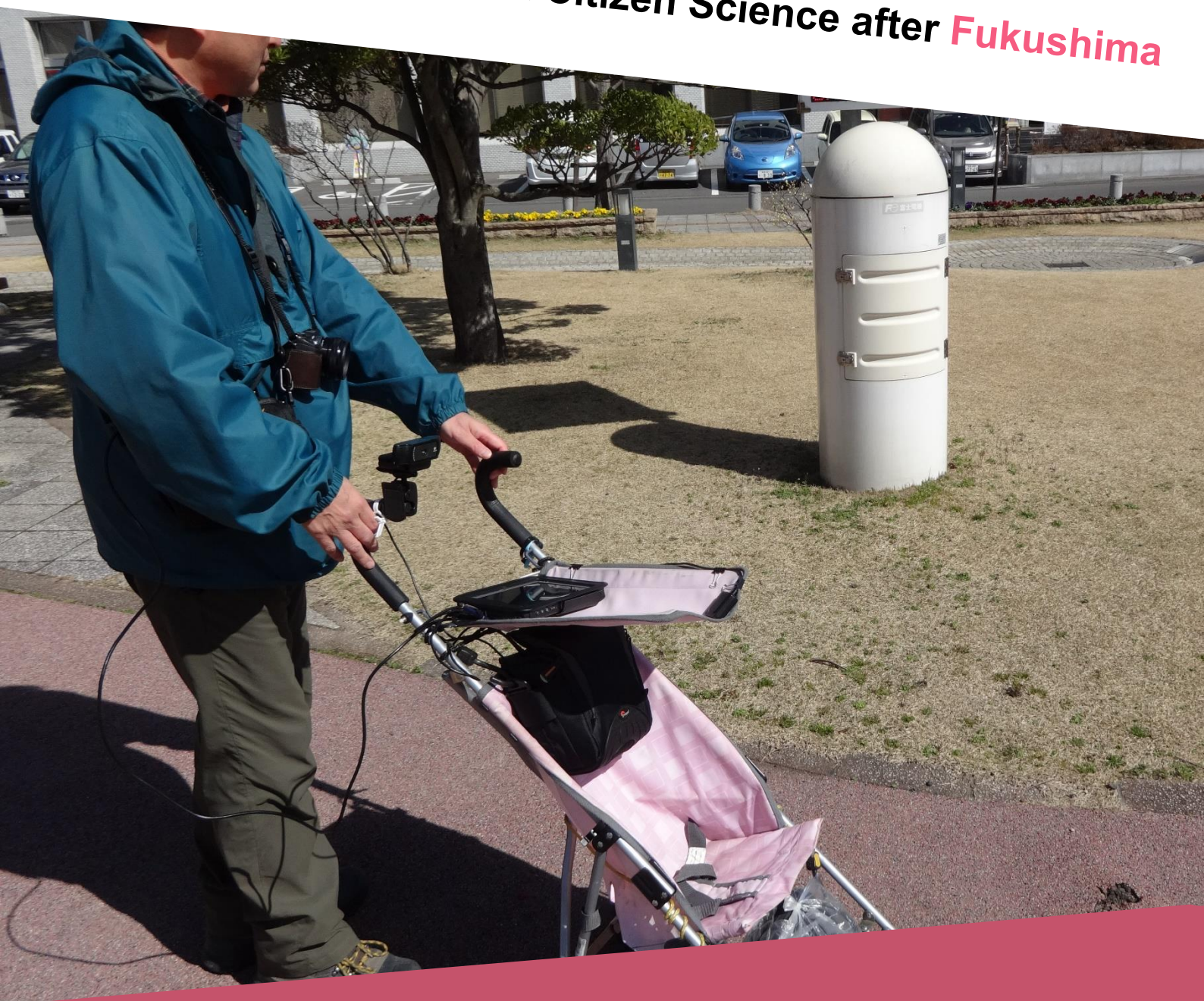
WORKSHOP REPORT

Learning from Citizen Science after Fukushima



Probing the Role and Potential of Citizen Science in Nuclear Science and Technology Governance in Japan and Belgium

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Background

Citizen science is a form of science developed and enacted by citizens, with citizen volunteers collecting or analyzing various kinds of data. Following the Fukushima Daiichi Nuclear Power Plant disaster (11 March 2011), citizen science has demonstrably contributed to filling information gaps, as citizens in the affected areas monitor radioactivity in the environment and communicate about environmental risks. By developing new, innovative ways of assessing risks using their own technologies (e.g. self-assembled Geiger counters), citizen scientists highlight discrepancies between expert and lay appreciations of risk, initiate contextual learning about disasters, and assist in post-disaster recovery. In these processes, they voice ardent criticism of nuclear safety authorities (governmental agencies, oversight bodies, regulators) and nuclear power plant operators, as these institutes are seen to deliberately spread biased information to sustain an illusion of safety. Citizen science thus challenges conventional approaches to nuclear safety management, opting instead for inclusive governance, defined as the opening of knowledge and knowledge making to all members of society.

Against this backdrop, a research team of Belgian and Japanese social scientists organized a stakeholder workshop on 27 February 2019 in Brussels for Belgian and European radiological protection researchers, members of safety authorities, civil society representatives, and policy makers. The workshop aim was to explore with these stakeholders **opportunities to integrate citizen science concepts and approaches in the governance of nuclear incidents/accidents in emergency preparedness, response and post-disaster recovery.** It built on findings from the team's two-year (2017-2019) social science research project **After and Beyond Fukushima: Probing the Role and Potential of Citizen Science in Nuclear Science and Technology Governance in Japan and Belgium,** funded by the Research Fund - Flanders (FWO) and the Japanese Society for the Promotion of Science (JSPS); and was motivated by a concern shared by scientists, governments, regulatory bodies, and citizens to heed lessons from the Fukushima disaster and sustain a more fruitful dialogue between all concerned actors. A concise overview of the project aims, methods, and findings can be found in Appendix A of this report.

Workshop approach

In the opening plenary session, Belgian and Japanese researchers presented key findings from their research project, providing answers to the following research questions:

- How and why did the 2011 Fukushima Daiichi disaster trigger the emergence of citizen science in Japan and other countries? Which forms did, and does, citizen science take?

- How do formal institutions (e.g., public authorities and scientific research communities) in Japan and elsewhere respond to the rise of citizen science, particularly citizen-driven radiation monitoring?

Two Japanese citizen scientists, one representing Minna-no-data site and C-labo Nagoya, the other Citizen Science Initiative Japan, shared their perspectives on these same questions based on their local experiences.

Subsequently, three subgroups of workshop participants discussed potential paths of collaboration between citizen scientists and formal institutions. These conversations drew on recommendations which the research teams had drafted for Japan and Belgium/Europe (see Appendix B). Key threads from these conversations are presented in the Discussion section below. The threads do not capture all that was said but point at recurrent opportunities and challenges of embedding citizen science in nuclear safety governance, which merit further consideration by technical and social scientists, emergency responders, policy makers, and citizen scientists.

Discussion

Overall, workshop participants showed great interest in the radiation measurement activities undertaken by citizen scientists in Japan and in the findings emanating from this research project. Several of them also explicitly endorsed the recommendations presented to them, remarking however that for public authorities, research communities, and other formal institutions **the question of how to engage with grassroots (or bottom-up) citizen science remains open.** Recurring questions raised in this respect were: How do we engage with citizen scientists? How do we support them? What are they asking of us? Whereas there is an active community of citizen scientists in Japan and Europe, it is not always clear "what is out there" to begin with.

Further reflecting on these issues, participants underlined the importance of **taking contextual factors into account when engaging with citizen scientists and citizens** in Japan and Europe, such as the policy and regulatory frameworks that govern nuclear safety, the prospects for nuclear power, and the existence or lack of public confidence in nuclear institutions and their operations, among others. In Japan, radiation monitoring by citizens surfaced in the immediate aftermath of a life-changing cataclysmic event, and triggered an urgent public need for safety that according to many, was not being met by formal institutions and government (NAIIC, 2012). In Europe, no such event has taken place (even if the 1986 Chernobyl accident is part of the collective memory and has led to a few citizen-led radiation monitoring initiatives, notably in France), which may explain why there is no sense of urgency among the public at large. One participant argued that, "We have become too comfortable" and that "here, there may even be too much safety." Hence, citizens as well as institutions, may not see the need to involve citizens and wider publics in nuclear emergency preparedness and response at an early stage – and some may even be opposed to the

idea of public engagement on nuclear safety matters. The risk of not involving citizens, however, is that if a major nuclear accident does occur, we will not be as well prepared as we could, or should, be.

This point tied in with debate about the importance of **training and education through science outreach to schools and other educational organizations** in order to raise public awareness about radiological protection and nuclear safety, and better prepare all stakeholders for an eventual accident (technical safety risk) and the public's response to the accident (social safety risk). Various participants argued that more efforts should be made to reach out to interested citizens and students in particular, as doing so could help to better anticipate potential emergencies and disasters with engaged societal stakeholders rather than those who are not or only remotely interested. Training would have the added benefit of facilitating "ongoing data collection" by citizen groups in a scientifically sound manner and with citizens providing data that scientists would otherwise lack.

Another – possibly complementary – approach to "reaching out" is to **have professional scientists and other vested institutional actors participate in citizen-led activities.** Referring to Japan, where several citizen science organizations now offer training on radiation and radiation measurement to secondary and high school students, one participant stressed that "collaboration [with citizen scientists] in the form of training and education constitutes a win-win" for technical experts, citizens, and government. He argued that participation of this kind would encourage research communities to directly engage with citizen scientists' problem definitions, methods of data collection and analysis, and citizens' knowledge of local environments. Thus, rather than ask how to (better) involve citizens in science, we may also consider how to involve scientists in society.

Workshop participants acknowledged the potential challenges and pitfalls of engaging with citizen scientists in the ways described above, including practical constraints (time, money, resources), issues of ownership, and expectations management. In doing so, they also highlighted **the lack of a regulatory framework for citizen engagement in nuclear safety governance.** The citizen science initiative Safecast has repeatedly called for the establishment of official guidelines that allow for including citizen groups in monitoring, communication and decision making in order to create a regulatory risk governance environment that is conducive to mutual engagement, where formal institutions work *with* citizen scientists in the interest of safety (Brown, 2018). Yet, it remains to be seen how in such a framework responsibilities are apportioned and distributed among actors operating at different institutional levels. As the case of Japan illustrates, there remain distinct **asymmetries in the relations between formal institutions and citizen science groups.** The former were not only slow to respond to citizens' concerns during and after the Fukushima disaster; they also appear slow to tap into the potential of citizen science for crowdsourcing, science communication, and science democratization. To make the most of this potential, a more symmetrical relationship between all concerned stakeholders is required in which citizens are not

considered merely as consumers of scientific knowledge or "data points" that surrender information to experts, but instead play an active role in scientific research, for instance by co-defining research agendas and by strengthening the voices of vulnerable groups or communities. To paraphrase one participant, if engagement between stakeholders does not ensue on symmetrical terms, the result is a "dialogue of the deaf."

With these considerations in mind, participants acknowledged the value of **bringing together various stakeholders to talk with one another** to initiate learning and build mutual trust among stakeholders, as well as develop institutional capacity for public nuclear safety governance. This research project and its concluding workshop are meant as a first, tentative – albeit important – step in initiating learning and conversation of this kind, by developing with public authorities and formal scientific institutions an appreciation of the need for more institutional engagement with bottom-up citizen science, with a greater support of the benefits of citizen science in science policy directives and public engagement strategies.

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APPENDIX A – The Research Project in a Nutshell

After and Beyond Fukushima: Probing the Role and Potential of Citizen Science in Nuclear Science and Technology Governance in Japan and Belgium was a two-year (2017-2019) social science research project, funded by the Research Fund - Flanders (FWO) and the Japanese Society for the Promotion of Science (JSPS). The research project adopted a data-led sociological approach with the aims of garnering insight into the emergence and development of post-Fukushima citizen science, developing theoretically- and empirically-informed concepts of citizen science, improving research design and establishing promising future research venues. It drew on a range of qualitative research methods, including documentary analysis, semi-structured interviews, participant observation, mobile ethnography with radiation dosimeters, and a survey of a Japanese citizen science group (Minna no Data Site), conducted in February 2018. The Japanese team (8 researchers) and the Belgian research team (5 researchers) initiated 5 exchanges between them to discuss tentative findings and further develop their research approach. Project methods and outcomes were presented and discussed at international academic and citizen science conferences. The project teams engaged with a wide range of actors in Japan and Europe: citizen scientists, decision makers, oversight body representatives, and scientists and technologists in radiological protection.

DEVELOPMENT AND SPREAD OF CITIZEN SCIENCE AFTER FUKUSHIMA

Citizen science for radiation monitoring and measurement emerged in response to an urgent need of Fukushima residents and Japanese citizens for accurate and actionable radiation data, as governmental agencies, nuclear powerplant operators, and emergency services failed to provide such information in a timely manner. As public concerns about the accident grew, citizen-led radiation monitoring spread to countries in the proximity of Japan (e.g. Canada, USA) and to other nations that have experienced nuclear fallouts, such as the Ukraine and France. This spread has informed the development of citizen science as a distinct field, as to this day citizen scientists generate their own open-source data, do-it-yourself measurement devices, and radiation maps, engage in educational activities (e.g. in East Asia), and broaden the objects of their research investigation, from raditiation monitoring to food contamination measurement and environmental pollution monitoring, healthcare services and agricultural activities.

INSTITUTIONAL RESPONSES

In Japan, post-Fukushima citizen science initiatives remain potent and present at the local community level; yet, there is little to no formal institutional endorsement of citizen science concepts and methods. Whereas some local governments (e.g. Koganei City and Iwaki City) collaborate with citizen scientists (e.g. by displaying citizen-generated radiation data maps), the central Japanese government, industries, and research institutions still tend to disregard or ignore citizen scientists and their activities.

Official references to citizen science are few and scattered, and generally reflect a commitment to public outreach (e.g. one-way science communication) rather than to scientific citizenship, understood as the involvement of citizens in the definition of research problems, data collection, and analysis. Over the past years, Belgian, European, and international nuclear safety bodies (e.g. IAEA) have shown more willingness to engage with citizen scientists, albeit primarly to expand research opportunities for radiation data collection and to educate citizens about radiation risks. These observations suggest that policy orientations towards 'public engagement' in science and 'two-way science communication' - which now permeate EU policy discourse - have yet to be translated to the radiological protection and nuclear safety fields. In Europe, translation would require the combined efforts of policy makers, technical scientists, and social scientists, with these actors reaching out to, and building on, present citizen-led radiation monitoring initiatives in countries such as Germany and France (e.g. ACRO-CRIIRAD).

INTEGRATING CITIZEN SCIENCE INTO EUROPEAN NUCLEAR SAFETY GOVERNANCE

A concluding workshop with stakeholders in nuclear governance (researchers, citizen scientists, members of safety authorities, and policy makers) highlighted the lessons learned from this research project, providing an opportunity for all to share their perspectives on how citizen science can inform European approaches to nuclear emergency response, preparedness, and recovery. It consisted of presentations by Japanese and Belgian social scientists and citizen scientists, followed by joint discussion of a range of issues, including: (a) the various, often contested, meanings of citizen science (public participation in science, crowdsourcing, science democratization); (b) the opportunties for public institutions to proactively reach out to grassroots citizen scientists; (c) the need to look beyond the scientific value of citizen science, as citizen scientists build communities where citizens connect, learn, and discuss topics of mutual concern; (d) how emergency responders, relief organizations, and public authorties can work with citizen scientists to better prepare for incidents and accidents; (e) the limitations of citizen science, as interactions between citizen scientists and other stakeholders elicit pitfalls, which may hinder joint problem solving.

APPENDIX B – Research Project Recommendations for Japan and Belgium/Europe

Recommendations for policy and practice of citizen science for radioactive measurement in Japan

Go Yoshizawa & Nozomi Mizushima, Brussels, 27 February 2019

1. **Management of Citizen Science Organizations**
   Citizen science (CS) practitioners and supporters should facilitate fair and inclusive management of CS organizations, with special attention to gender and inter-generational issues.

2. **Evidence-informed Approach**
   CS practitioners and supporters should analyze, archive and publicly share their evidence-informed (explicit or tacit) knowledge of radioactive measurement, risk management and policy evaluation. Openness and transparency would enhance their legitimacy and effectiveness, and facilitate building partnerships with other actors.

3. **Public Engagement**
   CS practitioners and supporters should consider building social capital, modelling community leaders and narrating compelling stories in order for the public to sustainably and positively engage with CS.

   ✓ Problem: CS practitioners come under pressure not to release dose data in Fukushima

4. **Grounded Practice**
   Policymakers and journalists should not only focus on the scientific and democratic aspects of CS but also illuminate its individual and communal aspects. For this they should support ways to make CS activities more visible, inclusive and sustainable in society.

   ✓ Challenge: Community CS activities become unnoticed and marginalized

5. **Expert Engagement**
   All the relevant actors should carefully consider and monitor professional scientists' scientific achievements and social attitudes, and foster a critical attitude by reflecting on their background, affiliation and activity.

   ✓ Problem: Underestimated radiation doses in study of Fukushima

6. **Multi-level Governance**
   All the relevant actors should deliberate on how they can allocate their tasks and cooperate with each other at different levels (i.e. central government, local authority and community levels) of radioactive measurement governance, reflecting local knowledges and values.

   ✓ Challenge: Public data management of thyroid cancer screening in Fukushima

- ✓ Problem: No official health records archived at the time of the disaster

7. International Collaboration

All the relevant actors in Japan should demonstrate more accountability and responsibility to the international community by increasing opportunities to interact, cooperate and collaborate with actors outside Japan (e.g. international oversight bodies). They should emphasize in such interactions that Japan has a long and rich tradition of citizen science and nuclear issues, from which much can be learned.

Recommendations for citizen science policy and practice for radioactive measurement in Belgium and Europe

Michiel van Oudheusden & Joke Kenens, Brussels, 27 February 2019

1. Define 'citizen science' clearly but use it flexibly

'Citizen science' means different things to different people. It may be understood as public participation in science, expanding opportunities for scientific data collection, or as science democratization. Those who engage with citizen science must recognize these various meanings and the motivations that sustain them. They would do well to clarify their perspectives on citizen science, recognizing that various stakes – scientific, social, economic, and political – shape citizen science activities.

- ✓ In Japan, the notion of citizenship is contested, indicating that no single term is appropriate for all contexts
- ✓ Citizens do not measure data for the same reasons as scientists

2. Proactively engage with bottom-up citizen science

Contrary to expert-led citizen science projects in which citizens collect data for scientists, bottom-up (or grassroots) citizen science initiatives are instigated by citizens themselves. Formal public institutions (public authorities, scientific research communities, mass media, and educational organizations) should proactively engage with these grassroots initiatives with the aims of learning from citizen scientists, hearing their needs, and exploring new scopes of collaboration.

- ✓ Citizen scientists develop innovative methods, build knowledge of local environments and experiential knowledge in response to pressing real-world problems such as environmental pollution

3. Look beyond the scientific value of citizen science

Data collection constitutes one of the main activities of citizen science organizations, but it is not their sole activity. After the Fukushima Daiichi nuclear accident, bottom-up organizations have developed into venues and communities where citizens connect, learn, and openly discuss topics related to radiation contamination and health issues. Their value to the community stretches beyond their scientific activities.

- ✓ In Japan, citizen science organizations organize information sessions on

ionizing radiation and provide access to healthcare – both physical and mental

4. **Work with citizen scientists to better prepare for incidents and accidents**
   Citizens increasingly use the internet and modern crowd-sourcing technologies to collect and share reams of information, in real time. Emergency responders, relief organizations, and public authorities should tap into this crowdsourcing trend now rather than wait until an accident occurs. All concerned stakeholders should develop methods together that integrate data and observations from a variety of sources.

   ✓ The Tokyo-based citizen science initiative Safecast aggregates radiation data from across the world with the aim of sharing accurate, relevant and up-to-the-minute data that can be acted upon immediately

5. **Acknowledge the limitations of citizen science**
   The scientific and societal benefits of citizen science cannot, and should not, be assumed. It is important to understand how interactions between citizen scientists and other stakeholders elicit tensions and pitfalls, which may hinder joint problem solving. Social scientists can contribute to making these tensions explicit and to developing constructive ways of managing them, by examining citizen science concepts, approaches, and practices.

   ✓ Over the years, some local governments have collaborated well with citizen science organizations, while others have not