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practice paper

PARTICIPATORY APPROACHES IN RESEARCH, TECHNOLOGY AND INNOVATION (RTI) POLICY AND THEIR POTENTIAL IMPACT

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ABSTRACT

The present article reviews various concepts of participatory science and research and discusses their potential to exhibit impact on the relationship between science and society. Starting with an overview of rationales, concepts and challenges, different forms and intensities of participatory approaches in research and innovation are discussed. We then look at the situation in Austria and sort selected Austrian funding programmes and initiatives into a diagram according to the intensity of participation as well as the social groups involved in each case. Finally, we try to gain more precise indications of the impact of participatory programmes on the relationship between science and society. Many questions remain unanswered, as precise analyses and evaluation results are usually lacking. While different surveys provide insights into society's level of information on a general level, interest, involvement and attitude towards science and research, approaches for impact assessment are fragmented and remain on the surface. We therefore propose to develop an analytical framework based on existing approaches and to include collaboratively developed indicators in it.

1 INTRODUCTION

This article is the result of one of three fteval working groups that were formed on the topic of research, technology and innovation (RTI) policy impact and regularly met from September 2020 to February 2021.[1] The topic of our working group was the impact of RTI policy on the relationship between science and society and we quickly agreed to focus on participatory processes. As a result of the working group, a blog post was created[2], which we also used to open up a space for further discourse. In doing so we followed three working hypotheses:

1. Participatory approaches have gained increasing attention on the policy level within the last years and they have the potential to directly affect the relationship between science, research and society.
2. There is no single public (society), but a plurality of different "publics'' on different topics or spheres. Different publics and groups require different formats of participation, interaction, cooperation, knowledge transfer and co-creation.
3. RTI funding programmes have the potential to influence the public understanding of science and research, as well as their relevance and responsiveness. However, it remains largely unknown what this influence looks like.

In the first section we present concepts of participatory approaches and highlight some philosophical and political rationales behind them, before we describe various forms of participation and focus on the degree of involvement of society in the second section. In the third section we summarise selected Austrian funding programmes and policies that connect science and research with the society. The fourth section addresses the need to learn about the potential impact pathways of such programmes and policies by suggesting the joint development of specific surveys and indicators. This effort could support the long-term goal of increasing the relevance, responsiveness and inclusiveness of science and research, as well as society's trust and empowerment in science and research.

2 RATIONALE AND CONCEPTS

2.1 RATIONALE BEHIND PARTICIPATORY APPROACHES IN RTI

In the last decades, the perception of societal outreach of research, technology and innovation has moved from an information-push oriented 'public understanding of science' approach (and the related deficit mod-

1 The fteval Working Group comprises: Carmen Calatrava (Technopolis), Anton Graschopf (RFTE), Erich Griessler (IHS), Jakob Kofler (KMU Forschung Austria), Patrick Lehner (LBG), Sabine Mayer (FFG), Elisabeth Nindl (FWF), Bettina Poller (RFTE), Barbara Streicher (ScienceCenter-Netzwerk), Dorothea Sturn (ZSI), Magdalena Wailzer (LBG), Isabella Wagner (fteval), Magdalena Wicher (IHS)

2 See https://www.fteval.at/content/home/news/ag_impact_results/AG-Impact_G2-Sci-Soc_Blogpost.pdf, April 26, 2021

el-thinking about the public) via 'science in society' to a 'science with and for society' understanding. RTI policy makers have come to realise that it is not enough to punctually involve societal stakeholders at later stages of RTI to ensure the best possible outcome and to mitigate risks. Instead, the involvement of broad societal groups has to be continuously ensured (Owen et al., 2012; Stilgoe et al., 2013; van den Hoven et al., 2013).

Unlike the traditional approaches to RTI in which researchers and innovators generate the ideas for projects, define the methods, generate results and interpret the outcomes, participatory approaches enable societal groups (users, stakeholders, civil society actors, citizens) to get involved, become a collaboration partner and shape the research agenda. Their participation should result in

- better public understanding of RTI, socio-political awareness and science literacy
- increased legitimacy of RTI policy interventions and co-ownership of society in science and research
- generating relevance, responsiveness and inclusiveness of RTI, ensuring that its outcomes align with the needs, values and expectations of society
- improved transparency and society's trust in science and research

2.2 CONCEPTS

Participation in science and research is debated, addressed and conceptualised in a multitude of research fields. In the following, we give a non-exhaustive overview on some of the key concepts and discourses offering frames to grasp the phenomenon. Note that there is considerable overlap between some of the concepts. The concepts in the following give a glimpse on the diversity of approaches to participation in research and are selected in terms of their overall relevance and their explanatory power for the present work.

Responsible Research and Innovation (RRI) is a key concept in EU-level discussions in this regard. The idea behind RRI is that societal actors and RTI actors become mutually responsive to each other (Von Schomberg, 2012), thereby co-creating solutions for which they share responsibility.

Apart from the RRI discourse, another strand of philosophical discussions on participation can be found in the **political philosophy literature** (cf. the special issue on participation in the journal Res Publica; Parvin and Saunders, 2018). Participation is commonly seen here as a direct corollary of democracy and widely supported at a principal or theoretical level.

The degree to which participatory processes are in line with democratic principles depends on their design. Philosophers identified a clear disconnect between the lived reality of participation, its underlying value of democracy, and its philosophical justification. Since the conditions for participation are sometimes too demanding and exclusive, participation practices can lead to an unfair concentration of power in the hands of a privileged, educated elite and would undermine the interests of disadvantaged groups who have not been able to engage in participation to the extent that wealthier people have (Brennan, 2016).

The issue of whom to engage gains even more importance when the power dimension of knowledge is considered. Habermas´ (1971) account on the notion of knowledge, – differentiating three main forms, instrumental, relational and critical knowledge – sheds light on the epistemological aspects of participation. Whereas instrumental knowledge is based on the natural sciences and a positivistic approach, relational and critical knowledge are constructivist concepts. This implies that relational and critical knowledge is collectively constructed by the people through social interactions. Acknowledging these forms of knowledge and their mutual interactions requires engaging with people and considering their local context and community (Park, 2005). **Participatory action research** can be seen as a movement emerging from these concerns, seeing knowledge produced by lived experience as equal to knowledge produced in academia (Torre, 2014).

One approach of public participation in science is **citizen science.** Looking at the development of this approach shows some of the key tensions of participation in research. In early works on the notion of citizen science, its double-sided nature as science for the people and science by the people was already highlighted. The former rests on political and epistemological aspects mentioned above. The latter refers to the educational purpose to integrate citizens in scientific endeavours as well as the usefulness of this kind of crowdsourcing to study particular phenomena. To date, most citizen science projects follow norms and values of institutional science, with the science by the people aspect being prevalent (Strasser et al., 2019). However, the science for the people aspect is gaining popularity and is more and more recognised in citizen science projects. Acknowledging this aspect requires considerably different project designs, making the whom and the how to engage major concerns (Mueller, 2012).

1.3 CONCERNS AND CHALLENGES

Participatory approaches in RTI activities are expected to better address socio-political issues and have more impact. In designing such formats, however, a number of potential difficulties and risks must be considered:

- Risks for researchers: The question of research quality[3] and the related problem of a loss of reputation are contradictorily discussed in the literature; it seems to be a feared rather than a real quality problem (Kosmala et al., 2016, Bone et al., 2012). There are also indications of possible career barriers for scientists, for example when participatory projects are seen as less important than classic journal articles or when junior scientist work is taken over by unpaid lay people (Riesch and Potter, 2014).
- Risks for participants: Their work is mostly unpaid and often not sufficiently appreciated (Jemielniak and Przegalinska, 2020). This lack of appreciation manifests itself, for example, in the fact that participants are often not named as co-authors or co-owners of outputs.
- In addition, there are a whole range of ethical risks to consider: Authorship and intellectual property rights, issues of human dignity, protection of privacy and data protection, transparency,

3 Data quality was almost universally recognised as one of the problems that scientists working in participatory processes need to address. Riesch and Potter (2014) presented a qualitative study of 41 semi-structured interviews with scientists working on the Open Air Laboratories project in England. They find that the major issues for researchers are the quality and accuracy of the data and worries about the reaction of the scientific community, such as journal reviewers.

inclusion, diversity and gender biases (see e.g. Bowser and Wiggins, 2015 or European Citizen Science Association, 2015).

3 FORMS AND INTENSITIES OF PARTICIPATION

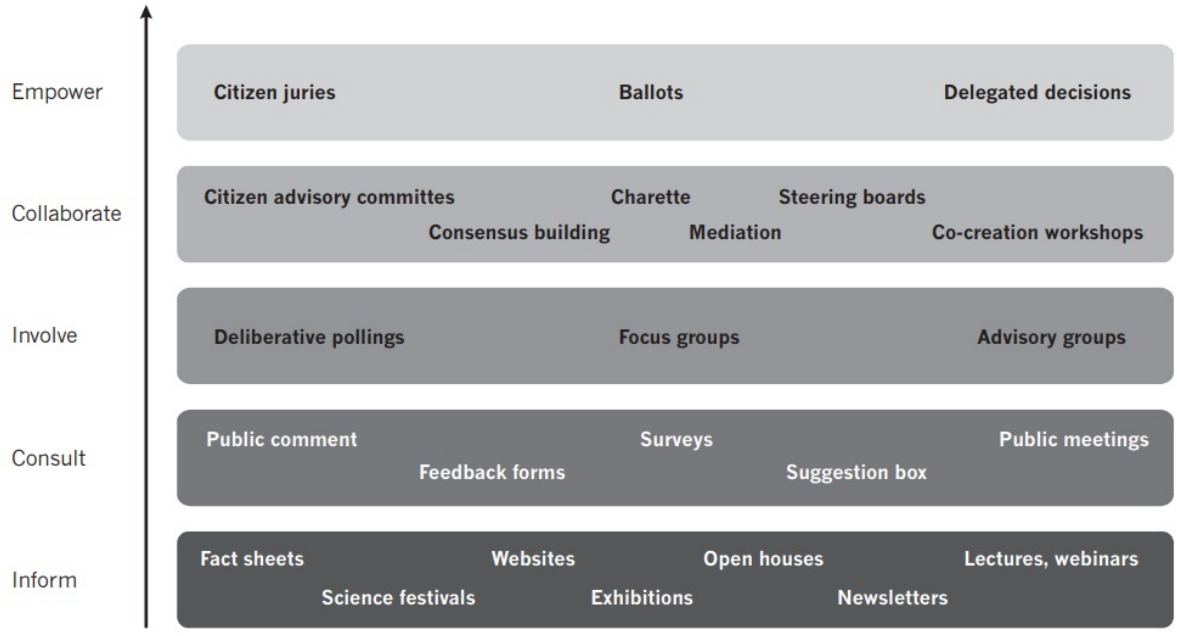
The decision on whom and how to involve different stakeholders, representing specific communities or society at large, depends on the purpose and context of the research endeavour (e.g. patients, family members, workers, members of an ethnicity or religion etc., Dryzek, 2012). The definition of the group of people to be involved in a participatory research project shapes its outcome. It determines who can participate and thus share his or her perspectives on a problem to be researched. This in turn determines not only the perceived legitimacy, but also the success of the participatory process. Were the appropriate groups involved to explore the research question holistically? For example, a research project that seeks to improve mental health support structures might have easy access to regular users and service providers, but may learn more from also engaging with non-users of the services to understand obstacles and barriers.

Finally, involvement of societal actors may not only take place in research projects along the research cycle (Hoekstra et al. 2020), but societal actors can also participate in decisions on framework conditions, such as the evaluation of project proposals or strategic decision-making and policy making processes. In these cases, questions of representation and power balance between interest groups gain further relevance and have to be reflected in the involvement process (Wynne, 2007).

When choosing the appropriate mechanism of public participation, it should be noted that the policy tools at hand largely differ in terms of the intensity of participant involvement. There are several approaches to conceptualise the different degrees of involvement: Arnstein (1969) developed a detailed typology of participation by identifying eight categories, visualised as spokes of a ladder, that differ according to the degree to which the society is engaged. She argues that the distribution of power is an essential part of participatory processes, determining its democratising and transformational potential. The ladder indicates the gradations of participation. In the following section, we use a simplified version of Arnstein's participation ladder to assess participation initiatives in Austria, the IAP2 Spectrum of Public Participation (2000). The typology defines the role of the public in participatory processes along the degree of power given to the public: the public is provided with information in the first mode *Inform*. In the second mode *Consult,* the public is asked for feedback, while in the third stage *Involve* partners work with the public throughout the process. The fourth stage *Collaborate* determines the public as a partner in all aspects of the decision. Finally, the stage *Empower* implies that the public makes the final decisions. The typology reflects that with higher degrees of involvement the empowerment of those who are affected by research increases, introducing a shift of power and ownership towards society.

In line with the degree of involvement, a specific format of interaction can be chosen. These formats or mechanisms of interaction are great in number and include citizen juries, expert advisory groups, patient and public involvement, consensus conferences, social labs and science shops, to name just a few. To design participatory processes, a variety of techniques can be combined (Rowe and Frewer, 2005). The appropriate mix of methods and the degree of engagement is highly goal and context dependent. While there is no standard typology of mechanisms nor a detailed guide which mechanism to use in what circumstances, Figure 1 provides an overview of exemplary techniques structured along the IAP2 typology:

Figure 1: Participatory techniques along the IAP2 typology



Note: The figure shows an adopted overview of methods grossly categorised to the IAP2 typology and the public engagement triangle (BIS, 2010). In practice, the design of the particular method determines the degree of participation; e.g. workshops could also be located in the Collaborate or Empower modes, depending on the degree of participation intended in the design of the workshop.

The design of the participation process also depends on the societal group to be involved and thus can influence participation structures (e.g.: meetings) and formats (e.g.: communication methods). For example, in the aforementioned research project on mental health support structures, some mental health patients struggling with stigma may hesitate to discuss certain topics in group settings and would feel more comfortable to share their perspectives in one-on-one meetings rather than co-creative workshops.

4 PARTICIPATORY RTI POLICIES IN AUSTRIA

4.1 RTI POLICIES TO SUPPORT PARTICIPATORY APPROACHES IN RESEARCH

Various research, technology and innovation policies aiming at governing and supporting the relation between science and society were established in Austria. Initiatives can be found on different levels using a variety of policy instruments. The initiatives cover a spectrum reaching from the creation of the Center for Citizen Science, the establishment of specific research funding programmes, the integration of science and society interaction formats into performance contracts with universities to programmes like the Kids University and events such as the researchers' night ("Lange Nacht der Forschung").

Strong impulses for public participation in science and research also came from Austrian research institutions that participated in and coordinated European Research projects (Framework Programme). The H2020 programme line "Science with and for Society" (SwafS) was and is critical for establishing a vibrant research community in the area of public engagement and RRI.[4] RRI aims at better aligning research and innovation with societal needs and promoting gender equality, public engagement, science literacy and science education, ethics and open access. The participation in SwafS projects also strengthened the connection of the Austrian research community with European and global networks and stimulated practice and debate of public engagement in Austria.

The SwafS programme supports university and non-university research institutes in experimenting with and promoting public engagement activities in research and innovation. Since 2014 it allocated in total 462 million Euro to science and society interactions, including public engagement and related topics. Austrian research organisations were very successful in this highly competitive programme: with a success rate of 19.2% (average 13.2%), they participated in 84 projects (37.2% of all projects), coordinated 21 of them (9.1% of all projects) and obtained funding of nearly 25 million Euro (7.2 % of total funding).[5]

In addition, Austrian funding agencies support and promote participatory approaches in science and research with designated funding programmes. The following section presents a brief overview of selected current or past funding programmes.[6]

4.2 SELECTED AUSTRIAN FUNDING PROGRAMMES

Benefit / AAL (Austrian Research Promotion Agency FFG)

The programme supports the involvement of end users (primary, secondary, tertiary)[7] in the development of ICT-based products and services with the aim of maintaining and improving the quality of life of older people and guaranteeing them the longest possible autonomous life. Since 2008, projects have been supported with over 70 million Euro. The relevant end users are involved in all stages of the research process by consultation, collaboration and co-creation. However, the focus in the AAL and benefit programmes is not just on users in the sense of consumers and their needs and wishes – instead, they are designed to help solving the key societal challenge of ageing by involving the relevant stakeholders. Hence, secondary and tertiary end users are highly relevant to pave the way to the successful implementation in a very sensitive and highly regulated market.[8]

#Connecting Minds (Austrian Science Fund FWF)[9]

The programme funds transdisciplinary research projects in a two-stage process. In the first stage, researchers and non-academic stakeholders (e.g., representatives of NPOs/NGOs, associations, public administration, firms, health and teaching facilities) develop a project idea (workshops funded with 10.000 Euro), in the second stage the full proposal is submitted. Funded projects receive 200.000 Euro annually for up to five years. The first call ended in spring 2020 with a total volume of four million Euro. The joint initiation and implementation of research processes by scientists and societal actors is expected to support the search for solutions to complex current issues, the transfer of (basic research) results into practice and to strengthen the dialogue between science and society. The involvement of society starts at a very early stage in the research process, is continued in the implementation and thereby supports the empowerment of the actors involved. The generous funding and the rather long project duration permit profound cooperation and co-creation.[10]

4 Under the lead of EU-Citizen.Science (http://eu-citizen.science/ April 22, 2021) 18 SwafS projects formed a network that regularly meets to discuss common challenges and widely disseminate key findings.

5 See: https://eu-pm.ffg.at/ui/login/, March 5, 2021.

6 Programmes are described in alphabetical order. Programmes that solely support citizens and patients taking part in research studies and clinical trials are not considered here. For information regarding evaluation reports of the programmes, please refer to 5. Uncovering the relationship between science and society.

7 As primary end users we understand citizens directly in their personal capacity, secondary end users are end user organisations' staff in their professional capacity, entities representing groups of persons, or networks of elderly people (family, friends, neighbourhoods...), tertiary end users are institutions such as insurances or communities.

8 See https://www.ffg.at/ambient-assisted-living-joint-programme and https://www.ffg.at/programm/benefit, April 22, 2021

9 The programme is funded by a special endowment from the Austrian National Foundation. At the time of writing, this endowment has expired, so that the continuation of the programme in 2021 and subsequent years is not secured.

10 See https://www.fwf.ac.at/de/forschungsfoerderung/fwf-programme/connectingminds, April 22, 2021

Innovationslabore (Austrian Research Promotion Agency FFG)

Innovation laboratories are structural measures to support the systematic and early-stage involvement of users in innovation processes (user-centred innovation). Introduced in 2016, they are utilised in thematically open calls or specific thematic fields (e.g. urban mobility lab), run up to a maximum of ten years and receive a funding of up to five million Euro (though most funding programmes use this instrument with less time and resources). So far, these infrastructures received funding of 29 million Euro. These laboratories are open for all – firms, research institutes, universities, communities, citizens, pupils etc. and thereby constitute a space for open innovation, that supports co-creation, the creation of a community and the transmission and transfer of know-how. They serve as platforms and provide infrastructure and services, where all interested parties can participate in co-creation processes, search for information and participate in collaboration and exchange. The broad range of offerings and the longer-term orientation enable multifarious forms of participation.[11]

PPIE – Public and Patient Engagement and Involvement (Ludwig Boltzmann Society LBG)

The PPIE programme is a top-up funding for citizen and patient participation activities in ongoing research projects, open to all disciplines. The funding amounts to 20.000-60.000 Euro for a duration of six to twelve months. The first call ended in October 2020 and has a budget of 600.000 Euro, the second PPIE call will open in autumn 2021. The ambition of PPIE lies in supporting the active participation of patients and the interested public in research processes to increase the quality and impact of the research, to ensure its societal relevance and to push innovation processes. The involvement of and collaboration with citizens and patients covers the whole research process, starting with the development of the research question. PPIE currently is the only programme in Austria that involves society in the funding decision already. Four representatives of the public, thereof one patient, one person from the field of public health and two young persons (16-25 years) with basic knowledge of scientific processes, are members of the panel.[12]

Sparkling Science (Austrian Agency for Education and Internationalisation OeAD)

Under the umbrella of Sparkling Science, funding programmes with calls between 2007 and 2016 and a total volume of 35 million Euro supported research projects with the aim of reducing structural barriers between the educational and the scientific system in Austria.[13] The participation of pupils in research projects should raise the interest of young people in research and science. The funding constitutes a top-up for ongoing research projects, mainly financed by other sources. The last projects ended in 2020. Overall, it was a wide-ranging programme with a large variety of different projects, many of them spanning over several years. Participation and success often critically depend on the engagement of teachers and schools, that enable and support participation.[14]

Top Citizen Science (Austrian Science Fund FWF)

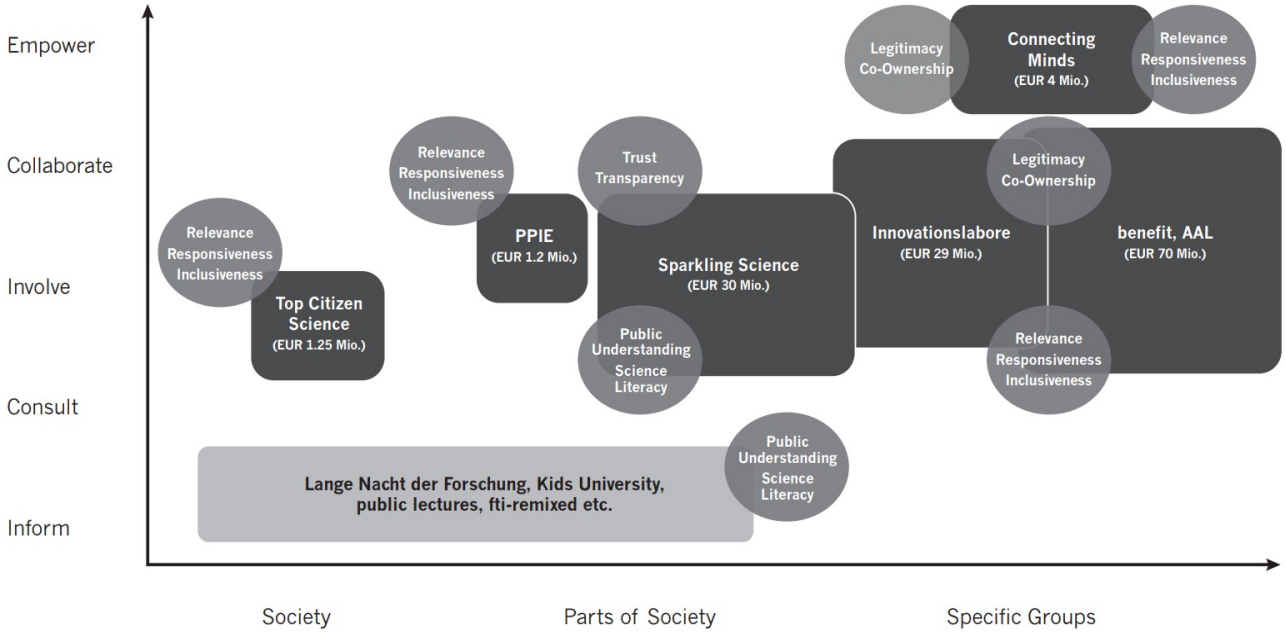
Since 2016, running FWF-funded projects can be augmented by citizen-science components. The funding per project amounts up to 50.000 Euro, the volume per call totals currently 250.000 Euro. The collaboration with citizens is expected to lead to a substantial, additional scientific knowledge gain in the research projects. Consequently, the programme targets citizens with highly specialised knowledge or expertise (knowledge communities), but also young target groups. The involvement in research is freely configurable, but due to the programme design it mostly consists of generation/collection and interpretation/analysis of data. As the award of funds is based on criteria of scientific excellence, the input of society in a research project needs to be relevant in order to achieve the desired excellent results.[15]

The abovementioned selected funding programmes supporting participatory approaches in research in Austria can be mapped according to the degree of involvement, the specificity of the society and the main rationale of the programme. While society is in very general terms understood as a group that interacts, in RTI policies the term more often refers to specific groups or parts of society, that are target groups for policy interventions (e.g.: pupils). In addition, societal groups often emerge and develop in the context of specific research questions or technological controversies.

The mapping in Figure 2 gives an overview and may serve as the basis for further discussions; it is not to be read as a ranking or rating, but instead solely aims at displaying a variety of programmes in Austria. It shall help locating the programmes in the space opened up by plotting aspects of society and participation, and to potentially allow identifying gaps in the present funding landscape.

11 See https://www.ffg.at/instrumente/Innovationslabor, April 22, 2021
12 See https://ppie.lbg.ac.at/, April 22, 2021
13 At the moment of writing, the relaunch of the programme was secured. Details will be published in the coming months.
14 See https://www.sparklingscience.at/, April 22, 2021
15 See https://www.fwf.ac.at/de/forschungsfoerderung/fwf-programme/foerderinitiative-top-citizen-science/, April 22, 2021

Figure 2: Mapping of selected Austrian funding programmes supporting participatory approaches in research



5 UNCOVERING THE RELATIONSHIP BETWEEN SCIENCE AND SOCIETY

As discussed above, specific RTI policies targeting the relation between science/research and society are expected to a) promote public understanding of science and increase science literacy, b) increase the legitimacy of RTI policy interventions and to support the co-ownership of society, c) raise the relevance, responsiveness and inclusiveness of science and research, and d) improve transparency and society's trust in science and research.

The funding programmes and policy measures introduced in the previous section address one or more of these points. However, the measurement of the effect or impact of those programmes on the four aspects mentioned in the previous paragraph is a difficult undertaking. Some of the abovementioned programmes have been evaluated in the recent past. However, the emphases of evaluation approaches across programmes differ greatly and the effect and impact of the programme on the relationship between scientific and societal actors is rarely explicitly considered. For example, Manahl et al. (2016) analyse the scientific output of "Sparkling Science" projects rather than effects of the projects on the relationship between science and society. They find that on average, 2.8 scientific articles, 0.8 university final theses and 0.3 school final theses resulted from each research project (211 projects in total), which is markedly lower than for FWF funded stand-alone projects. Meanwhile, some programme evaluation reports find positive effects on the cooperation and the exchange between partners from different societal, scientific, institutional and economic actors.[16] Tiefenthaler et al. (2018) find that the "Sparkling Science" projects increased the awareness and openness in schools (and to a lesser extent also in universities) for (internal) cooperation and exchange, and thereby inspired others to participate in such research projects. Researchers mention that the work with schools and pupils inspired their perspectives on and approaches towards their research (e.g. research questions). This increased openness may serve as a first indication for an improved relationship between science and society. However, as this was not the focus of the evaluation, this interpretation should be taken with caution. In fact, Tiefenthaler and Zingerle (2020) point out that impacts are difficult to assess for reasons such as the rather short time span between the introduction of the programme and the evaluation.

To measure the impact of participatory programmes on the relationship between science and society, different surveys have been introduced on a quite general level in order to give insights into society's level of information about science, its interest and involvement in science, and the attitudes towards science. Examples include the Eurobarometer surveys on Science & Technology[17] and on Responsible Research and Innovation[18], the German Science Barometer[19], the Open Science Monitor by the European Commission[20] or the U.S. Science and Engineering Indica-

16 Tiefenthaler and Zingerle (2020) evaluated urban mobility labs, which are realized in the framework of the instrument "Innovationslabore". Two evaluation reports on the institutional and scientific effects of the programme "Sparkling Science" were prepared by Tiefenthaler et al. (2018) and Manahl et al. (2016).
17 See https://data.europa.eu/data/datasets/s806_73_1_ebs340?locale=de April 27, 2021
18 See https://data.europa.eu/data/datasets/s1096_79_2_401?locale=de April 27, 2021
19 See https://www.bosch-stiftung.de/en/project/science-barometer-representative-survey-german-citizens-science-and-research April 27,2021
20 See https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/open-science-monitor_en April 27, 2021

tors[21] report on public attitudes. Moreover, the European Framework Projects MoRRI and Super MoRRI[22] provide a sound conceptual framework and associated methodology for the monitoring of the current state and evolution of responsible research and innovation and its scientific, social, economic and democratic effects, including the effects on the relationship between science and society. On a national level, Kieslinger et al. (2018) developed an evaluation concept for citizen science programmes and initiatives. According to this, citizen science programmes should be evaluated along three dimensions of participatory science: (i) scientific impact, (ii) learning and empowerment of participants and (iii) impact for wider society. The authors offer an open framework which can be adapted and tailored to the specific goals of citizen science programmes. The different surveys provide an impression of the current status of the relationship between science and society and its gradual change over time, but they do not provide in-depth insights into the factors shaping this relationship. As most surveys are conducted on a European level, they also do not allow conclusions for national programmes. However, a glimpse into existing evaluation reports of national programmes show a lack of focus on the relationship between science and society. Therefore, we see a potential for new approaches that enable us to deepen the understanding of the role that (specific) RTI policy measures can play in improving the relationship between science and society.

First, a survey[23] could be designed to gather information on programmes promoting public participation in science and research and to display their impact on the relationship between science and society. In addition to covering the relationship between society and science as a whole ("Did mutual acceptance, trust and credibility change?" etc.), the effects of these programmes on the representatives of (specific segments of) society (effects of participation on attitudes towards science and research, interests and behaviour) and on the representatives of science (effect of participatory practices on attitudes, behaviour and research) should be considered.

Second, in line with the goals of the funding programmes, corresponding indicators should be developed collaboratively by representatives of science and society and should be included in the evaluation protocols of the relevant programmes. A participatory indicator development for different types of funding programmes generates indicators tailored specifically to the goal and audience of these programmes. The collaborative development of the indicators itself sheds further light on the motivational factors and/or aspired impacts from scientific and societal actors, as well as potential divergences. At the same time, the indicators need to be comparable across programmes in order to allow policy makers to draw meaningful conclusions on output, outcomes and impact of such activities. This could build on existing efforts within the EU such as the SuperMoRRI project or the SwafS Project Co-Act where participatory approaches in the evaluation of citizen science are tested.[24]

6 CLOSING REMARKS

Participatory approaches, in various forms and intensities, have gained increasing attention within the last years through concepts such as RRI, participatory action research or citizen science. In RTI policies, participatory approaches have the potential to affect the relationship between science, research and society. Despite the advantages of these approaches, they also present challenges for researchers (e.g.: career barriers) and participants (e.g.: lack of appreciation), as well as ethical risks, such as authorship, protection of privacy, transparency and inclusion.

A closer look on the Austrian RTI landscape shows that some programmes supporting participatory approaches have been initiated, but many of them show untapped potential for further development. To advance these initiatives, not only the underlying aspirations and expectations of the programmes, but also their realised impact needs to be understood. While different surveys provide insights into society's level of information on a general level, interest, involvement and attitude towards science and research, approaches for impact assessment are fragmented and remain on the surface. We thus suggest to introduce more specific surveys at programme level that systematically gather the impact of participatory approaches on both, the participants and the researchers. Through a set of suitable and comparable indicators the effect of participatory science and research can be analysed in more detail. This in turn would allow the design of RTI policies that have the potential to truly shape the relationship between science, research and society in the long-run.

Science has the potential to tackle some of the grand challenges our society is facing. At the same time, however, science is also, at least in part, the source for some of these challenges. Therefore, the relationship between science and society has a political dimension and should be guided by realistic expectations, be mutually supportive and based on transparency, participation and mutual trust. In order to reflect these principles, RTI policy should aim to better align science and research with societal values, needs and concerns. To this end, programmes which encourage the integration of a wide range of societal actors along the whole research and innovation process should be more strongly promoted. This could not only increase the relevance, responsiveness and inclusiveness of science and research but could also promote the public understanding of and the trust in science and research.

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21 See https://www.nsf.gov/statistics/seind/ April 27, 2021
22 See http://morri-project.eu/ and https://super-morri.eu/ April 27, 2021
23 This survey should build on existing work and evaluation concepts such as Kieslinger et al. (2018) or Wiggins et al. (2018).
24 See https://coactproject.eu/what-is-coact/ April 27, 2021

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