

*Research of, for and by citizens: citizen science as a grand platform for nuclear energy policymaking and governance*

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**Abstract**

The paper observes and analyses citizen science practice evolved subsequent to the nuclear accident in Fukushima in 2011. The paper also concerns and compares the case of Japan with Germany's nuclear phase-out, and highlights the different approaches between Japan and Germany in laying out the ground for nuclear energy agenda setting and policy making. In so doing, the paper suggests that it is inter-/trans-disciplinary approach involving the experts and lay public that the state can shape effective and sustainable nuclear energy management, which itself can strengthen civil society and promote democracy.

**Key words**

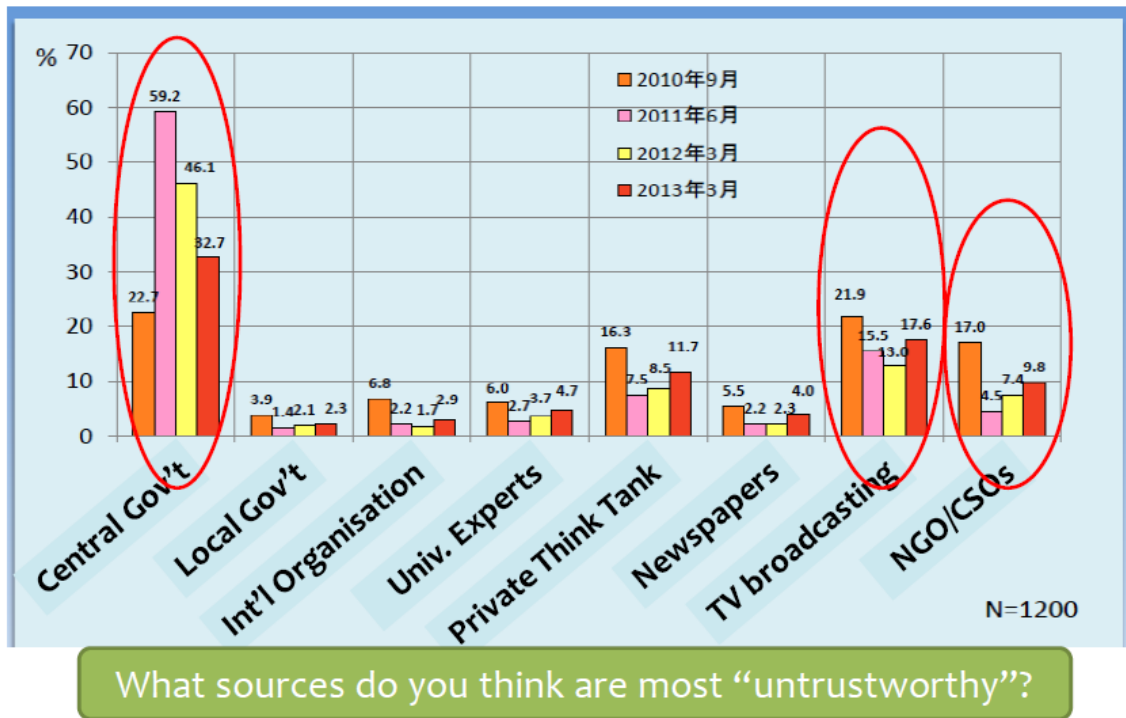
citizen science, inter-/trans-disciplinarity approach towards nuclear energy agenda setting, democracy, civil participation in science and technology

### *Fukushima Daiichi nuclear disaster and its consequences*

The nuclear accident in Fukushima, happened as repercussions of the tsunamis following the Tohoku earthquake on 11 March 2011, left detrimental effects in the spheres of environment, health, economy and politics of the region and beyond. Indeed, the accident discharged high volatility fission products including iodine, strontium and cesium into the environment through the air, soil and water, leading many to recall the Chernobyl nuclear power plant disaster in 1986 (see, for example, Barletta et al., 2016; Greenpeace, 2016; Hermanspahn et al., 2016). That was followed by relentless media reports about the damages on the environment and the neighbourhood, as well as about its impact on human health due to the intense radiation exposure by both national and international observers. The distribution of radioactive products halted the economy of Fukushima where agriculture and fishing industry have predominantly contributed to the revenue, with the media coverage never helping to restore the reputation of local specialities. Meanwhile, the accident has called for controversy as to whether Japan should ever run nuclear power plants, and has casted doubts on the current nuclear power plants in operation throughout the country.

As a result, the country was or perhaps has been divided into two; one side supporting the continual operation and the other advocating the closure of nuclear power plants. The division then inevitably brought about decrease in the support towards the central government. Contrariwise, university experts, private think tank, NGOs and media gained trust for providing information about the changing circumstances at stake.

## Level of Untrustworthiness



Hirose (2013), quoted from Suzuki (2014)

(cited from Van Oudheusden et al., 2016)

### *Citizen science on rise*

It was this gap in the expectations of the governing authorities and the lay public in Fukushima that has given rise to civil initiatives to take the lead in observing, interpreting and facilitating the circumstances at stake, the initiatives of which concur with the idea of citizen science. Citizen science is, in simple terms, ‘scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions’ (Haklay, 2015:6). It largely relies on voluntary contribution and is often committed to free and open access to the collected data set (ibid.). In Fukushima after the nuclear disaster, several citizen science groups have evolved and been monitoring the radiation levels and damages to, for example, human health, wild creatures, and plants.

Among them, an international citizen science organisation Safecast has been successful in paving the path for the citizens' involvement in nuclear science and technology in Japan. Safecast was formed in response to the nuclear accident and has started monitoring, collecting and shaping information on environmental radiation and other pollutants in Fukushima and beyond (Safecast, 2017). In so doing, Safecast aims at informing the lay public 'environmental data in an open and participatory fashion' (ibidem). Another notable move was the establishment of Citizen-Scientist International Symposium on Radiation Protection. The organisation has called for a number of individuals who were concerned about the radiation damages caused due to the accident in Fukushima and has so far held several symposia with both national and international experts (Citizen-Scientist International Symposium on Radiation Protection, 2017), which itself has helped equip the lay public with information that can be impactful to their living.

What these civil initiatives suggest is, the accident has helped acknowledge the importance of inter-/trans-disciplinary approach towards nuclear energy agenda setting, which had long been or is still seized by the experts. The latter idea is not a new trend itself, however, and the divide between experts and lay public who are often the receiver or user of scientific innovation has been critically discussed by scholars of science and technology studies (see, for example, Haklay, 2015:4-5). In the light of this, the nuclear accident in Fukushima has introduced the idea to nuclear field for the first time.

And yet, the acknowledgement has gone only to the extent that the Science Council of Japan has suggested 'answers (回答)' to the Japan Atomic Energy Commission (Yamaguchi, 2013) and been minimal to the nuclear agenda setting in post-Fukushima Japan. It is also worthy of notice that the initial lead in creating citizen science groups including the above two often comes from outside Japan. The fact that Safecast being an international organisation with the

core members being non-Japanese nationals, and that Citizen-Scientist International Symposium on Radiation Protection is headed by a French entrepreneur, point to a degree of weakness in the Japanese society to bring to light citizens' voices to broader public sphere.

### *Germany's move towards nuclear phase-out and the intersections between citizens' voices and experts' interests*

In light of this, it is significant that Germany opted for nuclear power phase-out as a response to the accident and the Chancellor Angela Merkel called for a group of academics to form Ethics Commission for a Safe Energy Supply. At the 8<sup>th</sup> Annual Meeting STS-Forum held in Kyoto in October 2011, the president of the German Research Foundation Kleiner told:

Indeed, the risk of nuclear power use in Germany has not changed through the Fukushima incident but the perception and consciousness of it has grown significantly among Germans under the impressions of the catastrophe. [...] The technical definition of risk - weighing the scale of an incident with the probability it might occur - is not suitable for the assessment of nuclear energy and systematically leads to unacceptable relativization of risk. The probabilities can only be calculated reasonably in terms of assumptions on the course of an incident and in the context of design limits. (Kleiner, 2011, my insertion)

To a question 'Which criteria form the basis of the risk analysis?' (ibid), he answered:

The commission defined an integral path of thinking which considered implications of ecological and sanitary consequences as well as cultural, social, economic, individual and institutional implications - in addition to all technical aspects, that is. (ibid.)

It is significant that the fear of Germans as to the use of nuclear power was considered as an asset that has led to summon an expert commission and to counsel a political decision process.

While that has changed the ways to assess and calibrate ‘risk’, the statement clarifies ‘cultural, social, economic, individual and institutional implications’ of nuclear power now form the basis of the risk analysis. To go a step further, one can understand this move as the state acknowledging the social shaping of science and technology, and experts as an integral part in the public engagement of nuclear energy agenda setting, or policy making by extension.

### *Learning from Germany: nuclear energy agendas and the voices of citizens*

By comparing the case of Germany in line with the evolving citizen science initiatives in Japan necessarily illuminates the lack of social dynamics, or perhaps better termed as the tendency to stay blind to the voices of the lay public, in nuclear agenda setting in Japan. Some controversies as to ‘judicial risk (司法リスク)’ and how those that benefit from institutionalising nuclear power have arranged judicial procedures so as to win lawsuits (Yamamoto, 2017) also indicate clear division between the state and citizens over nuclear agenda setting. Recalling that the citizen science practices are often led by non-Japanese initiatives, it seems fair to say that the mutual shaping in the use of nuclear power is hardly feasible in Japan to date.

And yet, it is the collaboration of the state, experts and lay public that enables inter-/trans-disciplinary approaches so as to better shape public policies around nuclear energy and, for the lay public is likely to be the most affected in case of emergencies, the state should give larger consideration to it when balancing the three pillars. By having experts translating social problems into political language, and the state listening and responding to them, it becomes possible to regard the gaps between the state and society as an opportunity for enhancing emergency preparedness and democracy in civil society.

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