors to scientific research. In volunteer computing citizens basically provide their computer resources for scientific purposes. At the other end, it comprises approaches that suggest that researchers immerse themselves into local communities, to closely collaborate with local actors and citizens, identify research questions and provide their scientific skills in order to solve relevant issues of today's society. The degree of participation differs widely and there is a demand for more involvement of the volunteers and the establishment of a partnership on equal terms between scientists and citizens. However, when looking at the main motivational drivers for scientists the data gathering aspect is by far the most important one, which may lead to a conflict in expectations. In addition, the level of engagement vary widely from person to person and may also change over time and experts recommend strategies to offer different levels of engagement.

The involvement of citizens in scientific projects also tends to have an educational value, implicit or explicit. While in the majority of projects the informal learning aspect of adult citizens is addressed, schools are more and more considered an important target for the introduction and promotion of citizen science.

Open questions:

- Should there be a specific definition of citizen science officially adopted by the EU? If yes, how broad should it be? Should it support all levels of citizen science? what is its position in the Digital Science with concepts like e-Science, Open Science, Science 2.0 or Global Systems Science? Should only research-driven systematic projects be considered? Are private partnerships / industry innovations welcome? And non scientific disciplines (politics, arts, amateurs…)?
- Should citizen science projects always have an educational goal?
- How may the level of involvement change over time and what does this mean for citizen science projects and programmes?
- What are the possible risks, security issues and constraints of citizen science?

Possible recommendations:

- Define citizen science and its participatory model, adopting the implications of the definition on the support measures taken by the EU for citizen science
- Catalogue and align the units related with science, society, e-infrastructure, global systems
- Create a catalogue/map/list of stakeholders and their profiles
- Enhance public debate and decision-making processes on science challenges and policies

2. Awareness and motivation for active involvement

Attracting and retaining people who would be willing to contribute their skills, time, and effort for a scientific cause is an important pillar of citizen science work. Motivational drivers and barriers for both scientists and volunteers are diverse and depend on the project type but also on the context in which volunteer engagement is taking place. While in some contexts providing valuable contributions to science or to the local community might be the most important motivational driver for citizens' involvement, in other contexts it might be money incentives, as only financial aid would render the participation possible for some participants. Intrinsic motivators, like the interest in the science topic or the satisfaction from contributing to science, have been identified as being amongst the most important drivers for volunteers' participation. But when a preferably large number of citizens should be involved over longer time spans in citizen science projects (that might be less intrinsically motivating), external motivators, like community recognition, competitive elements, or incentives come into play. Volunteers' motivations are said to be temporal, dynamic and changing even when the ultimate goal remains the same.

The initial phase of involvement, when volunteers need to understand the projects' objectives and opportunities for contribution, has been identified as the most critical one. The majority of volunteers only perform activities one day and do not return to execute more tasks, so the regular minority contribute for the larger proportion of tasks carried out in the project. Media coverage, approaching existing institutions, using social networking features, but also collecting first positive hands-on-experiences with science are potential drivers. Once volunteers are involved the next challenge is keeping them engaged. This requires finding out what motivates them in the long run, but also continuous personal information flows between the involved stakeholders and well adapted and interesting tasks are important.

Motivational issue do not only consider volunteers, they are also relevant for the involvement of scientists. Involving non-scientists in a more and more collaborative manner to scientific research is something which tends to worry some of the scientists, educated, trained and placed within the hierarchical academic world (Rotman et al., 2012). Important issues for research collaborations are shared vocabulary, practices, meanings, but also competencies, mutual recognition, prestige. Thus bridging between scientists and volunteers and establishing trustful, balanced collaboration between these groups is not always an easy matter. It is said that in many institutions there is still a lot of resistant scepticism amongst researchers. Scientists need to understand that citizen science is committed to authentic research which can bring

viewpoints and perspectives not otherwise available to science.

Participatory experiments using ICT platforms may help researchers in the process of gathering and modelling experimental data on global systems. Moreover collective experiments, in which the public are no longer consumers of the output of science but become a driving force within the research, stimulate shifts in public opinion (San Miguel et al, 2012, p 18).

Open questions:

- What are motivational drivers and barriers related to different types of citizen science projects and how do they change over time?
- Do we need any expert help (publicists, psychologists, etc.) to find the "real" motivations of people?
- How could we best support citizen science in schools and what role are teachers playing? Should we address younger audience in primary schools?
- With the increasing usage of technology in citizen science projects, how to avoid that those citizens who don't have access to technology are excluded?

Possible recommendations:

- Proactive awareness raising amongst researchers in specific Horizon 2020 to include volunteers, designers, communicators, teachers, policy makers…
- Promote public events in Europe specifically promoting citizen science initiatives and teaming with science festivals and science museums
- Increase the participation of the society in the meetings organized about Horizon 2020
- Definition of incentives for researchers to participate in citizen science, such as recognition in appraisal and tenures
- Design and promotion of new researcher reputation and awareness systems
- Encourage knolewdge exchange and public interaction through non-academic means e.g. artistic performance, storytelling, film making...

3. Openness

A cultural change is happening at global scale through inspirational success stories of collaborative open-minded approaches breaking the walls of disciplines with transdisciplinary strategies.

Openness in the context of citizen science relates to the software used as well as to the data gathered. Current projects are based on proprietary software as well as on open source software with a clear trend towards openness. There is a claim by some experts in the community that citizen science platforms and software should be free to use and preferably open source, as this would best fit the initial idea of voluntariness, openness and collaboration.

Openness is an issue for the future of citizen science, also when it comes to access and interoperability of the citizen science data sets. Large data sets based on citizen science data have been created by scientists for their own needs and are often difficult to be used by other groups, like citizens or researchers. In addition, there is a claim that public authorities and companies provide open access to their data as well in order to be used by citizen scientists for their research and also increase interoperability between these data sets. When opening the data sets, the important question of ownership and IPR issues arises. A frequent issue for scientists who work in citizen science projects is that they do not want to share and provide access to the collected data. When companies as sponsors are involved it might even complicate this issue. Only few projects have a clear policy about the ownership of the results, and especially volunteers are hardly informed about the intellectual property rights of projects they have been involved in. Hardly any regulations are foreseen for the use of the data by third parties. Experts require a political decision regarding the access to scientific data.

Regarding interoperability of data, there have been first efforts in the United States to synchronising data amongst data sets, but these efforts are still in the very early stages. That's why one of the biggest goals is that people working in this field define data standards that all citizen science projects can use.

Open questions:

- Is there a need for standards in terms of used technology and interoperability?
- Should citizen science only use open source software?
- Should there be open access and interoperability between citizen science datasets and/or public data?
- Is there a need to improve privacy regulations and IPR issues with regards to data usage and ownership?
- How the awareness of potential scientific value can be improved and compared to established scientific approach?

Possible recommendations:

- Promote cultural change and new scientific culture by increasing the benefits for researchers, public institutions and industry of opening
- Encourage asset and resource sharing including access to journals, methods, data, tools, and equipment akin to openscience
- Adopt Open source (software) and open access (data) policy
- Promote the creation of appropriate analysis and data collection tools as well as standards for interoperability, metadata, citations, anonymization, accessibility...
- Define governance structures regarding data ownership and usage

4. Facilitation and sustainability models

Citizen science has a long history and tradition, but experiences considerable expansion in the last years due to changing science paradigms and the increased usage of innovative technologies, effectively utilizing crowdsourcing for data collection over large geographic regions and bridging volunteers' and researchers' world.

To facilitate this growing movement it requires a "dedicated professional association that disseminates, advances in the field through annual meetings, encourages open dialogue, publishes an open-access peer-reviewed journal centralizing associated literature, and generally serves to guide the field." Citizen science data networks and a network of citizen-science centres could also provide access to connected datasets, infrastructure support for the management of huge data, visualizations tools, training material, a list of programs, best practices, protocols etc. (Newman et al., 2012, p. 303).

Education at universities for scientists and students in advanced statistical techniques and computational models, providing students with insights on how to collect, validate and handle huge citizen science data set and how to set up and conduct citizen science projects, was identified as another facilitation aspect.

The long-time sustainability and funding of citizen science projects is a challenge for all types of citizen science projects. Issues of prioritization and sustainability raise the question of how government funding and partnerships might help sustain public interest in doing science for society. The primary challenges for most projects include maintaining funding for cyberinfrastructure, databases, and project leadership (Dickinson et al., 2012).

Crowdfunding citizen science projects is currently considered as an alternative funding strategy. There is however a fear associated with this approach in terms of who is deciding on what research should be funded. Such an open approach might intervene too much in the scientific process. The challenge here is to find the balance between openness and involvement on the one hand and keeping the original idea of the specific research project on the other hand. Selling advertising space on citizen science websites is considered another funding model, but there is strong worry that this would devaluate the project.

Public funding of citizen science projects could on the other hand lead to wider recognition. EC should encourage Horizon 2020 projects to open citizen participation in experimental,

dissemination and educational activities.

There are also economic factors in favour of externalizing resources but it still requires a deeper economic analysis of relative costs of different forms of citizen science compared with other e-infrastructures.

Open questions:
- What is the role of cluster initiatives and citizen science associations? How to balance the visibility of the end-users? On which level do we need these initiatives (European, national, regional)? How could they best cooperate? Is it possible to integrate services (e.g. log accounts, workflows, collaborative tools, communication...) among different citizen science initiatives? What are the most important services these organisations should provide (e.g. practical support and guidance for setting up citizen science, etc.)?
- How citizen science should be addressed in the academic curriculum in the different levels (fundamental, high school, undergraduate, graduate, etc.)?
- What kind of funding mechanisms do we need in the Horizon 2020 to support citizen science projects and their sustainability?
- Is there a need for new sustainability and funding models? Or are there good practices to follow by the EU?
- How to fund large infrastructures for huge, dispersed and persistent data sets?

Possible recommendations:
- Promote citizen science in Horizon 2020 by e.g. reflecting it in the funding schemes, setting a list of requirements for the citizen science projects, launching specific calls, favouring projects that include citizen science aspects, etc.
- Support both citizen science associations for offering specific services to the community and researchers groups for implementing success stories
- Give more publicity to the funded projects
- Promote the design and definition of sustainability models for citizen science projects with long-term commitment for infrastructures and data repositories
- Make explicit the importance of involving different stakeholders e.g. civil society organizations

5. Impact measurement/Evaluation:

Citizen science generates a diverse set of outcomes for science, individual participants and socio-ecological systems, which determine the success of a project. In the core of all citizen science projects is the scientific advancement, next to advances in individual participants and local communities/societies as well as educational benefits. The degree to which the divers outcomes are realized depends on the type of the project and its objectives. To better understand the contribution of citizen science to science and society, it requires the elaboration and use of measurement tools and assessment scales that help to evaluate and compare the outcomes and effectiveness across multiple citizen science projects (Brossard et al., 2005).

Open questions:
- Would a standardised impact measurement across multiple European citizen science projects foster the larger expansion and acceptance of this approach?
- Who could be the ones to create these measurement tools and assessment scales?

Potential recommendations:
- Launch a tender to create a standard set of impact measurement toolbox that should facilitate the impact measurement of any citizen science project
- Ensure that all citizen science projects financially supported perform impact measurement
- Reform researcher evaluation methods, adapting science evaluation and ranking methods