Zurich-Basel Plant Science Center

Future Forums Project Report

Symposium and Workshops on Public Engagement with Science

Technical Report 2018

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1 Background

Research inherently influences the future and most researchers want to contribute with their work to a desirable future. What kind of future this shall be and how to get there is mainly a normative question about values and social responsibility. Consequently, research is always socially and politically entangled. Acknowledging the societal dimensions of research calls for joint participation of various societal actors in setting the research agenda. This requires an effort by the researchers that goes beyond public outreach.

With respect to technological advances and associated risks, it is now widely accepted that various stakeholder groups can have very different perceptions. Stakeholder engagement is best-known from technological risk assessments of large projects and has repeatedly shown to not only improve acceptance and legitimacy but can also improve a fairer implementation. Similarly, research projects could better align the scientific outcomes with societal needs if a public dialogue would be conducted already from early stage on. One of the currently most prominent approaches for assessing societal implications of and expectations towards research projects is the Responsible Research and Innovation (RRI) framework. The probably most influential implementation of RRI is within the Horizon 2020 funding programme of the European Commission.

The Zurich-Basel Plant Science Center (PSC) conducted a one-day symposium on relevance and methods of public engagement with science and two public future forums.

During the symposium, which targeted researchers, general concepts of public engagement with science and case studies from different scientific angles were presented. In addition, the participants of the symposium took part in discussion workshops on technological risk assessments, societal dimensions of their own research projects and on chances and barriers for engaging with the public.

In the future forums the PSC provided a platform for a dialogue between researchers and the public on the role of plant sciences for a more sustainable future food production. This question has been chosen because it has direct relevance for applied research projects in plant sciences. The first workshop on a desirable urban food supply in 2030 was open to a general audience. The second workshop on the role of research for sustainable food supply targeted representatives of civil society organisations who are explicitly aiming to support sustainable agriculture.

In addition, this project was a course for training seven young researchers (PhD candidates) in how to engage effectively with the public. During the workshops, the PhD students acted as facilitators of this dialogue.

This report summarizes the conducted activities and the major findings of the three events.

2 Symposium on public engagement with science: Relevance and methods

Twenty-seven participants (9 UZH, 14 ETHZ, 2 PSC, 1 reatch.ch) followed the invitation to a one-day symposium on public engagement with science. The symposium provided a broad overview on different concepts related to public engagement. In addition, two workshops for practicing methods and one generic discussion on benefits and limitations to public engagement with science were conducted.

2.1 Presentations

Of the six talks, three covered concepts of public engagement with science, while the remaining three talks presented case studies. The first talk was on risk perception and best practice of public engagement with technological risks (C. Beuttler, Forum Risikodialog). This was followed by an overview on narratives and worldviews and how they influence how climate change, global footprints and agricultural practices are communicated and perceived (M. Paschke, PSC). From a more sociological perspective it was presented how public engagement with science and responsible research and innovation developed from public understanding of science and how they were conceived and advanced into science-policy processes internationally (B. Wynne University of Lancaster).

In the afternoon the focus was on case studies: From a more philosophical perspective a transdisciplinary project for defining in a public dialogue minimum and maximum sustainable consumption (so called consumption corridors) was introduced (A. Di Giulio, University of Basel). At the interface of science and arts,

the Climate Garden Project was introduced and showed how a useful dialogue on climate change can be facilitated. The talk emphasized that experiences rather than information is more efficient for communicating consequences of climate change (which is well known from psychology) (J. Schläpfer, PSC).
Using a conservation science project as an example, the lack of institutional incentives for researchers to engage in a public dialogue, was presented. However, already minimal engagement with the local communities has led to the most direct conservation impact of this research project (S. Ismail, PSC).

2.2 Workshops

Workshop 1: *Identifying social dimensions of own research*
Following a set of key questions, two groups of researchers discussed one research project of one of the participants. The key questions were slightly adapted from the CATWOE approach [1] and stimulated discussions about challenges, actors, worldviews, transformation and environment related to a research project (See Annex 1 for the full questionnaire). One project discussed, was on reducing the loss of peat soil under intensively used vegetable farming in a specific region in Switzerland. In this project, there is general consent about the problem and that something should be done. However, within the study system the policy makers are perceived as the most difficult actors because they cannot deal with the high uncertainty about when productivity will dramatically reduce. The other project discussed was on a collaboration with an industry partner for designing a diagnostic tool for detailed plant phenotyping. In this project, the researchers did not think beyond technical and economic aspects. As societal aspects, the researchers repeatedly identified in the discussion the potential contribution this could have to improve plant breeding for improving crops adapted to climate change. This discussion helped participants to prompt thinking about the broader implications a research project can have.

Workshop 2: *Practice on public engagement. First steps for identifying risk perceptions of different stakeholders.*
The participating scientist practiced methods for identifying risk perceptions of different stakeholders. Using climate engineering as the example topic, the participants were put into the role of layperson. After a short introduction on climate engineering, the participants completed a Concern Assessment Matrix (Fig 1) and a Stakeholder Map (Fig 2). As a potentially high benefit with a low level of controversy, the participants identified that most climate engineering approaches do not use additional land. Potential opportunities for new jobs in industry and research were rated as intermediate benefit and high controversy. With respect to risk perceptions, financing and effectiveness were suggested to be very uncertain but not very controversial. As highly controversial, the participants identified the worldwide unknowns and the potential abuse of power. These two exercises are useful for identifying stakeholder groups and their perceived concerns as well as opportunities. This exercise helped participants to understand that risk perception influences decision making of experts and layperson.

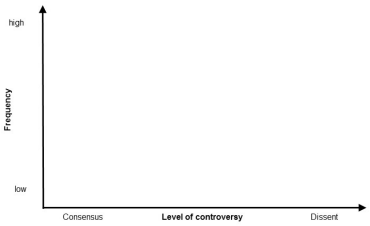

Figure 1: Concern assessment map (filled out twice, once with respect to risk perceptions and once with benefit conceptions)

Figure 2: Stakeholder map

[1] Brouwer, J. H., Woodhill, A. J., Hemmati, M., Verhoosel, K. S., & van Vugt, S. M. (2016). *The MSP guide*. Practical Action Publishing Ltd.

Workshop 3: Benefits and limitations of public engagement with research

Applying a World Café format all participants discussed three key questions that aimed to broaden awareness about engaging the public.

Question 1: What is public engagement with science ideally aiming for?

There was general consent that knowledge exchange can be useful for science and society. Some statements made, implied that public engagement is a way to pursue the public of the importance of research. This idea demonstrates that many researchers do not yet perceive public knowledge as a potential valuable source of information. Further there was the idea that public engagement with science can help identifying where to go as a society and defining the research agenda. However, the statement that public engagement should define the research agenda, was contested. The opponents of this statement, emphasised the importance of basic research which is often not tangible, with uncertain direct benefit and therefore of little public interest.

Question 2: What are obstacles for implementing public engagement with science?

Public engagement was identified as a not trivial and time-consuming task while the workload in research is already high. This raised the question how scientists should engage and whether it would need specialized science communicators. Participants also mentioned that in many cases a research project might not concern specific stakeholders directly. In these cases it is uncertain whom to involve in a dialogue because public interest would be low and because it is unclear who could represent the society. A further expected obstacle was the different language use of experts and layperson. It was also mentioned that the personal interest of a scientist but also of many citizens might not include public dialogue and engagement. For scientific career development, public engagement with science is not yet an asset and therefore of little benefit for scientists. This is also related to the aims of many funding agencies, which do not explicitly support efforts for public engagement.

Question 3: What factors facilitate effective public engagement with science?

Institutions and funding bodies have to be supportive to allow time and financial resources to be allocated to public engagement. This could increase willingness of researchers to invest time in public engagement.

Research topics that have a sense of urgency are more suitable for getting people involved. Other favourable attributes of scientific projects were interdisciplinarity and possibilities for adapting the research scope. It is also important for scientists and the representatives of the public that the general topic is personally relevant.

In addition, a series of personal qualities were mentioned. In particular, understanding of the cultural background by scientists was identified as a major factor for facilitating engagement with the public. For understanding the relevance of public engagement with science, the participants mentioned that education of scientists and of the public is needed. The scientists also need a sense of empathy and reliability for effectively engaging with the public.

For easier implementation of public engagement, an established platform for dialogue was suggested but not further specified.

3 Future Forum I: How should food supply of Zurich look like in 2030?

Within the national event “Festival der Natur” and the associated regional event “Abenteuer StadtNatur” the PSC conducted a public event. The venue was within the community garden project “Brache Guggacker”. Ten representatives of the public attended this forum. For stimulating the discussion on future food supply, four experts, who are professionally involved in the food sector and live in the area, gave input talks on their work and how they believe that this could contribute in future to a more sustainable food supply. Following these inputs, PhD students gave three 2 minutes flashlight presentations on novel developments in food production. For the dialogue, a rich picture, on how sustainable food supply of Zurich shall look like in 2030, was drawn by the scientists and the attendees.

The input talks covered the topics food life cycle assessments (Franziska Stössel, ETHZ), precision farming (Frank Liebisch, ETHZ) and food supply chains (Kathrin Ruthishauser, Migros). The flash light talks covered closed production systems of aquaponics and hydroponics, the potential of aquaculture and the ecological foot print of beer in relation to the consumption in Zurich.

In the rich picture, participants expressed their expectations towards production, consumption and some more general statements on aspects of the food supply system.
With respect to production, the wish was for doubling the number and area of organic farms in Switzerland by 2030. The participants also expected that fields would get larger for improved efficiency, while at the same time there should be more space for biodiversity. In general, agriculture was expected to become more efficient, while using less space. Transport of food was a key topic when discussing how to achieve sustainable food production. Many participants hoped that production would become more regional with scope for participation of consumers. In addition, alternative low input farming techniques or agroforestry were suggested to contribute to more sustainable production. Within Switzerland, the continued importance of agriculture for conserving the cultural landscape was mentioned. Within the city, participants believe that more garden cooperatives will produce more food in the city. In addition, some comments denoted scepticism towards new technologies as well as the challenge of turning urban areas into complementary urban-agricultural places. Although there was some doubt about the feasibility and scaling up of urban farming activities, people highlighted the educational value of urban farming and its good intentions to tackle food problems. More technical or commercial urban farming projects were also considered to have potential but they need to consider various social aspects.
At the interface of production and consumption, people expect that various alternative food sources might become more important (e.g. algae, bacteria, mushrooms, and insects). However, participants also emphasized that new food resources should not rely on imported soya (as currently for intensive fish cultures the case).
With respect to consumption, a reduction of meat consumption and more demand for alternative protein sources are expected. Consumers should also consume crops that are more seasonal. Considering the more systemic food supply, people expected that digitalization will further improve transparency of the entire food supply chain. It would be also desirable that the entire environmental costs should be included in the price of food products. Because future food production is linked to the large societal, environmental and economic developments, it is difficult to discuss this separately.
The discussion was only remotely related to scientific aspects of food production. Most discussions turned to how to optimize existing low-tech methods and abandoned urban spaces, rather than about new approaches or more knowledge that research could provide. There was nothing too specific about plant sciences, but it was briefly mentioned that in the future there might be new crop varieties that can survive with less pesticides and less water. The discussion on such new breeds turned very fast towards ownership and license concerns. However, one aspect that could be pursued is the implementation part of various methods discussed: valid solutions that have been developed theoretically or at small scale, fail to scale up or be implemented, assessed and funded. Real life data and large-scale implementation is missing in the crucial steps bridging theory and practice, especially considering the economic viability.
The discussions were lively, although the conversation tended to diverge fast, as if the topic was too broad to grasp in depth. This could also denote the complexity of the subject; that causes that many aspects related to the topic are mentioned, while they are often far from a specific research question.

4 Future Forum II: Society and research in a dialogue on sustainable food supply.

In the second event, we invited people from civil society organizations, which are involved in sustainable agriculture (fastenopfer, Grün Stadt Zürich, Kleinbauern Vereinigung, myblueplanet, Neue Nachbarschaft1, Pusch, Schweizer Allianz Gentechfrei, Vision Landwirtschaft, WWF). The aim was to provide a platform for discussing sustainable food supply between scientists and civil society organizations. The participants of academia were two representatives of the PSC, seven young plant scientists and two senior researches. For stimulating the discussion, there were two input talks from scientists. One input talk was by Prof. Achim Walter (ETHZ) who gave an overview on different research projects within crop sciences. He presented how basic research on plant growth might

influence future plant breeding in 20 years and how more applied projects on image processing, buckwheat variability and mitigation of soil compaction could have a sooner impact. In general, his research wants to contribute to a more efficient future farming. The second talk was by Dr. Gurbir Bullar on the role of agricultural value chains and consumer choices for more sustainable farming and food production.
In group discussions, the NGO representatives and the scientists discussed three key questions. The statements made, are summarized below.

Question 1: How can technological progress in agriculture consider societal needs?
Technology shall support the people in the agricultural sector but shall not replace them. Therefore, the development of a new technology should also consider its implications for associated jobs.
Technological innovation should not be driven primarily by maximizing economical profit, because this leads to unsustainable food production and supply, which in turn also creates unsustainable demand. Dialogue with and education of farmers as well as consumers has been mentioned repeatedly as a way to overcome these pure economic drivers of technological progress.
Farmers are key stakeholders between research and food supply. Identifying the needs of farmers is crucial for successful implementation of new technology and should be assessed more systematically.
Technological innovation and research is rarely tailored to local environmental and socio-economic conditions.
Technological progress should aim to improve socio-economic development, considering the potential benefits for various stakeholders (e.g. farmers, developing countries, consumers). This would allow to develop solutions which have broader acceptance, are more environmental friendly and economically more sustainable.
Breeding of staple crops is needed for food security. The priority should be the diversification of crop varieties.

Question 2: How could dialogue with society about sustainable agriculture be implemented that research aligns better with societal needs?
There was consent that research and society need to be in dialogue. In general, there was concerns about: Who should be responsible for the dialogue? Who should be responsible for transporting the needs of society to research and vice versa?
It was criticized that research and funding is strongly influenced by trends not by problems, which favours some specific lines of research. It was suggested that the public sector could be engaged in "non-profit research" with all stakeholders to be included to counteract these influences. Trust in research could be fostered through such an approach.
Participants at the table emphasized that they would welcome new dialogue formats with different stakeholders (farmers, researchers, representatives of these initiatives, policy-makers). In particular new dialogue formats, new facilitation formats and social experimentation were raised key words.
The question, if consumers need to be involved in the dialogue was raised but remained open.

Question 3: What can plant sciences contribute to a more sustainable food supply, food system?
Many statements were related to plant breeding. Several crop properties which should be improved were mentioned: For example local adaptation, drought resistance, nutrient value, protein content, yield, less or no pesticide, taste, storage potential and shelf life.
Also, plant breeding should focus more on ecological farming and smallholder farming systems. Research should engage in development of applied technologies and innovations ready-to-use for small-scale farmers.
New cultivation techniques and new intercropping combinations need to be developed for agro-ecological practise. There should be offered consumers the opportunity to formulate their needs. Plant science research needs to take these needs into account. Funding should force participatory approaches and feedback loops here.
For novel techniques, participatory risk assessments should be conducted to meet a precautionary principle.
Ecological and economic research could help to develop true cost accounting that considers environmental externalities of production in the price.
Automation and digitalization in agriculture can scare parts of the society, because this is in contrast to idealized public perception of farmers and agriculture.
In Switzerland, agriculture has to fulfil different needs: (a) maintaining productivity (b) increasing

diversification (and conservation) of farming systems, scaling up agro-ecological systems, maintaining traditional systems that have established in certain cultural landscapes. Socio-ecological (and transdisciplinary) research, facilitation and investment is necessary for ensuring that these different sustainable farming systems become an economic viable alternative to conventional agriculture.
Participants added to many of their statements that more funding or investment into this should be made.
More education is needed, that consumers know about the impact of their consumption behavior.

5 Lessons learnt

Inherently to the broad topic of sustainable food production is that the output, apart from a few specific statments, is on a rather generic level. Therefore, it is necessary to think about how to further develop and formalize a dialogue with the public. For identifying potential research questions or for influencing future research the dialogue would have to be narrowed down to more specific questions or research topics. One possibility might be to conduct a series of longer workshops with the aim to narrow down this question to potential specific contributions (plant) sciences could have for more sustainable food production. This specific topic could then be developed further in an ongoing dialogue. Another way would be to start already with an existing research idea and to develop the scope of this project further to improve its societal relevance. It is also conceivable to include a public forum in the evaluation of draft research proposals and invite projects perceived as most relevant for a second round of full proposals. Such a forum could tremendously improve legitimacy of funded projects and would give the participants of the public a clear scope of influence and appreciation of their input.
A major question is, which communities have the greatest interest and are concerned with a certain topic. Identifying and reaching interested people is a major task and the required efforts and costs should not be underestimated. This also raises the question who represents best the general public. Targeting only the already sensitive people could bias the outcome of engaging with the public. That means that it will always be difficult to claim that a research project has been developed together with the society when some of the societal actors are not interested or cannot be reached.
Despite intensive efforts for advertising the first public event open to all people, the number of participants remained below the expectations. Although the timing of the event during dinner time (Thursday evening 18:00 to 20:30) might have influenced this, it raises the question on the incentives people have to participate in a dialogue with scientists. It has to be considered that when people invest their spare time, they need something in return. Perhaps a more specific opportunity to directly influence research could mitigate this problem. In the second public event, we did not aim for more participants, because representatives of civil society organisations represent interests of their often numerous members. When targeting civil society organisations the interest seems greater. We believe that this is because such a dialogue can meet their own aims of supporting a sustainable development. This allows conducting such workshops during working hours. As these people are professionally involved in the topic, a dialogue with scientists also provides them with an opportunity to stay up to date with novel developments. Further, the level of prior knowledge can be expected to be more advanced, which allows a more in depth discussion.
From the researchers' perspective, the dialogue was well appreciated and the PhD students who participated the course, certainly learnt about the significance and the opportunity a dialogue with the public can have. For their daily work on their PhD thesis the course had little effect because their projects were not designed for engaging the public and because their projects were not explicitly discussed during the workshops. However, the experience that the public is interested in what scientists are doing and thinking about what science wants to achieve, has influenced their thinking and made them more sensitive to the societal dimensions of research.
It was repeatedly noticed that different types of research are unequally suitable for a public dialogue. It is clear that applied research topics, which have a sense of urgency, are more suitable than basic research. In addition, what is relevant to basic science is not necessarily interesting for the general public. The reason is, that basic research primarily aims to broaden human knowledge, often with uncertain or no direct

applicability. This can make it difficult to get people interested to engage in a dialogue. What was also mentioned multiple times is that for early career scientists the main performance criteria is the number and the scientific impact of their publications. This reality provides little incentives and leaves no resources for additional efforts to engage with the public. Although researchers expressed that this could be mitigated through funding schemes that explicitly promote public engagement, it would also need a cultural shift in the scientific community.

Despite the broad topic of the workshops, it became obvious that in general the aim to improve resource efficiency of agricultural production is widely accepted. We also identified that plant breeding for improved local adaptation, drought resistance, nutrient value, protein content, yield, less or no pesticide, storage potential and shelf life are generally perceived as valuable contributions for mitigating future food supply challenges. With respect to new methods and technologies there was a mixture of excitement towards the potential benefits and scepticism due to the uncertainty about the environmental and societal implications, coupled with a resignation that these developments will be driven by economic forces and not by research or the society. It became also apparent that towards small tangible projects like the community garden Brache Guggach, the basic attitude is very positive. In contrast, large-scale industrial food production is viewed as more controversial, as it does not meet the idealized perception of farmers that get their hands dirty.

An interesting idea that came up during the workshops, was to establish a public platform for discussing and adapting research projects. At such a platform, scientists could present their research ideas for a public evaluation with the help of science facilitators. Such a formalized platform would reduce significantly logistic efforts for scientists and could provide highly effective input from the public. Mutually not exclusive, such a platform could also serve as a first evaluation round of research proposals.

Annex 1 Questionnaire to prompt thinking about societal dimensions of a research project:

Sample questions for discussing societal dimensions of a research project

Challenges: What are the obvious societal challenges of the chosen research topic

Actors: Who has an interest in the research project? (adverse or positive)

World View: What are the mindsets of the identified actors? Are there contradicting views/values?

Transformation: What is the desired change the research project shall bring?

Environment: What are obstacles for achieving the desired change?

Questions adapted from the CATWOE approach as described in: Brouwer, J. H., Woodhill, A. J., Hemmati, M., Verhoosel, K. S., & van Vugt, S. M. (2016). *The MSP guide*. Practical Action Publishing Ltd.