Chapter 7
Public Engagement in the Tradition of Participatory Approaches – An Approximation

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Abstract Public engagement is viewed as a prominent aspect of responsible research and innovation (RRI) both in academia and policy circles. In our paper, we would like to contribute to refining the notion of public participation as an RRI element by assessing the potential of four domains of participatory R & I theory and practices that have to date received little recognition in the RRI context: 1. Participatory design, 2. user-led innovation, 3. participatory research and 4. systemic R & I policy instruments. We test the usefulness of our concepts with a set of case studies from a recent RRI research project.

7.1 Introduction

Innovation policy has been gradually shifting from a focus on achieving specific objectives to solving complex problems such as climate change or poverty. These are also referred to as "grand challenges" or "societal challenges". According to Mazzucato, these problems are "'wicked' in the sense that they are complex, systemic, interconnected and urgent, requiring insights from many perspectives" (Mazzucato 2018, p. 803). Solving them therefore requires a wholesome and inclusive approach. Mission-oriented innovation policy consequently involves different stakeholders from different sectors and has a strong directionality (Steward 2008). Mazzucato argues that societal missions are more complex than traditional missions because they are less clearly defined to start with and need to be co-defined by a multitude of stakeholders. Their reach is also much broader, having the potential to ultimately affect the majority of society. This is echoed by the increasing emphasis

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in sustainability studies on transdisciplinary research on transformation pathways with stakeholders (Fazey et al. 2018).

In the context of „Responsible Research and Innovation" (RRI), public engagement has been one of the key pillars from the very beginning. First of all it is one of the "RRI keys" of the European Commission who defines on its RRI Website: "Public engagement (PE) in Responsible Research and Innovation (RRI) is about co-creating the future with citizens and civil society organisations, and also bringing on board the widest possible diversity of actors that would not normally interact with each other, on matters of science and technology."[1]

At the same time, participation is a prominent aspect in the wider understanding of RRI as responsible governance of research and innovation adopted in the academic community. In the framework proposed by (Stilgoe et al. 2013), which has been adopted by many RRI scholars and practitioners, "inclusion "takes a prominent place as one of the four key dimensions of responsible innovation governance that is closely intertwined with the other three dimensions reflexivity, anticipation and responsiveness. The authors emphasise the need for extending participation to questioning the purpose and process of a research or innovation endeavour as well as the very participation process itself (Owen et al. 2012). They also point to a number of pitfalls and tensions around public participation approaches and argue for the continuation of the ongoing experimentation process for refining and improving participatory research and innovation (R&I) practices.

In our paper, we would like to contribute to this debate by assessing the potential of four domains of participatory R&I theory and practices that have to date received too little recognition in the RRI context: 1. Participatory design, 2. user-led innovation, 3. participatory research and 4. systemic R&I policy instruments.

In Sect. 7.2, we briefly sketch out the key elements of each participation tradition. We close this section by reviewing the potential contributions to inclusive R&I governance in a common framework. In Sect. 7.3, we introduce the results of a recent stakeholder discourse on R&I co-creation requirements in the context of the NewHoRRIzon Social Lab Process in two different fields, i.e. healthcare and environment. In particular, we highlight the barriers and challenges to public engagement and the promising practices and initiatives brought up by participants of this dialogue as examples. Finally, in our concluding Sect. 7.4, we compare the requirements brought forward by the participants of the Social Labs with the contributions of the four domains and draw conclusions on where RRI could benefit from reaching out to these four communities of research and practice.

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[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/public-engagement-responsible-research-and-innovation

7.2 Four Participatory Traditions in Research and Innovation

7.2.1 Participatory Design

Pioneered mainly by Scandinavian countries since the 1970es (Sanders and Stappers 2008, p. 7) design-led participatory innovation practices have been substantially developed and have now become highly prominent under labels such as co-design, co-production, co-creation and collaborative service design. In the literature, co-production and co-creation tend to be associated mainly with the participation of citizens to service implementation, whereas co-design implies that citizens participate as initiators of a new solution in the "front-end" stages of a service development process of exploration and idea generation (Voorberg et al. 2015). The most comprehensive models of design-led participation aim for a more sustainable public service transformation and are therefore looking for engagement at all stages of public services development, considering initiatives that support co-design, co-decision, co-production and co-evaluation and ultimately resulting in co-governing (Pollitt et al. 2006). They are gaining prominence in the context of the "New Public Governance" approach, where public value is not only delivered by the government, but co-produced with citizens and stakeholders (Sangiorgi and Prendiville 2017). Participatory design is now increasingly valued as an opportunity to create "infrastructures" (Bjögvinsson et al. 2012) that facilitate dialogue and collaboration among diverse actors involved in an innovation process, from ideas to actual implementation. These "collaborative infrastructures" are creating spaces for experimentation, collaboration and risk taking in very diverse settings, from local councils to government departments and combining stakeholders from the public, private and third sector to create common and often public value. Living labs, social innovation labs, community hubs, co-design labs are some of the tangible manifestations of these collaborative, multi-stakeholder infrastructures that are spreading across the world (Manzini and Staszowski 2013), often supported by public policies (Bason 2013). Benefits discussed include a perceived improvement of service quality, increase of democracy and accountability (Verschuere et al. 2012) as well as social, cultural, political and ecological value (Meroni et al. 2017) and in some cases economic efficiency (Parks et al. 1981).

7.2.2 User Led Innovation

From decades of seminal work on the role of users for innovations, Eric von Hippel concluded that "the information needed to innovate in important ways is widely distributed" (Hippel 2005, p. 14), and he advocated "democratising innovation" by recognising and harnessing these distributed contributions. He pointed out that in a very early stage, few users anticipate market needs and are willing to provide ideas

for the development of new products or even develop new or modify existing products. He concluded that such "lead users" with extreme needs and expectations of benefits from an innovative product could improve the approximation of product attributes to heterogeneous users' needs (Hippel 1986). Their main incentive to innovate is the direct use benefit from a design, a product, or a service and the urge to satisfy their own needs (Piller and West 2014). In the 1990s, the term "user innovation" emerged to describe the phenomenon where users innovate by themselves. Notions such as customers-as-innovators, user driven innovation, creative customers and co-creation (Prahalad and Ramaswamy 2004) have now become widespread in innovation management. Several approaches were developed to support user innovation, most prominently the workshop-based "Lead User Method" (Hippel 1986, 2005; Herstatt 1992). Parallel to this adoption of user engagement within the business realm, scholars from various fields have highlighted a more radical turn of user led innovation: the emergence of Internet-based large and medium scale collaborations among individuals as a new mode of innovation, production and consumption. One of the most prominent concepts is the notion of "commons-based peer-production" proposed by Yoachi Benkler from Yale Law School (Benkler 2006, 2016, 2017). Peer production is defined as a form of open creation and sharing performed by groups online that set and execute goals in a decentralised manner, harness a diverse range of participant motivations, particularly non-monetary motivations, and separate governance and management relations from exclusive forms of property and relational contracts. The two core characteristics of commons-based peer production are decentralisation and the use of social cues and motivations for coordination instead of pricing or hierarchies. While the model first emerged within the context of software production, this is but one instance of a more general phenomenon: "At its core, peer production is a model of social production, emerging alongside contract- and market based, managerial-firm based and state based production" (Benkler and Nissenbaum 2006, p. 400). Benkler argues that in certain cases the commons-based peer production model is superior to the other two models due to information and allocation gains. He states that in the particular conditions of the digitally networked knowledge economy, these conditions apply to an increasing number of production tasks. In his recent work, he argues that the core benefit of commons based peer production is its ability to elicit self-directed action from diverse sources of human talent and diverse motivations without the formalisation losses of market based interactions. This may be particularly beneficial in highly uncertain and dynamic environments (Benkler 2016). Benkler's seminal work was taken up and further developed by a number of scholars and practitioners and is now widely used not only to further describe the phenomenon but also to actively shaping collaborative innovation projects.

7.2.3   *Participatory Research*

In participatory research, the design, planning and conduct of the research process takes place as a collaborative endeavour between researchers and the people whose lifeworld and meaningful actions are under study (Bergold and Thomas 2012). The research aims, questions and methods are formulated and selected in a joint process, converging the perspectives of science and practice in order to benefit both sides – i.e. lead to new insights for both scientists and societal actors. Such stakeholder interaction has proven fruitful for unearthing important insights across diverse fields: public space and community planning (Senge and Scharmer 2011), agriculture (Gonsalves 2005), architecture, education, software and information systems, and products and services across a range of industries (Reardon 1998). Although everyday practices have been the subject of study for a long time, participatory research enables a fundamental questioning and rethinking of interpretations of what causes certain problems and what could be appropriate strategies to address these problems. It does so by explicitly giving stakeholders of the researched field and in particular marginalised groups a voice (or enable them to make their voices heard). The justification of participatory research comes from the explicit wish to make research significant and useful, and thereby increase the societal impact of scientific research. Reference is often made to evaluation studies, which show that many scientific findings and interventions have not been implemented in society.

Participatory research methods build on well-known empirical research procedures, especially qualitative methodologies/methods such as observation, in-depth and semi-structured interviews and focus group discussions, although quantitative methods such as questionnaires may also be used. In addition, new methods have been developed to enable safe deliberation spaces in which various "stakeholders" engage in reflexive exercises on specific issues, such as multi-stakeholder dialogues and roundtable workshops. Citizen science as far as it allows active participation of citizens not only in data collection but also research design could also belong in this type of co-creation. Participatory research may go beyond mere understanding and also take an "action perspective", aiming to change social reality as part of the research process (Bell et al. 2004). The research methodology is then often labelled "participatory action research" (Chevalier and Buckles 2019) "community-based participatory research", "participatory learning and action", or "transdisciplinary research" with the latter gaining prominence especially in sustainability studies (Fazey et al. 2018). These approaches have in common that they explicitly incorporate a problem-solving intervention component, and are characterised by an emergent and iterative design, combined with reflexive monitoring and evaluation to guide the action towards a common goal. It is here where participatory research shows overlap with participatory design.

7.2.4   Systemic R&I Policy Instruments

There is a long tradition of involving stakeholders in R&I policy development, especially in agenda and priority setting. One especially prominent systemic instrument is participatory foresight, i.e. structured multi-stakeholder futures dialogue to underpin R&I policy agenda setting (Grupp and Linstone 1999; Da Costa et al. 2008). Drawing on perspectives of science and technology studies (STS) (Bijker and Law 1997), such foresight processes include stakeholders and actors from the downstream phases of innovation such as users and citizens as experts on important aspects of innovation futures into the foresight processes (Truffer et al. 2008; Rosa et al. 2018; Warnke and Schirrmeister 2016). Another prime example of the "R&I policy co-development" is the so-called *Smart Specialisation* approach, currently the European Union's paradigm for industrial innovation policy. Smart Specialisation involves setting investment priorities through a process of Entrepreneurial Discovery (EDP) which is designed as an iterative bottom-up "collective experimentation process" (Foray 2015, p. 30), replacing the older top-down processes of deciding on prioritisation areas. EDP entails the co-construction of shared visions concerning future economic opportunities (Gheorghiu et al. 2016, p. 35). Other examples of stakeholder inclusion in R&I policy development are participatory evaluation approaches (Daimer et al. 2012) and stakeholder based public procurement (Buchinger 2017).

7.2.5   Comparison of Participatory Practice Domains

All four participatory practice domains are dedicated to "public participation", where "the act of dialogue and negotiation serves to transform opinions in the members of both parties (sponsors and public participants)" (Rowe and Frewer 2005), in contrary to communication and consultation, where the flow of information is one-directional. Moreover, there are clearly some overlaps and even use of similar vocabulary and methods such as the "living lab" which is seen as a participatory infrastructure in co-design circles and is also used in user-led innovation as a site for various user workshops and has even gained prominence as a systemic innovation policy instrument. Also, if we look at the basic *rationale* of participation, which can be (i) normative (democratic principle), (ii) substantive (improvement of quality), (iii) social-learning (enabling networks), and (iv) facilitating implementation (Schmidt et al. 2020; Fiorino 1990), the four approaches all show an emphasis on substantive reasons, i.e. improving innovation outcomes by involving a richer diversity of expertise and perspectives albeit in systemic innovation policy instruments, social learning and facilitating policy implementation are equally important.

Yet, we can also distinguish clear differences regarding the scope of participation addressed by these approaches (see Table 7.1 below). Even though participatory design covers a very wide range of *innovation process phases*, it is only in commons-based peer production, the more radical variant of user-led innovation, that the participation process itself is fully governed by the participants as requested by (Stilgoe et al. 2013) for fully responsible innovation governance. At the other end of the spectrum, systemic policy instruments mainly focus on innovation policy agenda setting, with only few cases covering participation within evaluation and implementation of innovation strategies and actual innovation activities. Finally, the *type of activity* participants are engaged in varies considerably, along with the *main application domain*: While "user led innovation" focuses on idea generation often for commercial products, Commons Based Peer Production is dedicated to the production of common cultural goods, and participatory design targets the generation of complex solutions for public services in the public sector. Finally, participatory research is tackling actual research processes and participatory practices, while systemic R&I policy instruments are primarily concerned with agenda and priority setting.

Table 7.1 Overview characteristics of participatory practice domains

	Who is involved?	In what type of activity?	In what phase?	With which rationale?	In which domain?
Participatory design	Whole ecosystem of problem owners	Solution Development	Agenda setting Idea generation, implementation, evaluation	Substantive	Mostly public sector
User led innovation	Lead users (users with special demands) Users and volunteers (CBPP)	Product/ service innovation Production (CBPP)	Idea generation All phases including implementation and process design (CBPP)	Substantive	Mostly private sector Mostly information, knowledge or cultural goods (CBPP)
Participatory research	Users of the research results (e.g. patients/ relatives, farmers)	Research	Agenda setting, research implementation	Substantive Normative	Research
Systemic R&I policy instruments	Stakeholder representatives, users/citizens as "demand side experts"	Policy priority setting	Agenda setting, (evaluation, implementation)	Social learning, implementation Substantive	Research and innovation policy

7.3 Case Studies

7.3.1 Methodology

Having described and compared these four participatory traditions in R&I, this section introduces the results of a stakeholder discourse on co-creation in the fields of healthcare and environment that took place in the context of the NewHoRRIzon project on "Excellence in Science and Innovation" by adopting the concept of Responsible research and Innovation".[2] The New HoRRIzon project uses a Social Lab methodology (Timmermans et al. 2020) to diagnose the current state of RRI in the specific programme lines of the European Framework Programme for Research and Innovation (Horizon 2020) and to assess potentials and barriers of its use. Altogether, the project established 19 Social Labs related to the programme lines of H2020. The Social Lab process involved the experience and expertise of diverse groups of practitioners that have been sensitive to the particularities of R&I as well as the needs and processes of the stakeholders involved (universities, non-university research institutes, industry civil society organisations, the public(s), research funding organisations, policy-makers, and others). In the Social Labs Health and Environment, participants came from mostly but not exclusively European organisations. The Social Lab Health consisted of eleven active participants, while the Social Lab Environment had 30 participants, with 17 being actively involved. They had mostly already been working on various RRI issues without using the overarching RRI concept.

Each social lab lasted for about 34 months and consisted of desk-research and a series of expert interviews to gain insights into relevant issues of the specific scientific-technological areas, three workshops as well as interactions in the phases between the workshops. Here we focus on the findings on participation as this emerged as a common theme in both social labs. We present specific challenges and opportunities discussed, describe co-creation and participation initiatives highlighted by the participants as particularly interesting for reaching specific societal impacts and finally summarise the main objectives and knowledge gaps identified in the Social Lab discussions on participation. The selected examples of participatory practices will be assessed in the last section of the paper along the four participatory practice communities described above.

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[2] http://newhorrizon.eu; The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 741402.

7.3.2   Case Study: Participation in Health

Public and patient participation in health has evolved considerably since the World Health Organization's Alma Ata Declaration asserted people's "right and duty to participate individually and collectively in the planning and implementation of their health care" in (World Health Organization 1978).

While co-creation has played a role in other service-based sectors for years, the health sector has been comparatively slow in adopting it. Historically, patients have been considered subjects of research and have been passive recipients of healthcare services, and the healthcare ecosystem has evolved relatively independently of their voices (Makhni 2017). More recently, the increased availability of medical knowledge has enabled patients to become more active participants in their own care (Janamian et al. 2016). Heightened attention has also been given to the fact that patients with chronic illness are often experts themselves, possessing both experience and knowledge of their condition (Cordier 2014). However, at the point of care, a power imbalance between patients and healthcare professionals remains, which is characterised by patients' dependence on clinicians. This can impede shared decision-making when it comes to the individual patient's care (Joseph-Williams et al. 2014).

To unleash the full innovative potential of equal partnerships between all stakeholders involved, patients and the public need to be able to have a more substantial contribution in all aspects of health R&I. Challenges such as an ageing population, the perceived threat of increasing costs for healthcare through personalised medicine or yet unforeseeable consequences of climate change, can only be addressed through strong stakeholder collaboration. Already in the short term, co-creation can lead to increased efficiency in health services, improved health outcomes, increased trust in the health care team, reduced health care costs, increased value and use of medical research, and higher patient satisfaction (Janamian et al. 2016). Additionally, the involvement of patients can contribute to policymaking that is better aligned with societal needs, more valid and beneficial research and reaching a wider audience through addressing target groups better.

Patients are already pushing for a more active role in the R&I process, for example through crowd-funding research they find relevant (Wenner et al. 2015), developing solutions that are not yet on the market as patient entrepreneurs (Hehenberger 2019) or participating in research as citizen scientists (Wiggins and Wilbanks 2019). They are often organised in general or disease-specific patient organisations, which can provide a powerful voice for patients and a point of contact for those who seek to collaborate with them.

The following examples of promising participation projects were highlighted through the social Lab Health process of the NewHoRRIzon project and will later be reflected in the context of the four participatory traditions in R&I described in Sect. 7.2.

7.3.3   A. Reorganisation at Karolinska University Hospital

At Karolinska University Hospital in Stockholm, Sweden, a reorganisation process replaced departments with a smaller number of themes (e.g. cancer, ageing, emergency and trauma) to allow for more seamless care.[3] Within these themes, the focus was on providing the best possible care for patients by defining "units" and within them common patient pathways called "sections". Each pathway is overseen by a multidisciplinary team consisting of the head of the unit, a patient representative and various healthcare as well as business professionals. These participants are regarded as equal and traditional hierarchies play much less of a role than they usually would. The head of a pathway as the person in charge can be a nursing professional and is not necessarily a doctor. The involvement of a patient representative within each pathway is also important and ensures that in the design of the pathway, patient needs are taken into consideration and outcomes that matter to patients are focused on.

7.3.4   B. Science Shop "Science Together" in Tunis

Tunisian civil society has been very active since the revolution in 2011. The science shop at the Institute Pasteur de Tunis[4] carries out research on behalf of citizens and local civil society, responding to civil society's needs for expertise and knowledge. It focuses on the fields of health, environment and vulnerable populations. When civil society actors approach the science shop with a viable idea, it is transferred into a project and carried out by students under the supervision of academic staff and in collaboration with the civil society actors. The first health project was proposed by the Tunisian Association for Information and Orientation on HIV/AIDS and Toxicomani (ATIOST). It focused on the genetic characterisation of hepatitis C virus strains among injecting drug users in Tunisia and was co-created between ATIOST and the laboratory of clinical virology at the Institute. This set-up allowed the laboratory to have access to a key population and therefore to have innovative results, which described the circulating hepatitis C virus strains in this population. The outcome was very useful for the CSO's advocacy towards policy makers on the importance of involving this population in the national strategy for the eradication of hepatitis C in Tunisia.

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[3] Philips, 2019, https://www.philips.com/a-w/about/news/archive/case-studies/20190128-patient-first-how-karolinska-university-hospital-is-transforming-to-meet-future-demands-of-health-care.html

[4] Institute Pasteur de Tunis, undated, http://www.pasteur.tn/index.php?option=com_content&view=article&id=697&Itemid=827

7.3.5   C. Participatory Approaches in Research Funding in the Netherlands

The majority of non-profit health research in the Netherlands is funded by disease-specific health funds (HFs), some of which are either also patient organisations or have links with patient organisations. Twenty of these are organised in the umbrella organisation Collaborative Health Funds,[5] which focuses on common themes such as patient participation, which they define as "giving experiential knowledge an optimal place in order to influence research" (den Oudendammer and Broerse 2019). Patients are involved in in setting research agendas and evaluating research proposals, additionally, the involvement of patient organisations in the research itself is promoted through the requirement to provide letters of recommendation. While there are questions on how best to choose patients and which training to provide to them, there seems to be consensus that patient participation in research funding has a positive effect on outcomes (den Oudendammer and Broerse 2019; Caron-Flinterman et al. 2006).

7.3.6   D. myCode Project Involving Young Cancer Patients

The myCode project is being carried out by the Young Cancer Support Association and Karolinska University Hospital in Sweden as well as several other stakeholders including young cancer patients between 15 and 29 years.[6] Its aim is to enhance quality of life and increase survival rates as well as to improve the experience of undergoing cancer treatment. The project explores new innovative solutions for meeting the specific needs of teenagers and young adults, given that they feel a lack of belonging in the healthcare system, neither being at home in the pediatric nor the adult wards. One part of the project works with four young cancer patients to map their patient journey in order to determine where it could have been improved. Another part tries to create attractive digital social environments for encounters, dialogue and support between health care professionals and young patients adapted to this target group, which is well-acquainted with social media.

There was consensus in the Social Lab that participation in in health should fulfil (at least) the following two objectives:

1. Adding value for future societies: This means focusing on research and innovation that is relevant now and in the future by addressing societal needs. It also

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[5] Collaborative Health Funds in the Netherlands (Samenwerkende Gezondheidsfondsen, *SGF*) http://www.gezondheidsfondsen.nl/

[6] Karolinska University Hospital, 2020, https://www.karolinska.se/en/karolinska-university-hospital/Innovation/mycode/

involves empowering citizens and patients, eliminating academic research that is self-serving and "arrogant", as well as minimising the environmental impact.

2. Contributing towards a better science culture in society: Enabling citizens and patients to understand research and fostering collaboration between them and R&I actors.

In the SL discussion on participation, the following knowledge gaps/deficits were pointed out:

- While the concept of responsibility in health research can look back on a long tradition and has traditionally been well established in terms of research ethics (ethical approval, informed consent, data protection), public engagement and co-creation are less wide-spread and are taking place occasionally rather than routinely.
- Researchers are often too strongly rooted in their disciplines and not being aware of issues beyond, such as societal needs. This can lead to a technology push approach, i.e. finding application areas for newly developed technologies rather than finding solutions for real-world problems. Individual researchers can also feel overburdened to consider issues that lie outside their primary field of expertise, especially if there is no tradition of interdisciplinary collaboration and collaboration with civil society and a lack of organisational support for this.
- Although there may be awareness of the benefits of collaboration and an interest in pursuing such efforts, there is a lack of fora where different stakeholder groups can come together and co-create. In addition, there is a lack of awareness of the excellent initiatives which already exist as well as too little exchange on good practices between them and beyond.
- Incentives and immediate rewards for responsibility in health beyond what is required in any case are lacking or not visible enough. Linked to this is the question of "who is responsible for responsibility?" Widespread application of methods to measure its impact would be needed to show benefits and improve uptake.

7.3.7   Case Study: Participation in Environment

Climate change, biodiversity loss and pollution are very close to the lifestyles, attitudes and values of European citizens. Already in the 1970s and 1980s, the environmental movement inspired social-ecological research which developed into a driving force behind participatory and social impact oriented research. Since then, scientists linked to this tradition call for and undertake research on necessary societal transitions respecting the limits of growth and the planetary boundaries.

Today the public is deeply concerned about the state of our planet. They wonder about individual and collective contributions to avert worst case scenarios of climate change, how they could best adapt their lives to unprecedented weather

conditions and how the future of their children and grand-children would look like. The urgency of these concerns have become visible in the immense public support to the World Climate Summit (COP21) in Paris, 2015, that lead to the UN Sustainable Development Goals (UN SDGs) as well as in the Friday's for Future movement, internationally carried by the concerned youth, voicing research-based claims for rapid political action on climate change to meet the targets agreed upon at the COP21 summit.

Looking at Societal Challenge 5 in the European funding framework Horizon 2020 as the basis for the Social Lab of the NewHoRRIon project, up to 78% of the R&I projects do not consider RRI as of special relevance to them – which means that in those projects there is no specific attention paid towards "co-creating the future with citizens and civil society organizations".[7]

To succeed with the upcoming necessary and challenging societal transitions, citizens need to have the opportunity to participate in all R&I processes that focus on climate action, environment, resource efficiency and raw materials. Members of the Social Lab highlighted the relevance of co-creation in these specific areas of research: "The transition to a cleaner and healthier planet is a systemic change that affects all levels of society. If citizens and stakeholders are not part of developing the social and technological innovations and solutions it will become more difficult to bridge the gap between those wishing to move faster and those thinking they are already being pushed too far. [...] As challenges become more urgent, experts and scientists may gravitate towards imposing more radical solutions and seeing public engagement as an unnecessary hindrance to rapid transition, thus increasing the risk of stimulating public resistance to the sustainability agenda. It is therefore of utmost importance that public engagement is seen as a prerequisite for sustainable development and consequently integrated into SC5 R&I project designs."[8]

Researchers can increasingly build on citizens locally organised and nationally or internationally connected along their stake – may it be as individual citizen scientists fostered by the European Citizen Science Association or as science shops in a network of European hubs or as a multitude of engaged national and transnational civil society organisations. Researchers and innovators should use this potential to come to scientifically relevant and socially meaningful results. Fostering the mutual understanding of needs and opportunities might ease the way towards and the implementation of upcoming necessary and challenging social transitions.

The following examples of participation projects were highlighted as particularly promising in the social Lab process and will later be reflected in the context of the four participatory traditions in R&I described in Sect. 7.2. They all have a link to the European Commission's objective of jobs & growth, they were discussed in

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[7] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/public-engagement-responsible-research-and-innovation

[8] Statement from a group within the Social Lab focusing on "Public engagement: from "nice to have" to "NEED to have", to be integrated in the "RRI-Ex", new.rrihub.eu/newhorrizon.php

this specific context and published in a brochure to highlight "impact through participation" (Federation of German Scientists 2019)[9].

7.3.8   A. Project InnovationCity Bottrop: Public engagement in real-life laboratories

The city of Bottrop had planned to halve CO2 emissions within a decade by simultaneously improving citizens' quality of life in a pilot area with 70.000 inhabitants.[10] Citizens were invited to voice their ideas and visions for climate-neutral urban redevelopment. In a series of events they could discuss their ideas with a planning team. On this basis, the Council of the City of Bottrop passed a master plan that has since then gradually been realised by the administration in cooperation with Innovation City Management GmbH and the support of many stakeholders and economic partners. At the end of the project in 2020, more than 300 projects in the areas of housing, working, energy, mobility and urban development had been initiated. The objective of halving CO2-emissions had been reached in combination with considerable positive effects on employment and investments. This example supports the argument that participatory approaches can foster public support and lead to impressive sustainability solutions.

7.3.9   B. Project CuveWaters: Improving Living Conditions in Africa – Participation to Develop Ownership

CuveWaters (2006–2015) was a German-Namibian joint project about the long-term improvement of living-conditions through integrated resource management in the Cuvelai-Etosha-Basin in Namibia.[11] The project integrated a transdisciplinary approach designed and organised as a joint learning process, transcending the boundaries that separate disciplines and scientific fields as well as the boundaries between scientific and practical knowledge[12]: Those Namibian actors involved in the problem were also integrated in the research process. Their perspective and

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[9] Matthias Bergmann, Institute for Social-Ecological Research, Germany, Daniel Dörler, University of Natural Resources and Life Sciences Vienna, Austria, Philipp Schepelmann, Wuppertal Institute for Climate, Environment and Energy, Germany, and Michalis Tzatzanis, Austrian Research Promotion Agency, Austria, designed and implemented the activity in the social lab on this topic, especially https://newhorrizon.eu/responsible-research-and-innovation-for-jobs-&-growth/

[10] InnovationCity Ruhr – Modellstadt Bottrop, https://www.innovationcity-bottrop.de/index.php?id=3&L=1; https://www.innovationcity-bottrop.de/index.php?id=276&L=1

[11] CuveWaters – Integrated water resources management, 2019, http://www.cuvewaters.net/Home.5.0.html and http://www.cuvewaters.net/Transdisciplinary-Research.103.0.html

[12] CuveWaters, 2019, http://www.cuvewaters.net/Transdisciplinary-Research.103.0.html

practical knowledge merged with the scientific ways of posing the problem and thereby, expected research results connected to both science and society. Users, beneficiaries, practitioners, administration and political bodies participated in the decision-making process at the local, regional and national level. A demand-responsive approach was developed to involve them throughout all phases of the project and allowed all stakeholders, especially users on the local level, to offer their input. Community workshops were conducted in close cooperation with local partners. A crucial aspect to enhance ownership and economic independence has been the attention given to capacity development (as a main prerequisite to Governance) including both academic education and non-academic training – demonstrating how participative research can foster jobs and growth.

7.3.10 C. Project Roadkill: Citizen Science as Innovation Engine in Science, Economy and Society

Project Roadkill aims to reduce roadkill by investigating which animals are killed on roads and under which circumstances.[13] The data collected by citizens via smartphone apps on a wide geographic range allow the project to identify roadkill hotspots which then can be mitigated in cooperation with local authorities. The data submitted is displayed on a map on the project's website and shared with special interest groups for their own research. Participants learn about habitat fragmentation, how to distinguish species and they can bring in their own expertise. The blog on the project website keeps them posted on the scientific process from data collection to publishing in peer-reviewed journals. According to the very specific needs of the citizen science project, new software has been developed. Project Roadkill actually was a test run of the concept for an Austrian start-up software company, which has since become one of the main providers of mobile applications and websites for scientific projects engaging with the public.

7.3.11 D. GREEN-WIN: A Win-Win Strategy for Green Business: Is Green Growth Possible?

In the GREEN-WIN project, researchers empirically looked for green business models in three different economic sectors both in industrial countries and emerging economies as win-win strategies for entrepreneurs to gain a living while protecting the environment and contributing to the public good.[14] In a multi-stakeholder process, scientists, local investors and business representatives engaged in a scoping,

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[13] Roadkill, https://roadkill.at/en/

[14] GREEN-WIN, http://green-win-project.eu/about

visioning, pathways development, evaluation and iteration process peaked by workshops and a final international conference. The workshops demonstrated that green matchmakers could significantly improve matchmaking between green investors and green entrepreneurs and that more of those matchmaking processes would be necessary. The multi-stakeholder process was accompanied by an exploration on the key financial barriers and opportunities to activate and scale up climate finance. GREEN-WIN thus developed, as a particular theme, the cross-cutting role of finance – including key characteristics of current financial systems in relation to sustainable investments, how specific features of underlying sectors affect the ability to attract finance for win-win strategies, and the potential to transform finance systems themselves to better reflect and integrate climate and sustainability goals.[15] Looking at concrete win-win strategies and climate finance governance the project combines the micro and the macro level to contribute to a green win.

The Social Lab participants attributed considerable importance to the following objectives of participation in research and innovation in the field of climate action, environment, resource efficiency and raw materials:

1. To foster successful transitions by improving the link between science and society. On the level of R&I this implies providing strategies, methodologies and narratives on how to implement participation; on the political level proven best practice examples are necessary. In the long run, this will prevent divides between science and society as well as within society itself.

   The following two objectives are closely related to this overarching one:

2. To realise truly impact oriented research & innovation that takes all relevant stakes in and provides answers with an agreed-upon effect on our lifestyles and society in the multitude of transformation processes to come.
3. To work in a new research culture spreading from the niches where it prospers across universities, research & innovation centers, funding organisations and industry, provided with the necessary adaptation of structures, methodologies and resources to make common ownership of R&I processes and results possible.

In the SL discussion on participation, the following knowledge gaps/ deficits were pointed out:

- Participatory approaches are well rooted in some research traditions with the specific expertise that is called for in projects explicitly set up to change social reality as part of the research process. However, R&I funding strategy in general and thus the majority of R&I calls lack the incentives and control instruments to encourage researchers to consider a sound participatory concept for their specific research project.
- The arguments for RRI that are brought up by supporters to better root RRI in research funding are mainly addressing those already convinced. They do not reach the concerns of those following other objectives such as the focus on creat-

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[15] GREEN-WIN, http://green-win-project.eu/about/wp2

ing jobs and growth. There is a need to provide proven arguments for RRI and benefits for applying it that targets those stakeholders in a language they can relate to.

- While researchers acknowledge exchange and discussion on their work with other researchers and stakeholders, they are hesitant to engage in approaches they are not experienced in. To do so would mean to invest scarce time resources without being sure about questions of research ownership, peer acknowledgement and results to be expected. While some institutions seek cooperation with experts and institutes knowledgeable in designing participatory approaches, individual researchers would benefit from training and support in translating the methodology and meaning of such best practice examples for their specific research.

- Civil society organisations would not consider R&I as a genuine field of activity for them as an organisation and for their members. They need to get informed and involved to acknowledge the importance of R&I to their own stake and be empowered to represent it in such processes. Researchers need to take the specific working conditions of many CSO activists into account. They are often – different to many other stakeholders – representing their institution while contributing time and expertise for free: It might be that they are not working on a regular contract or that the content of their work in the CSO is not closely enough related to the research project that they could get involved on this ticket. Alternative resources for remuneration or recognition of their work would be necessary. This is especially the case as engagement in e.g. a multi-stakeholder process needs first and foremost time to come to a common understanding of the problem and to come to viable solutions to invest in. it also requires time for dissemination and implementation of the research results in the various target groups and the general public. In order to integrate civil society partners successfully, it is necessary to provide them with a substantial share of funds to make real participation possible.

7.3.12   Integration

In this section we review the cases in the light of the participatory practice domains introduced in Sect. 7.2. In particular, we ask in how far approaches from these domains could contribute to address the knowledge gaps highlighted in the cases studies.

Table 7.2 presents an assessment of the selected examples of participatory practices vis-à-vis our four participatory practice communities. A cross indicates that insights from this community may contribute to the particular participation example. It emerges that all four participatory approaches we have introduced above could contribute to at least one of the projects and the other way round all eight projects may benefit from at least one of the approaches. Looking at the knowledge

Table 7.2 Relating the cases and the participatory practice domains (X: Relevance of domain for case study)

	Participatory design	User led innovation	Participatory research	Systemic Instruments
Karolinska university hospital	X			
Science shop Tunis		X	X	
Project myCode		X	X	
Participatory research funding				X
Project InnovationCity Bottrop	X	X		
Project Cuvewaters	X			
Project roadkill			X	
GREEN-WIN	X			X

gaps brought forward in the two Social Labs, this potential for enrichment from our four traditions becomes even more apparent:

- Co-creation of solutions in the health and environment fields, especially in cases like the Karolinska and Cuvewater, where concrete solutions are implemented with a wider ecosystem of problem owners could well be underpinned by participatory design approaches. The perceived lack of well-tested and innovative co-creation practices that emerged in the Social Lab health could be addressed by building on the repositories available in the design community. Other more research oriented cases like the Young cancer patients or the Roadkill project could benefit from the wealth of sophisticated methods developed in participatory (action) research. The system capacity building approach of Green Win is well in line with systemic innovation policy instruments. The lead user method could possibly contribute to joint idea generation such as in Innovation City Bottrop and Science Shop Tunis.
- The urgent wish for better impact of sustainability transformation strategies that was strongly voiced in the environment field is echoed in the approaches of participatory design on the one hand and systemic innovation policy instruments that both are directed at social learning and improvement of implementation effectiveness.
- The lock-in of researchers in their disciplines, which has been a key concern in the health Social Lab is also at the heart of the "user led innovation" approach which started from the empirical observation that users rather than technicians at the producer company possessed the relevant knowledge. The wealth of case studies and methods from user led design may therefore come useful to practitioners in the health field aiming at "finding solutions for real-world problems". Pointing to the well-tested success of the lead user method in the commercial realm may also help researchers to muster organisational support for interdisciplinary collaboration and collaboration with civil society even in cases where there is little tradition.

- A third aspect of concern in the health field was the lack of fora where different stakeholder groups can come together and co-create. Here, experience from participatory design which has moved towards establishing permanent infrastructures for collective experimentation may prove useful. At the same time, there may be an argument to be made for applying systemic innovation policy instruments such as participatory foresight exercises in the health sector that could function in the way of such fora.
- The need for linking up to dominant discourses such as "jobs and growth" in order to reach out to a wider circle of actors was voiced in the environment Social Lab. In this respect, it may be useful to look at arguments from user led innovation, which is well established in the commercial realm but also to align with the tradition of systemic instruments that are also situated in a context where "jobs and growth" often forms the dominant rationale. This may even provide an opportunity to overcome the fixation on the economic growth paradigm as some proponents in both communities of practice advocate alternative perspectives on societal progress.
- For working with CSOs for and with research, as requested by the SL health, there is a wealth of experience in participatory research that very often works with CSOs such as patient organisations, environmental NGOs or trade unions.
- Both discourses point to an even wider range of traditions to be included in particular the socio-ecological research (environment) and the corporate social responsibility (health).
- Finally, the quest for widespread application of methods to measure impact of responsible practices that has been voiced in the Health Social Lab, may find some useful ideas in the area of participatory research where there is a long tradition of extending the participatory approach into the evaluation phase (Verwoerd et al. 2020).

7.4 Conclusions

RRI is a comparatively new research field and has sometimes struggled to transition from a rather abstract concept to an established research approach with proven methods. One of the key domains of RRI is public engagement, which can also be considered more broadly as the participation of relevant stakeholders to address a particular societal problem. In this chapter, we have investigated how the public engagement dimension of RRI could benefit from established research and practice traditions on participation in research and innovation that do not directly frame themselves as RRI but are nonetheless closely related. Four communities of theory and practice emerge as particularly relevant: Co-design, user-led innovation, participatory research and systemic R&I policy instruments. When considering the barriers and challenges of participation experienced by actors in the fields of health and environment as well as individual successful real-life examples of participation in light of these four practice traditions, we were able to identify areas where RRI

could enhance its impact by drawing on the expertise of other communities of research and practice:

Designing participation in RRI should define better the type and level required for the issue at hand and if possible broaden the scope of participatory elements beyond pure implementation (Stilgoe et al. 2013). Drawing selectively from other established communities, especially participatory design seems a promising strategytowards richer and more targeted participatory research and innovation processes. Further communities such as corporate social responsibility (Lubberink et al. 2017; Blok 2019) should be incorporated in a similar manner.

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