With and for Society?

Experiences from CICERO Center for International Climate Research with User Involvement in Science

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Abstract

In order to ensure that scientific knowledge is made relevant and useful for solving pressing societal challenges such as climate change, science policy actors like the European Union have increasingly advocated for various approaches for including non-academic stakeholders in the production and governance of scientific research. Concepts like "co-production," "Responsible Research and Innovation" and "user involvement" have rapidly risen onto science policy agendas in Norway and the EU, carrying a demand that scientific researchers step out of the "ivory tower" and work in closer collaboration with different societal actors.

This thesis presents a case study of the Norwegian research institute CICERO Center for International Climate Research as it experiences these demands for user involvement in scientific research projects. In particular, I examine how these science policy shifts contribute to re-shaping the relationship and boundaries between science and society. Drawing on the science and technology studies (STS) concepts of *cultural cartographies of science* and *boundary work*, I describe how different understandings of user involvement and co-production draw up different "maps" of science-in-society. Are Norwegian science policy efforts toward open science tearing down the ivory tower to build an open and democratic agora of scientific knowledge production – or perhaps a knowledge production factory?

The findings of this thesis highlight the role of science policy instruments and research funding mechanisms in shaping the dynamics of user involvement, and raise questions about the claim that current efforts for user involvement make scientific knowledge relevant and useful to society as a whole. They also suggest that obscuring tensions between the different understandings of co-production that underpin research and policy on this topic may lead to black-boxing and de-politicisation of the concepts of "responsibility," "relevant science" and "useful knowledge." In particular, this thesis highlights the importance of continuously asking the question: relevant and useful for whom, and to what end?

Acknowledgements

In a thesis about co-production, it seems only appropriate to acknowledge that the knowledge presented here, too, is co-produced – a product of engagement and discussions with many different people, and probably more than I will remember to thank here.

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List of Acronyms

CICERO	Center for International Climate Research
CoGS	Communicative Circuitry of the Green Shift, a SUM research project
EC	European Commission
ENERGIX	Large programme on energy, an RCN funding programme
EU	European Union
IPCC	Intergovernmental Panel on Climate Change
KLIMAFORSK	Large programme on climate, an RCN funding programme
KPN	Knowledge-Building Projects for Industry
OECD	Organisation for Economic Co-operation and Development
PFTP	Power from the People, a CICERO research project
NGO	Non-Governmental Organisation
NSD	Norwegian Centre for Research Data
NVE	Norwegian Water Resources and Energy Directorate
RCN	Research Council of Norway
RCP	Representative Concentration Pathway
RRI	Responsible Research and Innovation
STS	Science and Technology Studies
SUM	Centre for Development and the Environment
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

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1 Introduction

> To make research relevant and useful, it is important to ensure increased participation and influence from the users of research in its prioritisation, planning and execution.
>
> The Research Council of Norway (RCN 2018b)

1.1 Background

The world today faces a number of complex challenges. Climate change represents one of several so-called "wicked problems" – highly complex and uncertain issues lacking straight-forward solutions – which contemporary societies must address (Sun and Yang 2016). In the face of these challenges, there has been a growing call from both academic and science policy actors for a closer integration of scientific knowledge production and political and societal decision making, highlighting the need for science to produce useful knowledge which can be quickly taken up in decision making, and for the lines of communication between scientific and other societal spheres to be opened up (Nerlich et al. 2018b).

At the same time, scientific knowledge appears to be standing in the midst of a legitimacy crisis. The political climates in many countries have been described as entering a "post-truth" era, where facts are seen as giving way to emotional appeals and falsities as the basis for political debate (Sismondo 2017b). Right-wing populist movements across the world are partly fuelled by various publics' dissatisfaction with experts. The "ivory tower" is under attack from several fronts, with critics from different ends of the political spectrum accusing traditional academia of being un-inclusive, undemocratic and out-of-touch with realities on the ground, as well as ineffective in providing solutions to pressing societal problems (Mirowski 2018).

This has led to a number of efforts to reform the public image of scientific knowledge and institutions, and re-shape the relationship between science and society. Research on public perceptions of science and calls for new and more effective tools for science communication abound (Wynne 2010; Carvalho, van Wessel, and Maeseele 2016). In recent years, "open science" has become an

increasingly popular slogan, acting as an umbrella term for measures to make scientific research, data and results more public, open and transparent. These include initiatives for open access publishing of scientific data and research; promoting public engagement with science and policy; open and participatory forms of innovation; increasing transparency in scientific advice for policymaking; and co-design or co-production of scientific research with stakeholders (Nerlich et al. 2018b).

Another, parallel stream of science policy changes have called for scientific research to operate in a solution-oriented mode to a greater extent than previously (Beck and Mahony 2018). "Impact" has become a core concept in international science policy agendas, calling for researchers to predict – and actively work to ensure – that their research will have positive societal effects and contribute to solving societal challenges (Ramos-Vielba et al. 2018). Advocates for this solution-oriented logic have also joined in calls for the inclusion of non-academic stakeholders in scientific knowledge production, seeking to ensure that scientific knowledge is made relevant and useful to society (Feldman and Ingram 2009; Lövbrand 2011).

As such, the idea that various non-academic actors should be included in scientific research and decision making about science is rapidly rising onto the international science policy agenda (Lövbrand 2011). These kinds of efforts have been given a number of different names: Responsible Research and Innovation (RRI), citizen science, co-production, co-design and user involvement, to mention a few (Kershaw 2017; Bremer et al. 2019). The contents of these terms vary to an extent, but they represent the same core ideal – that scientific research and governance can be improved through the inclusion of non-academic stakeholders, whether they are public- or private-sector institutions, or members of the public.

In the face of the "scientific legitimacy crisis" and the need for solutions to pressing societal problems, these initiatives are intended to accomplish the multiple tasks of improving public faith in science, democratising scientific knowledge production, and making scientific knowledge more applicable to solving societal challenges (Nerlich et al. 2018b). They have been especially highlighted in fields that coincide with large global issues of concern, such as climate and environmental science. In particular, climate science is increasingly being asked to operate in a solution-

oriented mode, with the focus shifting from research identifying and describing the climate problem, to research intended to identify actionable solutions for mitigation and adaptation (Beck and Mahony 2018). In line with this, efforts for co-production and co-design in scientific research have received a particular focus in the climate field (Bremer and Meisch 2017).

The European Union (EU) has been one of the frontrunners in these efforts to open up scientific knowledge production and decision making, as seen in the 2018–2020 Eighth EU Framework Programme for Research and Innovation, Horizon 2020. While the Sixth and Seventh Framework Programmes highlighted "Science *and* Society" and "Science *in* Society" respectively as priority areas, Horizon 2020 has reframed this focus as "Science *with and for* Society," bringing to the forefront an agenda of "inviting members of the public into the processes of science as well as into discussions about its purposes" (Peter et al. 2018, 8). In addition, Horizon 2020 happens to be described as "the biggest EU Research and Innovation programme ever" (EC 2019b).

Following these shifts in European research funding, Norwegian science policy has also adopted the concepts of user involvement, RRI and open science. The Research Council of Norway (RCN) has in recent years directed more of its funding mechanisms toward promoting user involvement in science, and in 2019 has begun the development of a new "comprehensive policy for open science" (RCN 2018c). This, combined with the Research Council encouraging Norwegian research groups to seek EU funding and using the attainment of funds from international programmes like Horizon 2020 as a measurement of the quality of Norwegian research, has led to Norwegian research institutions increasingly being expected to include non-academic stakeholders, or "users," in scientific research projects (Brandt et al. 2019).

In this thesis, I aim to describe how these expectations are being met by one such Norwegian research institution: CICERO Center for International Climate Research. As an independent environment institute with a strong focus on policy-relevant climate research, CICERO represents an interesting case for studying these processes in the Norwegian context. By examining how informants in and around CICERO describe their experiences with user involvement in practice, I seek to contribute to a growing body of research that looks at how these science policy shifts are

contributing to reshaping the scientific knowledge system, and the role of scientific research in contemporary society (see eg. Lövbrand 2011; Kershaw 2017; Lemos et al. 2018; Nerlich et al. 2018a).

1.2 Rationale

The increased emphasis on co-production and other components of open science in scientific governance has been met with a great deal of optimism in both academic and policy environments (Nerlich et al. 2018b). However, cautioning that there is a need to critically examine the concepts underpinning these science policy shifts, Irwin argues that "there is a pressing need to move away from the orthodox science and technology studies (STS) defence of public participation and citizen-science engagement […] towards an analytically sceptical (but not dismissive) perspective on the 'new' mode of scientific governance" (Irwin 2006, 300). In a similar vein, Nerlich et al. suggest in the introduction to their volume *Science and the Politics of Openness: Here Be Monsters* that there may lurk "unknown beasts" in the unexplored territories which are opened up in efforts toward "making science more public, open or transparent" (Nerlich et al. 2018b, 3).

In this thesis, I seek to turn an analytical gaze to one aspect of this new mode of scientific governance: the increased call in Norwegian science policy for co-production or user involvement in research. The rapid growth of this agenda in Norway and the EU, particularly in the context of climate science, makes it an interesting and timely topic of research. In an analysis of scientific papers on climate change mentioning co-production, Bremer and Meisch (2017) found that the use of this term has increased dramatically since 2007. It appeared in only 13 publications in the ten-year period following the term's introduction to the climate literature (1996–2006), but was used in 118 publications between 2007 and 2013. Their analysis also suggests an annually increasing trend in publications on co-production.

So far, much of the empirical research on co-production in practice has taken an evaluative and instrumentalist stance, concerned largely with assessing the effectiveness of strategies for involving different stakeholders and the practical challenges faced by so-called "boundary organisations" (Kershaw 2017). Alongside this, and perhaps because the field is so new, efforts like Kershaw's (2017, 2018) to

turn a more analytical gaze to the actual practices of "doing co-production" have often been concerned with the space of ideas and narratives around what the concept entails, in the context of projects gearing up to actually start co-producing. There has been a recent call for more research studying the practice of co-production in order to understand when, in what contexts and for what purposes "to co-produce or not co-produce" (Lemos et al. 2018, 723).

In addition to its instrumental use describing the inclusion of different stakeholders into processes of scientific knowledge production, co-production is also used within STS to describe the processes through which science and society are mutually co-constituted (Jasanoff 2004). In this context, there is a need for research which examines what may be called the "co-production of co-production," looking into the way this concept has arisen from academic research and come to be adopted in science policy – and is in turn being used to reshape the scientific research system (Bremer and Meisch 2017, 12). As part of this, analysis of co-production and the open science movement may need to take a stance in-between practical, ground-level evaluations and overarching discussions of concepts and narratives, looking into how the implementation of these concepts is changing research systems in practice.

This thesis attempts to occupy this space, looking into the increased demand in Norwegian science policy for user involvement[1] in science, particularly driven by shifts in the Research Council of Norway's research funding mechanisms. In particular, I aim to use experiences from CICERO Center for International Climate Research as an example of how these policy changes impact the work of a Norwegian research institute. As a climate research institute, CICERO operates in a field where user involvement is already being actively promoted by the Research Council of Norway (RCN 2018b, d). In addition, as an independent environment institute, it relies primarily on project funding from the Council to support its operations (CICERO 2017a). The Center has also since its foundation been focused on producing knowledge which is policy relevant, and has a long history of negotiating tensions "at the boundary" between science and politics (Nilsen 2001).

[1] In Norwegian, *brukerinvolvering* – a term used by RCN and by Norwegian researchers more often than co-production (*samproduksjon*), and therefore the term which is mostly used in the empirical chapters of this thesis.

As such, CICERO represents an interesting example through which to examine this new mode of scientific governance, and could even be seen as a kind of "canary in the coal mines" for the implementation of science policy instruments promoting increased user involvement in the Norwegian context. The Research Council of Norway have signalled their intention to expand the application of user involvement in additional fields of research, with climate research considered as one of the fields where these practices are already well-established (RCN 2018b, d). Because of this, many of the experiences from CICERO described in this thesis may be shared – or come to be shared – by other research groups and institutions in Norway. Considering that similar changes are also being implemented in several other countries as well as in the EU, the findings here could also potentially offer lessons for studies of co-production and open science in other contexts.

1.3 Questions and scope

Defining the research questions

In this thesis, I present a case study of CICERO Center for International Climate Research as a Norwegian research institute encountering increased demands for user involvement. The case study is grounded in work within the interdisciplinary field of science and technology studies (STS) on boundary work and boundary organisations, as well as Gieryn's (1999) concept of *cultural cartographies of science*, which will be further discussed in the literature review. These concepts focus on how societal ideas of the nature of scientific knowledge, the value and purpose of scientific research, the role of the scientist, and the relationship and boundaries between science and other societal spheres are continuously negotiated and re-defined (Beck and Mahony 2018).

Efforts to "open up" scientific research and decision making processes through user involvement appear to represent an attempt to shift the boundary between science and society, making the boundary concept a useful framework for the questions posed in this thesis. In order to strike the balance between practical, ground-level experiences and overarching conceptual discussions called for above, I combine a case study approach looking into the concrete experiences of a Norwegian research

centre with demands for user involvement, with a perspective that relates these experiences to broader science policy shifts and science-society relations. In particular, I focus on the boundary work and cultural cartography undertaken by my informants, as well as by actors like the Research Council of Norway, around the concepts that underpin this science policy shift: co-production, user involvement, relevant science and useful knowledge.

The main research question which I will seek to address in this thesis is:

> What do CICERO's experiences with user involvement in science indicate about how this science policy shift is being implemented in the Norwegian context? In particular, how does it (re)constitute the relationship and boundaries between science and society?

In order to explore this overarching question, each of the analysis chapters also addresses one or two sub-questions:

i. How does the Research Council of Norway define the concept of "user involvement," and how do they use their policy and funding mechanisms to promote increased user involvement in science? (Chapter 4)

ii. How do my informants engage in boundary work when describing the role of the "relevant scientist" and ideals of science-society relations in the context of user involvement? (Chapter 5)

iii. According to my informants' descriptions, what kinds of shifts in scientific knowledge production are entailed in the production of "useful knowledge"? (Chapter 5)

iv. How do my informants perceive the role of the "user" in user-involved science, and how are relationships between scientists and users shaped by the Research Council's funding mechanisms for user involvement? (Chapter 6)

To explore these questions, I use a qualitative methodology grounded in the STS tradition of interdisciplinary social research. The methodological underpinnings of this thesis are further discussed in Chapter 3.

Scope and limitations

The question of how science policy efforts for user involvement re-shape the relationship between science and society is a very broad one, which involves a wide network of different actors. The Research Council of Norway, influenced by Horizon 2020, plays a key role in implementing this shift in the Norwegian context, and a deeper exploration of science policy decision makers' motivations and frameworks for promoting user involvement than there is space for in this thesis would certainly provide an interesting context in which to view the experiences from CICERO.

While Chapter 4 contains a discussion of the Research Council's policy and funding mechanisms for user involvement, another part of this landscape fell outside the scope of this thesis: the "users" themselves. Rather than conduct interviews directly with user partners, I chose instead to focus on interviewing a larger number of researchers in and around CICERO, in order to gain a more in-depth understanding of researchers' own experiences with and perceptions of user involvement. As such, the thesis focuses on "user partners" as seen from the perspective of the researchers working with them, which represents a somewhat one-sided view of processes of user involvement. However, within the scope of this master's thesis, taking CICERO as a case study and the experiences of researchers as my primary focus may also have enabled a more nuanced understanding of this side of the story than spreading the interviews out across multiple different institutions.

In addition, as touched on above, CICERO occupies a somewhat particular place in the Norwegian research system. As an independent environment institute focused on policy-relevant climate research, they are more dependent on Research Council project funds than a more traditional academic institution such as a university. They also cannot be said to represent the "ivory tower" which these science policy shifts in part seek to dismantle, having always had at least one foot in a more societally-engaged and advisory role. It is likely that pressures to engage in user involvement would impact other kinds of Norwegian research institutions in different ways. In particular, the discussions in this thesis around the concept of "useful knowledge" might be somewhat specific to the field of climate research, with other challenges experienced in other fields.

As such, it would be very interesting to see what kind of picture of user involvement in the Norwegian research system would come out of a larger research project with a wider scope, and by looking into how these shifts are perceived and negotiated from a variety of different perspectives. In particular, it would be interesting to examine boundary work and cultural cartographies of science at different points in the network of research institutions, public and private sector institutions, and science policy decision makers which constitute this landscape.

However, the more limited perspective of this thesis, focusing largely on the experiences within CICERO (triangulated with interviews with three of the Center's research partners), might still provide an interesting piece of the puzzle. As suggested above, there is reason to believe that CICERO could be one of the Norwegian research institutes currently feeling the impacts of these science policy shifts most strongly, a kind of first responder to demands for user involvement. As such, the findings here can serve to indicate questions and challenges which could be addressed more thoroughly in future research. In addition, CICERO's experiences with user involvement could offer lessons for other Norwegian research institutions, which may come to experience this demand to an increasing extent.

1.4 Layout of the thesis

To lay out the foundation for the discussions in this thesis, the literature review in Chapter 2 opens with an overview of the key literature from which I draw the theoretical framework on cultural cartographies of science and boundary work, focusing on how these concepts have been developed and used in STS research. Then, I contextualise the broader background of the thesis by outlining discussions on the "scientific legitimacy crisis" and calls for a new relationship between science and society. In particular, I focus on initiatives for open science and co-production of scientific knowledge, and on how these are informed by different understandings of the concept of co-production. Finally, I describe the context specific to the case study of CICERO Center for International Climate Research, outlining STS research on the social and political role of climate science before briefly describing the different components of the Norwegian research system, and CICERO's place in it.

In Chapter 3, I describe the methodological background and research methods that were used to explore the thesis questions. I discuss the epistemological underpinnings of this thesis, which highlight the situatedness of all knowledge claims and the importance of reflexivity in discussing qualitative research methods. Then, I describe how I used a case study approach to study CICERO Center for Climate Research's experiences with user involvement, making use of qualitative semi-structured interviews with CICERO staff as my primary method of data collection. Finally, I describe how the data was analysed using a methodology which draws on thematic qualitative data analysis.

In order to address the overarching research question described above, each of the analysis chapters focuses on a slightly different element. In Chapter 4, I focus on the Research Council of Norway and look into the background documents for the Council's 2019 policy on open science. I examine how these documents define "user involvement," and what understanding of the concepts of co-production and user involvement appears to inform their use of the term. Then, I outline the Council's research funding mechanisms, showing how they use the allocation of funds among different application types to encourage increased user involvement in scientific research projects. As many of my informants described the Research Council as a primary driver of the push for increased user involvement in science, beginning with a description of the Council's own frameworks provides a useful background for contextualising CICERO's experiences, which are the focus of the following two chapters.

In Chapter 5, I turn the attention to one half of the science-society boundary as it is positioned in user involvement, focusing on the role of the scientist and of scientific knowledge. In particular, I describe how my informants engage in boundary work when discussing the role of the "relevant scientist" in the context of user-involved science, and how they define the ideal relationship between CICERO and the rest of society, showing that there appear to be multiple different understandings of this relationship within the organisation. Then, I attempt to open up the often black-boxed concept of "useful knowledge," describing how my informants explain the shifts in scientific knowledge production necessary to produce knowledge that is useful to their user partners.

Chapter 6 looks across to the other side of this boundary, focusing on the role of the "user" in user-involved science – from the perspective of researchers. I describe how the many different understandings of the concept and purpose of co-production or user involvement entail different roles for user partners in these processes, and look into which of these concepts appear most prevalent within CICERO. I identify three primary reasons given by my informants for involving user partners in scientific knowledge production. Then, pointing to the Research Council's funding mechanisms as a key driver of this engagement, I describe how these funding mechanisms shape the relationships between researchers and their user partners, focusing on my informants' experiences with the often challenging process of finding user partners to engage in scientific research projects.

Finally, Chapter 7 attempts to bring it all together in a conclusion which starts off with a summary of the most important findings from each of the three analysis chapters. Then, I return to the overarching question posed by this thesis about how these shifts contribute to reconstituting the relationship and boundaries between science and society. I draw on the concept of cultural cartographies of science to discuss what kind of map of science-society relations is drawn up by my informants' descriptions of their experiences with user involvement. Particularly, I question whether efforts to promote user involvement in the Norwegian context are drawing up the knowledge-democratising map which I describe in Chapter 2 as the "agora," or whether a different arrangement of science-in-society is visible from the findings in this thesis. The chapter ends with a discussion of what these findings indicate about one of the promises underpinning calls to build a new relationship between science and society: the notion that through these policy changes, scientific knowledge production should be made relevant and accountable to society.

2 Literature and context

2.1 Mapping science – understanding and representing science in society

In the late 1970s, the interdisciplinary field of science and technology studies (STS) arose from efforts by researchers in a variety of social scientific and humanistic fields to examine the social dynamics and social construction of science and technology. STS followed in the footsteps of previous social scientific research on the interactions between science, technology and society (Edge 1995), but departed from its predecessors in that it expanded its gaze to look into how scientific facts and technological artefacts are themselves the products of social processes (Rohracher 2015, 200). As such, "for STS, understanding science and technology means investigating not only how science and technology shape social life and the world around us but also how the latter in turn shape developments in science and technology" (Felt et al. 2017, 1). This process of mutual co-constitution of epistemic, technological, and social orders has been described as the *co-production* of science and society (Jasanoff 2004), which has become one of the core concepts within STS (Felt et al. 2017).

Beyond this broad ambition, the theoretical strands and fields of research within STS are characterised by diversity, as well as multiple tensions (Callon 1995; Edge 1995). It is beyond the scope of this literature review to outline the many different components that make up STS – however, one key division has been between research focusing on describing the nature of scientific knowledge and scientific knowledge production, and research focusing on the role of science in society (Callon 1995). In addition, a core tension has been between different conceptions of the relationship between fact and value, as well as research focusing on critical and reflective analysis of the scientific knowledge system and science in society; and research taking a more "rationalistic" approach, acting as a kind of regulatory science for the research and educational sectors (Edge 1995).

In his seminal work *The Cultural Boundaries of Science*, Gieryn (1999, 1983) proposed setting aside questions of the contents and nature of "real" science in

favour of turning the analytical focus to the negotiated and historically contingent processes through which different actors construct cultural representations of science in contests over *epistemic authority* – "the legitimate power to define, describe, and explain bounded domains of reality" (ibid, 1). Gieryn described these representations as *cultural cartographies of science*, using the cartographic metaphor to describe how actors "map" the landscapes of science, drawing up boundaries between legitimate science and non-science, defining the domains of credible methods and reliable facts, and locating the realm of science in relation to the rest of the "culturescape," painting the roadways through which it may be connected – or disconnected – from other parts of society. This process of cultural cartography he described as *boundary work*: "the discursive attribution of selected qualities to scientists, scientific methods, and scientific claims for the purpose of drawing a rhetorical boundary between science and some less authoritative residual non-science" (ibid, 4-5).

Key to Gieryn's analysis is the notion that such cultural maps are drawn up very differently depending on the context in which they are drawn, and that these processes are characterised "by their variability, changeability, inconsistency, and volatility – from episode to episode of cultural cartography, few enduring or transcendent properties of science necessarily appear on any map (or in the same place)" (ibid, 5). This, he argues, is not because there exists no real science underneath the maps on which to draw a stable representation – rather, there are too many real sciences, the actual field of scientific activities too large and complex to be fully captured in any given representation. Gieryn equates this with the way the totality of nature is not captured in a geographical map of a natural terrain, but rather cartographers will select particular properties and aspects to highlight according to the purposes of their specific maps (whether, for example, they are intended for hiking or driving). Similarly, "instead of being a more or less accurate copy of one or another real science, these cultural maps are contextually tailored selections from a long menu, where 'context' is defined by the players and stakeholders, their goals and interests, and the arena in which they operate" (ibid, 21).

To those who would claim that the epistemic authority and credibility of science are founded not in contextual representations but rather in qualities inherent to scientific

inquiry which distinguish it from other forms of knowledge, such as the Mertonian norms of communalism, universalism, disinterestedness and organised scepticism (Merton 1973), or the theories of Popper or Kuhn (Popper 2005; Kuhn 1970), Gieryn asserts that:

> Credibility in the culturescape is not decided in tinkerings at the lab bench or in the refereeing of a manuscript or in the machinations of instruments, statistics, or logic. It is analytically presumptuous to think that people and organizations in society at large possess an understanding of science fixed clearly by actual practices in the lab, or by scholarly tries at demarcation, or by idealized reminiscences. Epistemic authority is decided downstream from all that, as claims float through layers of cartographic representations where credibility is attached or removed. (Gieryn 1999, 27)

As such, the core claim in this analysis is not that there *are* no unique or essential properties of scientific inquiry – but that these properties cannot be called on to explain science's epistemic authority, its power to be used as a basis for decision making in society at large, or the power of specific scientists' claims to be accepted as facts. Instead, this authority can be explained by analysing instances of what Gieryn calls *credibility contests*: "battles between truths," where different actors engage in boundary work in order to offer competing cultural cartographies of science, which define certain kinds of truth-claims as legitimate and authoritative in contrast to others (ibid, 4; 16-17). Through such contests, the nature and societal role of scientific knowledge – and of scientific knowledge-makers – is continuously negotiated and (re)defined.

Particularly one concept from this analysis – that of boundary work – has been taken up by many researchers "to describe how the boundary between science and politics is constantly negotiated in practice" (Beck and Mahony 2018, 2). Jasanoff (1990) focused on how scientists, particularly in the context of scientific policy advisory committees, engage in boundary work in order to allocate epistemic and political authority by defining who is in and out of expert groups, as well as to gain control of particular issues by defining them as either scientific or political. Other researchers have used the concept of boundary work to examine how scientists seek to prevent external control over scientific work and to protect the autonomy of science (Elzinga

1997; Beck and Mahony 2018). However, boundary work can also consist of the opening up of science in certain contexts – according to Gieryn, historical analysis shows that the direction of boundary work toward emphasising either the purity or policy relevance of science depends on what is at stake for cultural cartographers.

> Among the most common cartographic tropes is this: if the stakes are autonomy over scientists' ability to define problems and select procedures for investigating them, then science gets 'purified,' carefully demarcated from all political and market concerns, which are said to pollute truth; but if the stakes are material resources for scientific instruments, research materials, or personnel, science gets 'impurified,' erasing the borders or spaces between truth and policy relevance or technological panaceas. (Gieryn 1999, 23)

Building from this theoretical framework on boundaries, the concept of *boundary organisations* has been used to understand processes of organising the interaction between scientific expertise and policymaking (Miller 2001; Guston 2001), particularly through research on institutions designed to "exist at the interface of research and policy organizations and facilitate communication and collaboration between them" (Parker and Crona 2012, 264), such as scientific advisory institutions. These kinds of organisations face a number of challenges related to working "at the boundary," including addressing the diverse and often contrasting needs of different stakeholders, as well as negotiating tensions between simultaneous demands for relevance and objectivity (ibid; Cash et al. 2003; Shaw and Robinson 2004).

In addition, the concept of *boundary objects* has been developed to describe objects which sit between different social worlds (such as those of science and policy), are mutually intelligible to both, as well as "plastic enough to adapt to the local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star and Griesemer 1989, 21). Examples include guidelines, standards, diagrams – or particular reports or sets of figures which are used by both scientific and policy actors, such as those of the Intergovernmental Panel on Climate Change (IPCC) (Lahn and Sundqvist 2017).

These concepts form a useful background when entering the discussion of the second theoretical area of relevance to this thesis: the way STS scholars and other researchers themselves act as cultural cartographers of science when constructing

different models of the relationship between science and society – as well as normatively calling for a re-constitution of that relationship.

2.2 A new map of science-society relations

A new relationship between science and society?

Something appears to have happened to the relationship between science and society in the last few decades. From the "war on science" to talk of Western societies entering a "post-truth" political climate, many commentators seem to agree that the legitimacy and epistemic authority traditionally enjoyed by scientific knowledge is currently under threat (Haas 2017; Sismondo 2017b). The rise of right-wing populism in Europe and the US appears in part to be fuelled by a dissatisfaction with elites and experts, who are seen to be out-of-touch with realities on the ground (Smith 2018). At the same time, critics on the opposite side of the political spectrum accuse academic institutions of a deficit of epistemic democracy, raising concerns that systems that have purported to produce universal truths have in fact privileged particular perspectives at the expense of others. One such movement has been the growing call in recent years to "decolonise" academic systems, research and knowledge (de Jong et al. 2017).

Indeed, as touched on in the previous section, the concept of truth as an outcome of scientific inquiry has itself come into question. Researchers within science and technology studies (STS) and related fields have raised questions about the traditional image of the scientific process as neutral, value-free and detached from society and social concerns. Scholars like Latour and Woolgar (1986), Jasanoff (1990), as well as others have showed the different ways that science is entangled with social dynamics and societal pressures. Research has been carried out to reveal these dynamics at every stage of the scientific process – from the macro-level of studying ways political and social contexts shape agenda-setting and the framing of issues and questions of scientific concern (Jasanoff 1990, 2004), to the micro-level of examining the dynamics of social relationships and meaning-making inside scientific laboratories (Latour and Woolgar 1986).

This has raised a debate about the objectivity of scientific knowledge, with researchers highlighting that the classic image of the neutral and value-free scientist is complicated by the social reality of a scientific process entangled with social and political dynamics, and critiquing the positioning of certain privileged actors' ways of knowing about the world as "objective" against the subjectivity of less privileged perspectives (Haraway 1988). In particular, research in feminist theory and indigenous knowledge systems has highlighted how the concept of objectivity has largely been defined from a Western, white, male perspective (Haraway 1988; Berkes 2010). This has led to a prevalent theoretical focus in STS on the situatedness of knowledge claims, based in an understanding that scientific knowledge, like all forms of knowledge, "is *local* and reflects the specific historical moment, cultural context as well as the networks within which it is made" (Felt et al. 2017, 1-2, emphasis mine).

These lines of inquiry launched a credibility contest described as the "science wars," where proponents of a more traditional view of scientific legitimacy fought against what they saw as the undermining of scientific knowledge through questions to its objectivity and truth-value. As summarised by Gieryn in the midst of the conflict, warriors of the "reason, empiricism, and truth of science" took up arms against "postmodernism, relativism, and radical social constructivism" (Gieryn 1999, 336). This conflict may not have been so much resolved as placed on a shelf, although some consider a 2004 article published by Bruno Latour in the journal *Critical Inquiry* (Latour 2004) to have been a kind of white flag on the part of the constructivists (Fuller 2016).

To what extent the destabilisation of concepts of truth and objectivity by STS scholars has contributed directly to the "post-truth" era is debatable – and has been debated (Fuller 2016; Sismondo 2017b; Collins, Evans, and Weinel 2017; Fuller 2017; Lynch 2017; Sismondo 2017a). Whether or not constructivist work "has been read by climate change deniers, vaccine sceptics, Fox News commentators and other vanguard post-truthers" (Sismondo 2017a, 587), however, it undeniably forms part of a landscape in which a traditional source of scientific epistemic authority – an image of neutrality and objectivity, of being unsullied by social and political values and

interests – has been called into question. In other words, the world currently appears to be in the midst of a credibility contest around scientific knowledge.

At the same time, since the 1980s and 1990s researchers within STS and science policy have "explored changes in research systems, institutions, cultures and practices that collectively appear to signal a new relationship between – or co-production of – science and society" (Kershaw 2017, 18). This new relationship has been conceptualised in a number of different ways, including "Mode 2" science (Gibbons et al. 1994), "post-normal" science (Funtowicz and Ravetz 1993), and several others. Despite their variety, these different concepts "all describe, theorise or advocate a shift from the disciplinary organisation of research within the academy towards a greater recognition of socio-economic priorities and involvement of broader communities – particularly non-academic actors – in the governance and conduct of research" (Kershaw 2017, 19).

The call for open, solution-oriented science

Today, this shift in science policy can be summarised under the headline "open science." In order to counteract a perceived diminishing public trust and faith in science, and with the stated aim of making scientific research more responsive to societal needs, a number of policy initiatives have been implemented in recent years in an attempt to "open up" scientific research and science-based decision making processes (Nerlich et al. 2018b). These changes include "promoting greater public engagement with science and policy, co-design of scientific research with stakeholders, open and participatory forms of innovation, increasing transparency in scientific advice for policymaking, and enhancing open access to scientific data and research outputs" (ibid, 2). This has been accompanied by an increased demand for science to operate in a solution-oriented mode and to produce knowledge which contributes to solving "large societal challenges," particularly in fields where such challenges are pronounced, such as climate science (Beck and Mahony 2018).

Researches have noted that climate science in particular is increasingly being asked to perform a new role akin to a "regulatory science" (Beck and Mahony 2018, 6) – in the sense of a form of scientific inquiry which is "produced in particular contexts for particular policy purposes, where it is expected that scientific and policy issues are

closely integrated at every stage of production and use" (Winickoff and Mondou 2017, 8). As I will discuss further in the coming chapters, particularly in Chapter 5, this demand for climate science to play a "new role" was recognised by my informants in CICERO. Several of my interviews brought up what came across as a sort of "slogan," seemingly prevalent within the organisation, along the lines of "we [climate scientists] used to research problems, now we research solutions."

There is significant variation in the ways different researchers have interpreted this shift. Some welcome it as a greater alignment of the scientific ideal with what has always been its reality, such as Jasanoff, who describes "a changing historical context, in which the ideal of science as a detached, curiosity-driven inquiry, guided by truthfulness to nature, has gradually yielded to the social reality of sciences that are more problem driven and politically accountable" (Jasanoff 2011, 1). Others take a cautious approach, suggesting that policy shifts toward increased openness must be critically analysed and examined for their actual effects and the ways in which they construct the key concepts around which they are built, such as co-production and "the public" (Nerlich et al. 2018b; Irwin 2006). Others still, like Mirowski, see calls for open science as something potentially sinister – a Trojan horse for neoliberal restructuring of the knowledge production system toward platform capitalism, enrolling the public as free labour in the scientific process through citizen science, and turning open data into a "monetizable free resource" (Mirowski 2018, 178).

One of the reasons for these varying interpretations may be that the concepts on which open science are built are in themselves elastic, and the agendas of the actors promoting it are diverse. In an analysis of scientific papers on climate change using the term co-production of knowledge, Bremer and Meisch (2017) identify eight different conceptual lenses with which different authors use the term, encompassing very different definitions. Relatedly, Bensaude-Vincent argues that "sustainable development," "responsible innovation" and "public engagement" form a "trio of buzzwords" which play a role as boundary objects and bring together the various different actors involved in the new organisation of science-society relations, as their fuzzy and negotiable meanings create "a 'trading zone' that allows different stakeholders to communicate" (Bensaude-Vincent 2014, 250).

Cultural cartographies of open science: from the ivory tower to the agora?

Another reason for these varying interpretations of the shift toward open science might be that the commentators – as well as the different actors implementing and advocating this shift – subscribe to different cultural cartographies of science. Calls for open science base themselves on an image of traditional, "ivory tower" academia as a closed-off space which suffers from a democracy deficit, has been insufficiently productive in producing useful knowledge for society, and is met with distrust among the general population (Mirowski 2018). To these problems, then, the solution is posed as an opening up of science on all fronts, in order to bolster its epistemic authority and legitimacy by making scientific knowledge more democratic, relevant and useful (Nerlich et al. 2018b).

Viewed as cultural cartography of science, one might imagine the overarching language of open science as drawing up a siege on the ivory tower. The tower must be destroyed, its walls broken down, in order to create an open agora – a space where all the many voices of society can participate in a democratic dialogue and share knowledge freely, in order to create common solutions to common problems. With this new, inclusive dialogue, open science proposes to create a new kind of knowledge that is relevant, interesting, accessible and useful to all – and therefore more legitimate and trustworthy.

This imagery is invoked explicitly by some proponents of a new relationship between science and society. In an article arguing for the "democratisation" of expertise through opening up decision making processes related to science and technology, Liberatore and Funtowicz[2] write, "only if the 'ivory tower' is opened up and experts come to the 'agora' (meeting place) is it possible to find out what elements they provide to formulate and implement policy decisions, and how these elements are actually used" (Liberatore and Funtowicz 2003, 147). This presents a clear example of cultural cartography – the "agora" map of science-in-society as a space for democratic dialogue and engagement, contrasted with the "ivory tower" map of academia as a closed-off and undemocratic space.

[2] Along with Jerome Ravetz, Silvio Funtowicz originated the concept of "post-normal" science, one of the influential STS cultural cartographies of science advocating a democratisation of scientific knowledge (Funtowicz and Ravetz 1993).

One of the key tools for building this "agora" has been the increased call for scientists to conduct research based on the priorities and needs of, and in collaboration with, non-academic societal actors in the private sector, public sector, and civil society. This kind of collaborative research has been described using a number of different terms, including stakeholder engagement, user involvement, co-production of knowledge, co-design, and Responsible Research and Innovation (RRI) (Kershaw 2017). Despite differences in some of their contents, these concepts share a foundation in the idea that a greater degree of involvement and dialogue (rather than one-way communication) between scientists and the "users" of scientific knowledge will lead to better, more impactful, and more useful science (Bremer and Meisch 2017). Following this development, several researchers have turned their attention to how these calls for closer engagement between science and society become key sites for boundary work, as well as a reason for the foundation of boundary organisations (Beck and Mahony 2018; Guston 1999; Edwards and Schneider 2001).

Conceptual lenses on co-production

As mentioned above, concepts of *co-production of knowledge* are used in a number of different ways in discussions of these processes (Bremer and Meisch 2017). In order to provide a background for the discussions in Chapters 4 and 6 of how the concept of co-production is currently being employed in Norwegian science policy, I will outline some of the conceptual discussions around the term below. Particularly useful in the context of this thesis is the categorisations by Bremer and Meisch (2017) and Lövbrand (2011) of the multiple different understandings of co-production which inform the use of the concept in science policy and academic research.

In STS, *co-production* has been used as a descriptive tool for theorising the way in which science and society co-create each other (Jasanoff 2004). However, the term was originally used to describe collaboration across the public-private boundary with a more instrumental and normative bent, focused on how actors from different organisations could – and did – intentionally engage in co-production (Ostrom 1996, 1972). This divide, between descriptive and normative uses of the term co-production, has generally been seen as the primary distinction between its different

meanings (Bremer and Meisch 2017). However, in an attempt to unpack the multiple uses of the term beyond this binary divide, Bremer and Meisch (2017) developed a model that conceives of eight conceptual lenses on co-production as it is used in relation to climate science. They describe co-production as "a complex meeting place where several different academic traditions and practices converge, overlap, affect each other, come into conflict, or cooperate"[3] (ibid, 2). This complexity, they write, has two implications: researchers using the term need to employ transparency and reflexivity in terms of which lens they draw on, and there is also a need to explore tensions between the different perspectives on the concept.

Bremer and Meisch divide the descriptive concept of co-production in two: the "constitutive lens" and "the interactional lens," focused respectively on "how our understandings of nature and society constitute each other, how these understandings evolve, and their mutual influence" (ibid, 6) and on "how science and society make and remake each other in dynamic processes" (ibid, 7). They also note that despite the common distinction between descriptive and normative co-production, some uses of the term span the two categories, particularly its use by authors who describe co-production as a new mode of scientific research following theories of Mode 2 or post-normal science.

The normative concept of co-production, meanwhile, Bremer and Meisch divide into six different lenses. The "Iterative Interaction Lens" focuses on the instrumental "usability" of scientific knowledge, promoting "the iterative interaction of science providers and users along an interdisciplinary research process designed to produce more useable climate information" (ibid, 8). According to the authors, this lens is by far the most widely used in science policy. Meanwhile, the "Extended Science Lens" focuses on "ways of doing science differently by including the knowledge and values of nonscientists as integral to the process of scientific knowledge production" (ibid). This is the lens most commonly employed by those calling for the agora, with different uses that "all stress the importance of creating a more robust and socially accountable science that is problem-driven, better reflects complexity and uncertainty, and includes a diversity of perspectives" (ibid, 9).

[3] In other words, the concept of "co-production" can be seen as a boundary object.

The remaining four lenses are less prevalently used in research and also less relevant to this thesis, but Bremer and Meisch (ibid, 9-10) also define the "Public Services Lens"; the "Institutional Lens"; the "Social Learning Lens"; and the "Empowerment Lens." They suggest that an understanding of these different lenses can be used to contextualise the use of the term co-production in particular context, as well as a tool for reflexivity, highlighting the importance of conceptual clarity and awareness of the tensions and trade-offs between different uses of the term.

Lövbrand (2011) also highlights this challenge in the context of two logics of co-production which she describes as the "logic of ontology" (focused on building the "agora" through epistemic democracy) and the "logic of accountability" (focused instrumentally on the production of useful knowledge for policy). In the "logic of ontology," the crossing of disciplinary boundaries is intended to challenge current knowledge and transform existing ways of thinking through the inclusion of a broader variety of voices in dialogue with each other. Lövbrand describes this logic partially at play in European climate science policy, where through concepts of democratisation, co-production of knowledge "emerges as a reflexive and emancipatory project" (Lövbrand 2011, 227).

However, more prevalent in European science policy according to Lövbrand is the "logic of accountability." Proponents of this logic take a more instrumental approach, focusing on the importance of open science initiatives like co-production and interdisciplinarity for producing knowledge that is *useful* to particular stakeholders. Rather than necessarily seeking to challenge existing knowledge on an ontological level, this approach asks scientists to produce knowledge "in the context of application," in order to ensure that scientific information is applicable to solving concrete societal problems, and serves the knowledge needs of specific societal stakeholders (Lövbrand 2011, 231).

Although they often occur side by side, there may be trade-offs between these two logics. Lövbrand argues that a focus on producing knowledge which is relevant and useful to policymakers in the context of existing policy frameworks may serve to restrict "the space for critical engagement with the ontological claims that underpin contemporary policy-making" (Lövbrand 2011, 234). As also suggested by Bremer and Meisch (2017), there is a need for greater definitional clarity in the use of these

concepts in order to avoid obscuring the tensions and contradictions between their different uses, and their practical implications in terms of how they reshape scientific knowledge systems.

In this thesis, I draw on literature and theory surrounding concepts of co-production of knowledge. However, when describing Norwegian initiatives for including non-academic stakeholders in research, I mostly use the term *user involvement*. Many informants both in CICERO and in the Research Council of Norway were not familiar with the term "co-production" but rather discussed similar activities under the term "user involvement." In addition, some of my informants suggested that not every activity happening under the umbrella of user involvement might qualify as "full" or "real" co-production in the sense in which the term is used in the academic literature (although, as shown above, there are several different definitions of what real co-production is).

2.3 Climate science and science policy in Norway and abroad

Studying the social and political role of climate science

In recent years, climate science and its role in national and international policy- and decision making has become an important site for STS research, representing a scientific field which is closely entangled with policy and politics, and which, along with the fields of environmental and sustainability science, has been at the forefront of efforts toward increased co-production in scientific research (Bremer and Meisch 2017; Beck and Mahony 2018). It is beyond the scope of this literature review to thoroughly detail the research on climate science which has taken place over the last few decades – however, in this section I will briefly outline some of this work in order to contextualise CICERO's role as a climate research institute.

Since the foundation of the UNFCCC's Intergovernmental Panel on Climate Change (IPCC), a number of researchers have analysed the role of this large scientific advisory body as a key example of a boundary organisation for climate change science (see eg. Beck and Mahony 2018; Shaw 2005; Hulme and Mahony 2010). Research on the IPCC has focused on how the institution balances the dual – and

often conflicting – demands of neutrality and policy relevance, as well as a critical examination of the Panel's stated aim of being "policy relevant but not prescriptive." This aim has been seen as an example of the "linear model" of scientific expertise, which risks obscuring the significant role of the IPCC's assessment processes in defining premises and issues of concern in international climate policy (Shaw 2005; Shaw and Robinson 2004; Beck 2011). Boundary concepts in general have been core to studies of the IPCC, with researchers also analysing elements of their reports as boundary objects, such as Lahn and Sundqvist's (2017) analysis of the "Bali box."

In addition, studies of the IPCC and the political role of climate science more broadly have focused on the role of climate modelling[4] as a privileged discipline within this field. Hulme argues that the "hegemony" of climate modelling as the scientific basis for climate policy has led to a "climate reductionism" where social, political and other human dynamics are removed from discourses about the future, in favour of climate being seen as the primary determinant of all future change, creating a situation where "the future is reduced to climate" (Hulme 2011, 264-265). Related to this, Yearley among others has argued for a greater recognition of the "comparatively neglected role of the social sciences" in climate research (Yearley 2009, 389).

Employing a descriptive concept of co-production, Beck and Mahony (2017) argue that in a situation where "climate science is being asked not to simply act as a Cassandra, warning of future catastrophes, but to furnish policymakers with 'regulatory science' and to anticipate and measure the performance of policies in the future," there is a need for greater recognition of the way in which the pathways and scenarios used in and generated by climate modelling "do not just represent possible futures, but also help to bring certain futures into being," drawing on the argument that the Paris Agreement's goal of keeping climate change to well below 2°C was informed by a "buttressed sense of technical feasibility" created by projections using RCP 2.6, an RCP that was itself "a product of coproduction between scientists and

[4] Climate modelling is based on the use of imagined future constellations of socioeconomic factors, simplified and quantified for analysis, to project different emissions levels leading to different concentrations of greenhouse gases. These projections create "possible futures" categorised into "Representative Concentration Pathways" (RCPs), which are used in complex computer simulations in order to project impacts on geophysical and meteorological factors such as temperature increase, precipitation, and glacier melt. The projections made using these RCPs are then used as a basis for a wide variety of scientific analysis and policy development, including projections of the impacts of climate change on ecosystems, livelihoods and societies; as well as plans for mitigation and adaptation (Hulme 2011).

European Union policymakers, the latter being keen on pathways which showed the technical feasibility of 2°C" (Beck and Mahony 2017, 312).

In addition to these kinds of analyses, which employ a descriptive concept of co-production to examine the role of climate science as a regulatory science for policy, the normative use of co-production has also been central to the development of climate research in the last few years (Bremer and Meisch 2017). In particular, the production of "climate services" has received increasing focus, defined as "the generation, provision, and contextualization of information and knowledge derived from climate research for decision making at all levels of society" (Vaughan and Dessai 2014, 587). With Horizon 2020, the European Union has announced their intention to "be the lead" in climate services internationally (EC 2015, 3).

Various normative uses of the co-production concept are seen as core to these approaches, intended to ensure that the knowledge presented by climate services is made relevant, useful, and useable to the stakeholders they serve (Vincent et al. 2018). The field of climate services is still emerging, "marked by contested definitions, an emphasis on capacity development, uneven progress toward coproduction, uncertain funding streams, and a lack of evaluation activities" (Vaughan, Dessai, and Hewitt 2018, 373). However, the emergence of this field marks a context where climate research appears to be at the forefront of efforts for co-production and user involvement in science. This is also seen in the Research Council of Norway's choice of this field as one of their focus areas for user involvement, as will be discussed in Chapter 4.

Outlining the Norwegian research system

Following a model from the OECD, during the 1970s the Norwegian research system was divided into three levels: the science policy level, including parliament, the government, and the ministries; the research strategic level, which at the time was made up of several research councils and a research policy council, and has since been compressed into the Research Council of Norway; and the research implementing level,[5] including universities, university colleges (*høyskoler*), companies and research institutes (Brandt et al. 2019). In the following section, I will

[5] In Norwegian, *utførende nivå*. I am uncertain of how this term is best translated to English.

briefly outline the way the research system is structured at each of these different levels, in order to contextualise the changes in science policy which I will discuss later on, as well as the role of CICERO as an environment institute.

A core principle at the policy level of the Norwegian research system is the sector principle: Rather than a central ministry for science and research determining science policy and funding priorities, each ministry has responsibility for research and innovation in and for their sector and/or their areas of responsibility (Gulbrandsen et al. 2012). The different government ministries interact directly with the Research Council of Norway for setting priorities within their fields, and to some extent also interact with research implementing actors within their field, although in 1985 it was established as another core principle that the government would primarily channel their research support through the Research Council – the so-called "Langslet doctrine" (Brandt et al. 2019, 38). As such, the Research Council's role has partly been to act as a sort of buffer between the policy and implementing levels of the research system, ensuring that the government's research needs are met while also ensuring a level of separation between science and state (ibid, 596). In other words, the Research Council of Norway might be understood as a boundary organisation.

Despite this separation, Norwegian science policy has since its advent in the 1960s been centred largely on aligning research with societal and political priorities, especially in terms of utilising knowledge production as a "productive force" for establishing the modern welfare state and developing the Norwegian economy (ibid, 28). As Brandt et al. describe in their detailed historical account of the Norwegian research councils, "science policy has for Norwegian authorities more often been about 'science for policy' than about developing specific policies for the research system"[6] (Brandt et al. 2019, 596). As such, the imperative for science and research to be relevant and useful to society is not new to the Norwegian research system – in fact, according to Brandt et al., conflicts between principles of academic freedom and societal relevance have run as a core tension throughout the history of the Norwegian research councils (ibid, 35).

[6] Quote translated from Norwegian, as are all quotes from Brandt et al. and other Norwegian-language sources.

At the strategic level of the research system, the Research Council of Norway currently plays a central role as the major channel for funding to research implementing actors, both in terms of distributing basic funding to universities, university colleges and research institutes, as well as administering competitive calls for project-based research funds and the establishment of research centres and institutes (Brandt et al. 2019). In 2016, the Research Council administered 25% of the state budget funds for research and innovation (FoU)[7] (ibid, 595). Brandt et al. divide the history of Norway's research councils into four periods: "The age of the research entrepreneurs" in 1945–1960; "The age of science policy" in 1960–1980; "The age of the knowledge economy" in 1980–2000; and the current "age of international research," which begins in 2000. In this age, research has increasingly been directed to focus on "global challenges," Norwegian science policy instruments have to a greater extent been modelled after the EU, and success in the international arena has become an important basis for measuring the quality of Norwegian research (Brandt et al. 2019, 36-39).

I will discuss the recent changes in the policies and funding structures of the Research Council of Norway in more detail in Chapter 4. However, one important shift is that the Council has during the last two decades worked to position itself as an "active agent of change" in the Norwegian research system, taking a greater strategic role in directing research toward particular priorities and attempting to develop Norwegian researchers' capacity for "excellent research" in prioritised areas (Brandt et al. 2019, 513). In addition, Brandt et al. note an increased focus on shaping research based on the needs and interests of knowledge "users," writing that "the organisational structure of the Research Council is now to a greater extent than ever set up to fit with strategic priorities nationally and internationally" (Brandt et al. 2019, 538). In particular, political priorities related to climate and environment research and the needs of the welfare state have become important agendas for shaping the Council's science policy instruments (ibid).

[7] The acronym *Forsknings- og utviklingsarbeid* (FoU), translating to "research and development work," is commonly used in the Norwegian context when discussing funding for research and innovation.

As mentioned above, the implementing level of the Norwegian research system is generally divided into three sectors: the university and university college (*høyskole*)[8] sector, the business sector (seen as the locus for innovation), and the institute sector. Of these, the institute sector comprised 24% of the Norwegian government's expenses related to research and innovation (FoU) in 2010, and is the largest sector for applied research and innovation in the Norwegian research system (Gulbrandsen et al. 2012). The institute sector is diverse, encompassing several different kinds of research institutes, which are divided into four types: technical-industrial institutes, primary sector institutes, social scientific institutes, and environment institutes (the latter of which includes CICERO) (ibid, 34).

Relatively little research has been carried out on the Norwegian institute sector, which has been described as occupying a space in-between traditional research and consultancy, with an emphasis on conducting applied and policy-relevant research (Gulbrandsen 2011; Gulbrandsen et al. 2012). Gulbrandsen (2011) describes research institutes as "hybrid organisations," facing the tensions of negotiating their in-between place between science and non-science, as well as between public and private realms. Internationally, the Norwegian institute sector has been considered to be particularly large compared to other countries, although the validity of this claim has also been questioned (Gulbrandsen et al. 2012, 13). Research institutes are intended to differ from universities and university colleges in that, while the latter are primarily organised based on educational needs and activities, institutes are organised with a basis in societal needs (ibid, 14).

Research institutes in Norway receive funding from a variety of different sources, with funding compositions changing between different individual institutes as well as institute types. All receive some basic funding (*basisbevilgning*), which is generally distributed by the Research Council. Of this basic funding, one part is set, and another is results-based, its disbursement dependent on the institutes' performance against five indicators: scientific publication or publication points; income from competitive research project calls; income from international sources; income from

[8] University colleges or *høyskoler* occupy an important space in the Norwegian higher education system. These are institutions for higher education that are focused on offering education directed at preparing students for work in particular professional fields and sectors. As such, they are considered sites for more "applied" research in specific professional fields, in contrast with the broad-ranging "basic" research considered characteristic of universities (Hansen 2018).

national contract research; and collaboration with the university and university college sector (ibid, 40-41).

Contract research (*oppdragsforskning*), in the form of mostly bilateral contracts to conduct research based on a request from a public institution or private company, is an important funding source for all four institute types. In addition to some of their basic funding from the Research Council being contingent on conducting a certain amount of contract research, all institute types on average also receive the largest part of their funding from such contracts (ibid, 41) – however, as shown below, CICERO appears to be an exception to this rule. I will discuss the distinction between this kind of contract research – which has a long history in the Norwegian research system – and the newer collaborative form of user involvement in scientific research projects in Chapter 4.

CICERO Center for International Climate Research

CICERO Center for International Climate Research[9] was established in the spring of 1990 on the initiative of then-prime minister Gro Harlem Brundtland, famously the head of the UN World Commission on Environment and Development (the Brundtland commission) which in 1987 introduced the concept of sustainable development (WCED 1987; Nilsen 2001). It was originally intended as a research centre on climate change focused on the social sciences and law, although its scope was quickly expanded to include a broader range of academic research. It was one of several research centres for interdisciplinary, policy-relevant research established during this time, although it differed from its contemporaries in not being established by or through a university, but as an independent institution (Bergrem 2005).

From its initiation, CICERO has had its focus on international climate politics and policy-relevant research, and it has a long history of participating in the development of the UNFCCC's IPCC assessment reports (CICERO n.d.). In fact, Nilsen (2001) argues that the foundation of the Center prior to the UN Conference on Environment and Development in Rio de Janeiro in 1992, which led to the establishment of the

[9] Although it has retained the acronym CICERO, the Center has gone through a number of name changes since its establishment. Originally the *Center for International Climate and Energy Research – Oslo*, it traded "Energy" for "Environment" in 1995 and later dropped the "Environment" and the "– Oslo" in 2000, becoming *CICERO Center for International Climate Research*.

UNFCCC, was an intentional move on the part of Brundtland and then-CICERO Director and former undersecretary to the prime minister Ted Hanisch, who also sat as an observer in the Rio negotiations. Nilsen claims that Hanisch saw the purpose of his work with CICERO as creating an international regime which would allow Norway to continue its oil production. This was to be accomplished particularly through creating a Norwegian political discourse on international climate politics based in the claim that Norwegian oil production was "green" compared to fossil fuel production in other countries (Nilsen 2001, 135-137).

In 1993, Helga Hernes took over the role of CICERO Director, and resigned from the position of observer in the Norwegian delegation to the UNFCCC negotiations, not wishing CICERO to be seen as a political actor (Nilsen 2001). As such, Hernes can be seen to have taken a step toward positioning CICERO more clearly on the science side of the science-policy boundary (Molland 2017). In 1995, the Center also changed the E in its name from "Energy" to "Environment," signalling a broader scope and a step away from its entanglement with Norwegian energy politics (the E would later be dropped entirely – in content though not in acronym – leaving CICERO's focus primarily on climate research). When Hernes left CICERO in 1996, "their profile had changed from close affiliation with the government, to closer association with other research institutes" (Molland 2017, 42). Today, CICERO is affiliated with the University of Oslo, although it is still an independent research institute with a strong climate policy orientation (CICERO n.d.).

CICERO today is classified as an environment institute, and describes themselves on their website as "Norway's foremost institute for interdisciplinary climate research." Their mandate is explicitly directed at developing relevant knowledge for and about national and international climate policy, and their website describes their core task as to "help to solve the climate problem and strengthen international climate cooperation by predicting and responding to society's climate challenges through research and dissemination of a high international standard" (CICERO n.d.). As mentioned above, CICERO scientists regularly contribute to the IPCC's Assessment Reports, and they also play a large national role as advisors and science communicators on climate science to Norwegian policy, business and media.

> CICERO has a national role in promoting knowledge about climate change and is internationally recognised as a driving force for innovative climate communication. We are in constant dialogue about the responses to climate change with public and private decision makers, government administration and civil society.
>
> *Description in the "about" section of CICERO's web page,*
> (CICERO n.d.)

It can be debated whether or not CICERO qualifies as a boundary organisation following the definition described above. Since Hernes' time as Director in the mid-1990s they have largely severed their formal ties to the Norwegian government, instead taking on a role as an independent science communicator and advisor – although they still receive some funding directly from the Ministry of Climate and Environment (CICERO 2017a). In addition, in many ways core to CICERO's current self-definition is its identity as a research organisation – and a top one at that, proudly emphasising its international acclaim for scientific excellence (CICERO n.d.). Unlike several other environment institutes, they also receive the majority of their funding from the Research Council of Norway (76% in 2017) – although they still engage in contract research, the majority of which is for public authorities (CICERO 2017a; Gulbrandsen et al. 2012). In fact, as described by one of my informants (I16), one of the conditions for CICERO's basic funding from the Research Council is that 25% of their funds should come from contract research.

As Gulbrandsen (2011) has argued for research institutes in general, CICERO can be seen to occupy a hybrid space in-between science and consultancy. In addition, the Center as described places a large emphasis on policy-relevant research, and wields significant authority as a source of science advice for Norwegian policy and politics, as well as in public discourse. Whether or not it formally qualifies as a boundary organisation, then, CICERO certainly operates "at the boundary" between science and policy. That, in addition to the fact that they unlike several other research institutes primarily rely on funding from the Research Council rather than from contract research, makes CICERO an interesting site for researching the shifting of this boundary through the increased science policy emphasis on user involvement in scientific research – as I will show in the coming chapters.

3 Methods and methodology

3.1 Whose knowledge is it, anyway? Epistemological underpinnings

As discussed in the previous chapter, this thesis is grounded in a theoretical framework informed by science and technology studies (STS) which takes as its basis a constructivist understanding of the nature of knowledge. This stance rejects what Haraway (1988) has described as the "God trick" of positioning certain ways of knowing as objective and certain scientific knowledge-makers as taking a position outside or above the phenomena which they study. Instead, this epistemological tradition sees all knowledge as essentially *situated*, irrevocably tied to the context of its creation and the cultural biases and social agendas of its creators (Law 2017). This includes the knowledge produced by social researchers.

One of the core concerns within STS has been the study of research methods as a field of practice, showing the ways in which scientific research – both natural and social – rarely follows the clear and linear descriptions of "the scientific method" given by philosophers of science, but rather are "messy," inextricably entangled with social dynamics, the researcher's own position and biases, and the "muddy" and unpredictable field of action and practice (Law 2017). This recognises that the researcher unavoidably has a part in co-producing the knowledge that arises from interviews and other research situations, and cannot necessarily claim a position as a neutral collector of "data" and reporter of "facts" (Law 2017; Aléx and Hammarström 2008).

As such, rather than attempting to enact a position as a neutral observer, this perspective holds that researchers should instead embrace and acknowledge the situatedness of the knowledge they produce (Haraway 1988; Harding 1992). Researchers are encouraged to adopt a position of *reflexivity*, wherein they continuously examine how their own social position and background, and the prejudices and blind spots that come with that position, impact their interpretations of phenomena and the ways they relate to their research participants (Bryman 2016, 388). Although some question an over-reliance on reflexivity as a source of superior

knowledge (Lynch 2000), it has become a core lens through which to discuss knowledge production in qualitative research (Law 2017), and as such I attempt to take a reflexive position in the following discussion of methods and methodology.

This constructivist perspective also entails that, rather than referring to the positivist criteria of objectivity, replicability, generalisability, and validity (all of which are problematised in a situated, constructivist understanding of knowledge), qualitative social research should instead be considered in relation to characteristics such as trustworthiness and authenticity, in addition to reflexivity. As described by Bryman, trustworthiness relies on four criteria: ensuring "credibility" through the validation of research results by research participants, as well as triangulation; "transferability" through the use of thick description to enable readers to make their own judgements about the research material; "dependability" through the use of transparency in documenting and reporting the research process; and seeking "confirmability" by showing that, although complete objectivity may be impossible, the researcher has made an effort not to overtly let personal biases affect the conduct of research (Bryman 2016, 384-386). Authenticity, meanwhile, requires sensitivity and attention to "the broader political impact of research" (Bryman 2016, 386).

In addition to an attempt to adhere to these more general criteria for qualitative research, the research for this thesis has also been conducted with attention to more specific discussions of method within STS. As so much of STS research in particular has been devoted to revealing the messiness of method, the field tends to reject a checklist approach to methodology designed to create an impression of external objectivity and neutrality, in favour of an interpretive approach which foregrounds transparency in discussions of the complex processes through which knowledge is produced (Law 2017).

3.2 Research methods

A case of what? Viewing CICERO as a case study

Due to its focus on the situatedness of all knowledge claims and the importance of locality and context, STS has generally centred a case study approach as its primary methodological instrument (Law 2017). However, the selection of any case study

requires a number of choices about inclusion and exclusion, in particular in drawing boundaries between case and context, or between "action (to be analyzed) and scenery (to be black-boxed)" (Wyatt and Balmer 2007, 623). The drawing of these boundaries for this master's thesis changed underway. Originally, I had intended to use a CICERO research project called *Power from the People (PFTP)*, and their work with user involvement, as my case study. However, early on in the interview process it became clear that many of the most interesting and in-depth reflections from my participants (both within and outside PFTP) on the challenges of user involvement and the new mode of scientific governance came not when talking about specific named research projects, but in the beginning parts of the interviews, when we were speaking about these science policy trends more generally.

In fact, some of my participants perceptibly "froze up" when the conversation moved from general science policy trends and their experiences with user involvement overall, to questions about the particular user involvement projects they had been part of. Most were also concerned that any statements they made about specific user partner institutions should be heavily anonymised. As will be discussed in Chapter 6, there appears to be a strong need for research groups to retain positive working relationships with core user partners in order to achieve continued funding, which could affect my participants' willingness to speak critically about their partners. In addition, as has been shown in the context of project-based funding in the development field, 3- and 4-year funding cycles can serve to incentivise funding recipients to represent projects as successful at the expense of discussing challenges, as an image of success may be essential to obtaining continued funding from the same source (in this context, the Research Council of Norway) (Mosse 2005).

This presents a challenge when doing interview-based research on a specific research project, where the identity of researchers and partner organisations could be fairly difficult to anonymise completely. Because of this, another method such as participant observation (perhaps with a longer-term engagement enabling more ethnographic research) might be more effective for a study of a specific research project and the collaborative relationships around it. However, this would have been difficult to accomplish within the scope of this master's thesis, particularly considering the time-frame of a typical research project (3–4 years) compared with

the fieldwork window of this thesis (at the very most six months). As such, the interview method used required drawing broader boundaries, and I chose to interview a wider range of CICERO staff in order to use the centre's experiences with user involvement, unattached to particular research projects, as my case study.

Another challenging aspect to all case study approaches is the question of generalisability. To what extent can any particular local case be said to speak to broader trends, or present insights which are applicable in other contexts? Following Irwin (2006), as well as Kershaw (2017), I suggest that the experiences described by CICERO can be seen as "symptomatic" of broader science-society relations. In particular, as discussed in Chapter 1, CICERO's role as a research institute focused on policy-relevant climate research, which depends primarily on the Research Council of Norway for its funding, means that they may be among the first research institutions in Norway to strongly experience a demand for user involvement in research.

Considering the literature reviewed in Chapter 2 and the analysis in Chapter 4, this demand appears likely to increase and spread more broadly through the Norwegian research sector, as well as internationally. However, it is important to be aware that the findings of this thesis, although they might point to some broader trends and could potentially reflect experiences shared by other research institutes, are also context-specific. This challenge offers another use for the three interviews I conducted with representatives of three of CICERO's partner research institutes. Although originally conducted because these three researchers were project members in PFTP, these interviews also serve as a form of triangulation, showing that many of the experiences discussed here appear to be shared by other research institutes.

Use of semi-structured qualitative interviews

The primary method of data collection used for this thesis was the conduction of semi-structured qualitative interviews. I chose the semi-structured approach in order to ensure that certain core topics were covered in all interviews and that key questions were phrased somewhat consistently, in order to enable comparison and drawing connections between different responses. At the same time, the choice of a semi- rather than fully structured approach enabled me to adjust the interview guides

somewhat between each interview to fit my different informants' backgrounds and roles, take into account "lessons learned" from how certain questions had been received in previous interviews, and allowed me the flexibility to follow interesting lines of questioning as they arose (Bryman 2016, 468-469). An example interview guide covering the core topics that were discussed in all interviews is presented in Appendix I – however, the guides were adjusted for each interview.

My interview approach was informed by an elite interviewing methodology. The phrase "elite interviews" refers to interviews carried out with participants who can be considered as experts within a certain field, or who hold positions of power in a certain community (Berry 2002; Richards 1996). Methodological discussions around these kinds of interviews highlight the importance of being aware of power relations in the interview encounter, and treating participants' statements as the statements of expert informants whose perspectives are based in a significant amount of experience with their field (Berry 2002; Aberbach and Rockman 2002; Richards 1996). Considering that most of my informants were researchers with PhDs and several years' experience working in the field of climate-related research, and some were even familiar with the theoretical frameworks and STS research on co-production which I draw on in this thesis, this was certainly a relevant perspective to include in the development of my interview methodology. Along with a concern with basing my analysis on an understanding of my participants' perspectives "from the native's point of view,"[10] so to speak, this is also the reason that I make extensive use of (sometimes long) quotes from my interviews in the analysis chapters of this thesis.

One particular aspect which required a reflexive approach during the interview process was the challenge of handling power relations. As a master's student interviewing academics, the roles in the interview situation could easily slip into a kind of script resembling a supervisor meeting. Many of my participants were more used to taking on a role of interviewer than one as interviewee, and expressed that it was strange (and interesting) to be "on the other side of the table." I was also aware that several of my participants – particularly those with a background in social sciences – were "evaluating" my interview methods underway. At the end of several

[10] A common adage about the purpose of anthropological research (Geertz 1983).

interviews, I received advice from my participants on completing the master's thesis and how I should conduct my research going forward.

However, this context meant that it was occasionally difficult to balance an approach of asking sometimes seemingly obvious, open-ended questions, and giving my participants the impression that I "knew what I was talking about" to the extent that they could trust me with more complex reflections. This created a need for me to find ways to flag my familiarity with the field, while balancing the risk that what I said could potentially colour my participants' responses. It also took some time, during my first few interviews, to find a way to subvert expected power relations and lead the encounter in an interviewer role.

Fieldwork and sampling

My interviews took place over the course of four months (September–December) during the fall of 2018. During this time, I carried out a total of 16 individual interviews averaging around 40 minutes–1 hour, as well as one joint interview with a CICERO informant and a research partner, which I also conducted together with a member of the SUM research project which this thesis has been written in association with, Communicative Circuitry of the Green Shift (CoGS). Of the individual interviews, 14 were with participants inside CICERO, and two were with representatives of two of CICERO's partner research institutions. All of the interviews were audio recorded and transcribed, with the transcriptions anonymised using an informant code and a code sheet that was shared with the CoGS group. In addition, I had access to transcripts of interviews conducted as part of the CoGS project, including six interviews with staff at the Research Council of Norway.

After identifying CICERO as my case study, I used a snowball sampling methodology for my interviews (Bryman 2016, 415-16). Six members of the *Power from the People* project, three in CICERO and three outside, served as original points for the snowballing; along with three members of CICERO's Climate Services research group, which focuses particularly on co-production approaches and the production of useful knowledge for different stakeholders. At the end of each of my interviews, I asked my participants whether there was anyone else I should speak to, and they would suggest others who had experience working with co-production or

user involvement, or who they knew to have had interesting experiences related to these topics. Toward the end of my interview period, participants often repeated the names of people I had already spoken to, and the contents of the interviews more generally appeared to reach a point of "theoretical saturation" (Bryman 2016, 412). I had a high response rate to my requests for interviews, with only six of a total of 23 people contacted not responding or saying no.

The resulting sample spanned across several different thematic areas. CICERO organises their work around the six main working areas of Climate Finance, Climate Policy, Climate System, Impacts, Local Solutions and Mitigation (CICERO 2019), of which I spoke to members of all groups except Mitigation, although most of my informants were clustered around the Impacts and Local Solutions groups. Considering that these two groups are primarily focused on action- and solution-oriented research, this clustering was relevant to the topic of this thesis. Appendix II presents a list of the informant codes used, along with each participant's title and affiliation, as well as their field. In total, I interviewed 8 social scientists and 7 natural scientists, as well as one communications specialist and one engineer (one of the non-CICERO informants).

Prior to the interviews, each of my participants signed an informed consent form following the Norwegian Centre for Research Data's (NSD) standards for data privacy. I also received NSD clearance for carrying out my thesis research. Following the completion of the first draft of the thesis' analysis chapters, I sent each quoted participant an email with a word document containing the quotes from their interviews which I had included in the text, as well as some of the surrounding text, so they could see the context in which I was using their statements and how I had interpreted them. I received responses from all but one of the participants, nine of which requested adjustments to their quotes. Most of these adjustments concerned phrasing and translation, as several of the interviews were conducted in Norwegian; and two concerned anonymisation. Two participants felt I had misinterpreted some of their statements and requested "deeper" adjustments to the quotes or their use. In accordance with the above-mentioned qualitative research standard of participant validation, I complied with all participants' requests for changes to the quotes. However, this did not have a significant impact on the main points in the analysis.

Mixed methods analysis

After transcribing the interviews, I began the analysis using an interpretive methodology drawing on thematic qualitative data analysis (Bryman 2016, 548). Using the software NVivo, I went through each interview transcript creating coding categories in two rounds. In the first round, I coded densely, marking any interesting themes or topics that came up relating to the thesis questions and attempting to categorise my informants' responses to core questions. Based on this first round of coding, I then identified which broader themes and topics came up most frequently and went through the transcribed interviews again, coding for these broader categories. The final list of codes used is included in Appendix III. In particular, many of my informants' responses clustered around the themes of relationships with user partners, the resource demands of user involvement, science-society relations, the concept of useful knowledge, understanding users' needs, and defining the user in the context of user-involved research.

This coding strategy served as a useful way to identify core themes around which to structure the analysis, as well as a way to view different participants' statements around the same topics in relation to each other. At the same time, I sought to avoid the "data fragmentation" which can occur when relying on coding in qualitative data analysis (Bryman 2016, 583), and attempted to ensure that my final use of interview quotes was conscious of their context. In addition, I viewed my informants' statements both in the context of their roles as highly informed expert informants, as well as expressions of their particular perspectives, contextualised through their academic and professional backgrounds and their roles.

The analysis in Chapter 4 of the Research Council of Norway's policy framework and funding mechanisms for user involvement is based on an approach informed by discourse and document analysis (Bryman 2016). In the first part, examining the Council's definitions of user involvement in the background documents for their 2019 policy on open science, I focus on the way language is used in these documents in order to construct a narrative through which the demand for user involvement is defined and legitimated, drawing on previous research on different understandings of the concept of co-production. The second part takes a more materialist approach, focusing on the distribution of research funds across different categories (Law 2017).

This analysis is based in an understanding that documents do not simply describe an external reality, but actively take part in modifying and transforming that reality, highlighting that words and materialities should not be seen as separate or conflicting fields of research, but rather must be understood in terms of how they interact and work together (Asdal 2015).

Ethical considerations

As mentioned above, the research conducted for this thesis received clearance according to NSD's standards for data privacy, and I have attempted throughout the research process to comply with the qualitative research standards of trustworthiness, authenticity and reflexivity, with a particular focus on participant validation and transparency in describing the research process. In addition, I have attempted to thoroughly anonymise the interview data, replacing names with an informant code combined with title and affiliation, and limiting mentions of particular fields of research, which may constitute identifying information. As an additional layer of anonymisation, I have also made use of gender-neutral pronouns (they/them) when referring to all interview participants, as participants' genders were not relevant to the analysis.

In addition to these general considerations, one particular ethical consideration for this thesis has been the potential impact of the thesis findings on CICERO Center for International Climate Research. As mentioned above, my participants were often hesitant to discuss challenges and critical reflections in relation to specific research projects or user partners, and both during and after some of the interviews where particular user partners had been named I received requests to anonymise or to not include this information. This likely relates to the dynamics discussed in Chapter 6, where maintaining a positive relationship with core user partner institutions is essential for research institutes to maintain their access to funding. Because of this, I have attempted to be particularly cautious in my use of quotes when referring to the topic of scientist-user relations, and have ensured that the final quotes used have been approved by the relevant participants (in some cases, with additional anonymisation added following participants' inputs).

Another challenge along the same vein has been the risk of leaving an impression, through the use of CICERO as my case study for this thesis, that the challenges discussed here in terms of meeting the demands for user involvement are unique to the Center. Considering that the Research Council of Norway is placing an increased focus on user involvement in research as a funding requirement, this could potentially have problematic consequences. Therefore, I have attempted to highlight that the experiences in CICERO are likely symptomatic of broader science-society relations. The triangulation of my findings through interviews with three of the Center's research partners also indicates that many of the challenges described here are also experienced by other research institutions. In addition, although I base my analysis primarily on interviews with CICERO staff, I am not affiliated with CICERO, and the final analysis and conclusion of this thesis are my own and do not necessarily reflect CICERO's views on these topics.

4 Responsible research? Building a new science-society relationship

4.1 The new mode of scientific governance in Norway and the EU

As described in Chapter 2, the governance of scientific research systems appears in recent years to have entered a new mode, with a variety of different actors describing, advocating or theorising a change towards a new relationship between science and society. This shift has been characterised by a stronger focus on scientific research working in alignment with societal priorities, and calls for the involvement of a range of non-academic actors in the governance and conduct of scientific research (Kershaw 2017). It is this science policy shift which I seek to study in this thesis, focusing on the increased demand for user involvement in scientific research processes as one of the key tools for this new mode of governance.

One of the most enthusiastic drivers of this push has been the European Union, in particular through its 2018–2020 Framework Programme for Research and Innovation, Horizon 2020. One of the core focus areas in Horizon 2020 is the programme "Science with and for Society," which aims to enable "all societal actors (researchers, citizens, policy makers, business, third sector organisations etc.) to work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of European society." This approach is described by Horizon 2020 as Responsible Research and Innovation (RRI) (EC 2019a).

This inclusive mission has been met with a variety of reactions. Many researchers, including several within STS, welcome these participatory approaches as a democratising wave that will ensure that science is held to account to its responsibility to produce knowledge which is beneficial for society as a whole (Irwin 2006). Stilgoe and Guston write that new concepts of responsible research and innovation are based on "perennial" ideas from science and technology studies, and that this new direction in scientific governance should be seen by STS researchers as

"a challenge and an opportunity" to be "critically examined and to be reflexively practiced, to be concerned about and to be hopeful about" (Stilgoe and Guston 2017, 870). Others raise questions about the EU's use of concepts like RRI, such as Prainsack and Leonelli (2018), who describe a growing depoliticisation of the concept of "responsible science" which risks shifting the ideas it carries away from their original meaning.

> Responsibility no longer means a collective responsibility to ensure that science contributes to making our societies more just and more dignified for everybody to live in. Instead, it increasingly connotes a duty for individual scientists – professional scientists or citizen scientists – to be useful to existing systems. (Prainsack and Leonelli 2018, 103)

The authors specifically mention the EU's concept of RRI as an example of the "worst instantiation" of this shift, describing that in this conceptualisation, "responsibility boils down to the duty to create a societal impact, which in turn is seen as an incentive – or even a societal need – to partner with industry" (ibid). In a similar vein, Lövbrand (2011) argues that the conceptualisation of co-production most commonly employed in European science policy is based in a "logic of accountability" which sets an agenda of producing useful knowledge which can slot in to existing policy frameworks and goals. She contrasts this with a "logic of ontology" approach, which would incorporate a broader range of perspectives into scientific knowledge production in order to more fundamentally challenge existing knowledge and the basis of contemporary policy-making. These concerns raise questions about whether current science policy shifts toward increased emphasis on RRI and user involvement are part of building the knowledge-democratising map of science-society relations which I described in Chapter 2 as the "agora," or whether a different cartography can be seen in the way these concepts are being implemented and shaped by actors like the European Union.

The Research Council of Norway appears to be following suit with the EU's increased emphasis on ensuring that scientific research works in alignment with societal priorities. Since 2000, the EU appears to have become the Research Council's primary reference point for science policy direction, to the extent that in their history of the Norwegian Research Councils, Brandt et al (2019) describe the period from 2000 onwards as "the age of international research." This has coincided

with an increased emphasis on ensuring that Norwegian research is aligned with both national and international priorities, with the introduction in 2003 of "large programmes" which replaced the previous division of funding according to sectors and academic disciplines (Brandt et al. 2019, 516). Since then, these programmes have become ever larger and more interdisciplinary, and are seen in part as instruments to represent the different Norwegian government ministries' priorities for research funding. This is exemplified by a ministry advisor quoted by Brandt et al. to have said in a 2016 meeting with the Research Council, "what we are frustrated about, is that when we've given you our priorities you give our money to the project with the best academic quality" (Brandt et al. 2019, 546). In other words, at least according to this ministry advisor, the Research Council should hold the ministries' priorities as the most important factor in the distribution of their programme funding.

Although, as shown in Chapter 2, the demand for research to be relevant and useful to society is not necessarily new in the Norwegian context, Norwegian research governance currently appears to be aligned with international shifts toward the "new mode" of scientific governance. When the Research Council of Norway in recent years has worked to position itself as an "active agent of change" in the Norwegian research system, it is particularly in the context of positioning itself as a driver of this science policy shift (Brandt et al. 2019, 543). The Research Council also appears, particularly in recent years, to have taken up the EU's call for RRI and other mechanisms for including non-scientific stakeholders in the production and governance of scientific research. When my informants in CICERO described experiencing an increased demand for user involvement in scientific research projects, they often mentioned the Research Council as a primary driver of this push.

Building an agora in the Research Council of Norway?

In this chapter, I will describe how the Research Council of Norway is currently implementing this policy shift, seeking to examine with what conceptual frameworks, and through which mechanisms, the Council is encouraging increased user involvement in scientific research. In this context, a number of interesting changes took place during 2018 and 2019, which will be the focus of this chapter. In particular, the Research Council has initiated a process for developing a new "comprehensive policy for open science" which will be finalised in 2019, of which

user involvement, Responsible Research and Innovation, and citizen science together constitute one of three primary focus areas.

Through focusing on the Research Council in this chapter, I seek to explore the first thesis sub-question posed in Chapter 1: *How does the Research Council of Norway define the concept of "user involvement," and how do they use their policy and funding mechanisms to promote increased user involvement in science?* Viewing these shifts in the context of the literature discussed in Chapter 2, which describes how a number of different conceptual lenses underpin different uses of the term co-production, I wish to explore which of these concepts appears to inform the Research Council of Norway's usage of "user involvement." Is the Council, through its policy and funding mechanisms, drawing up the knowledge-democratising agora? Or is another orientation visible in the way they employ the concepts on which they build their policy for open science and funding mechanisms for user involvement?

Starting with this structural-level examination of the Research Council's policy and funding frameworks will serve to contextualise CICERO's experiences with user involvement, which will be the focus of the following two chapters. This analysis focuses primarily on the Council's policy development and structures as of 2019 and more recent years, to examine how the Research Council is currently positioning themselves in relation to demands for user involvement and open science more generally. The recent shifts in the Research Council described by Brandt et al. (2019), which are discussed above and in Chapter 2, indicate that the changes discussed in this chapter represent the latest move in a long-term development within the Council toward the new mode of scientific governance.

In particular, this can be seen in the Research Council's recent more explicit focus on promoting user involvement approaches, and on the increased alignment of its policies and funding mechanisms with those of the EU, including the adoption of the concept of RRI. The fact that the Research Council is currently in the midst of a process for developing a "comprehensive policy for open science" provides a particularly good opportunity for gaining a window into their current perspectives on these topics.

4.2 Open science in the Research Council of Norway

> I think it's really interesting, this thing about user involvement – it's something that has kind of washed over us now.
>
> Special Adviser (I19), Research Council of Norway

The year in which I am submitting this thesis, 2019, is shaping up to be a big year for open science in Norwegian science policy. At the beginning of the year, the Research Council of Norway (RCN), the country's primary research funding body, set into motion two parallel policy processes intended to direct the Norwegian research and academic communities toward greater openness: "Plan S," and a new policy for "open science."[11] Plan S is a part of Norway's membership in an international coalition called cOAlition S, which seeks to reform the academic publishing sector toward increased open access, with the overarching goal that all research funded by its member states should be published with immediate free and open access by 2020 (Røttingen 2018).[12] Alongside this, the Research Council of Norway is at the time of writing engaged in a process for developing a "comprehensive policy for open science," organised around the three themes "open research processes," "open innovation," and "involvement and citizen science" (RCN 2018c).[13]

In this section, I will first look into how the background notes for the Council's policy for open science define and describe user involvement, using these documents to discuss how the Research Council of Norway's policy documents for open science conceptualise user involvement, and whether this conceptualisation is linked to any particular lens or logic of co-production (as discussed in Chapter 2). In addition, I will examine how this push for user involvement is explained and legitimated by the Research Council.

[11] In Norwegian, the term used is *åpen forskning*, translating directly to "open research" – a term which is somewhat more neutral as to the distinction between hard vs. soft or natural vs. social sciences than the English word "science."
[12] The implementation of Plan S in Norway has been met with some controversy, particularly from Norwegian academic environments concerned with the potential impacts of this plan on the ability of Norwegian researchers to publish in international "top journals" (Koch 2018; Carling et al. 2018).
[13] All of the Research Council's documents describing this policy are written in Norwegian, and have therefore been translated by me while attempting to stay as close to the original phrasing as possible. The original, Norwegian-language documents are included as appendices.

A comprehensive policy for open science

At the time of writing, the Research Council's process for developing a new policy on open science is still ongoing. As a first step in the process, the Council published a set of background notes on each of the three thematic areas "open research processes," "open innovation" and "involvement and citizen science" at the end of 2018. The notes set out a basic goal and premise for each theme as well as posing a list of questions, on which they requested inputs from relevant groups by the 1st of February, 2019. The overarching goal for the policy is to "clarify which goals [the Research Council] should work toward achieving within the field of open science," as well as to "clarify and define [the Council's] own role in this, and suggest measures for stimulating more open science in the Norwegian research and innovation system." Following the 74 inputs to the policy sent in from 47 different institutions in February of 2019, the Council has announced that they will publish a comprehensive document outlining their open science policy and invite a second round of inputs "before summer" (RCN 2018c).

The background notes describing the three main thematic areas for the policy outline them as follows: Note 1 on "open research processes" focuses on "describing how the research process in itself can be changed through new forms of sharing, collaboration and participation, in part driven by digitalisation." Note 2 on "open innovation" focuses on "businesses and public institutions, who through increased involvement, sharing and cooperation can achieve faster and better solutions, as well as economic and societal value creation." And Note 3 on "involvement and citizen science" focuses on how "researchers can involve civil society[14] and fellow citizens in different ways in the research process." (RCN 2018c)

Although all three thematic areas form part of a comprehensive strategy, this thesis focuses specifically on calls for the inclusion of non-academic societal actors in the scientific research process, as this is an agenda which has grown rapidly in recent years and on which more research is needed, as discussed in Chapter 1. As such, the following analysis focuses mainly on the third thematic area, "involvement and

[14] In this summary, the Research Council use the term "civil society." However, in the background documents for the policy they define "users" more broadly as "those who have a direct use for the research, from the private sector, public sector, authorities and civil society."

citizen science," and then primarily on the first part of this theme – that of user involvement.

It should be noted that I am viewing this policy process at its very beginning, and that the round of inputs submitted in February by various (largely academic) groups may change the Council's formulation of their open science policy significantly. However, it is interesting to examine which ideas of open science and user involvement shine through in these first background documents for the policy. As these documents were produced by the Research Council before any formal round of inputs, they can perhaps be understood as coming primarily from the Council itself rather than from other actors, and so can serve as a partial window into the prevalent views on open science and user involvement within the institution.

Defining users and user involvement

Note 3 on involvement and citizen science (Appendix IV) is a short, three-and-a-half-page document which briefly describes three "forms of involvement" in science which the Research Council seeks to highlight in their new policy: a) user involvement, b) Responsible Research and Innovation (RRI) for solving "large societal challenges," and c) citizen science. The document also poses a list of questions on each theme for the groups responding with inputs to the policy. The note is accompanied by a 3-page appendix which offers slightly more background on RRI and citizen science, and details the Research Council's own activities under the categories of user involvement, RRI and "involvement of the public" (Appendix V).

Both Note 3 and its appendix place the largest focus on the topic of citizen science, to which the main note devotes slightly more than two pages, which make reference to the researcher Dick Kasperowski's definition of the term. The two other topics, of user involvement and "large societal challenges," are given about a single page put together. As such, the Council's definition of user involvement in these documents is not comprehensive – and, unlike the definition of citizen science, does not refer to any research or specific theories. They give a passing mention to Responsible Research and Innovation, but do not define the term beyond mentioning in the appendix that "RRI has become an important concept in European research and innovation policy" and that "RRI will inspire experimentation, development and

learning across established boundaries, sectors and disciplines." Given this vague definition, the documents' use of RRI resembles ways the term has been used in other areas of science policy, as a buzzword (Bensaude-Vincent 2014).

Note 3 describes user involvement in science as "increased participation and influence from the users of research in its prioritisation, planning, and execution." It identifies five areas of the research process to which users can contribute:

- identifying relevant themes/issues where there is a need for research
- identifying factors which can promote or hinder participation in projects
- bringing in new perspectives in the analysis and interpretation of results
- giving inputs on the use of language, presentation and dissemination channels
- disseminating results to relevant groups/stakeholders

In other words, the document envisions possible user involvement in most stages of the research process, from design to analysis and communication, although it does not mention user involvement in data collection. However, public participation in scientific data collection is one of the primary focuses of citizen science. In addition, the section on RRI and "large societal challenges" sets out a broader goal of "clarifying which challenges and opportunities we are facing through involvement and participation."

The document also defines "users" broadly as "those who have a direct use for the research, from business, the public sector, authorities and civil society." It mentions that which specific actors should be engaged as user partners in a particular research project will depend on the theme and purpose of the research, giving the example of "patients, next of kin, professionals and decision makers" as relevant users in the context of health research.

Based on these documents, it appears that the RCN is operating based on a very broad definition both of the concept of user involvement and of the category of "users." User involvement can, theoretically, take place in almost any stage of the research process, and almost any societal group can theoretically be positioned as

users in a research project. When in later chapters this thesis will turn to an examination of scientists' actual experiences with user involvement, this broad conceptualisation serves as an interesting backdrop. In Chapters 5 and 6, I will examine whether user involvement in practice currently appears set to achieve the ambition of all-encompassing involvement set out in these policy documents.

Reasons for involving users

As for the rationale behind increased user involvement in science, the benefits proposed in the documents can be summarised in five points: 1) increased relevance, 2) increased usefulness, 3) increased quality of applied research, 4) better implementation of research results, and 5) contributing to solving "large societal challenges." Increasing the relevance of scientific knowledge is positioned as the primary goal of user involvement, set alongside "usefulness." In the second half of Note 3, the question of in which areas the Research Council should focus on promoting user involvement is posed in this way: "Are there areas where user involvement is especially useful?"[15] Despite their centrality as reasons for user involvement, however, neither "relevance" nor "usefulness" is defined in either of the documents.

The chains of causality between these five proposed benefits and the increased focus on user involvement are also not specifically defined, beyond the list of ways users can contribute to the research process. However, the document ties the need for these aspects of open science to what appears to be a nod to broader discussions of a changing relationship between science and society: "since research and innovation to an increasing degree are about developing knowledge which contributes to solving large societal challenges, openness and involvement are becoming ever more important." This is highlighted particularly in the context of "large societal challenges" which are "complex and unpredictable" – with the examples given being climate change, sustainable development, transition to "the renewable society," issues related to refugee flows and immigration, sustainable food production, and health.

[15] In Norwegian, the term translated here as "useful" translates more directly to "having use-value" (*har spesiell nytteverdi*).

As such, it appears that the justification given by the RCN for increased user involvement in science is primarily based in an instrumental understanding of these processes – as was also found by Lövbrand (2011) in her analysis of European science policy. In the RCN policy documents, the primary reasons to increase user involvement and implement RRI are held to be "making knowledge relevant and useful," and to ensure that science contributes to solving large societal challenges. In general, the notes focus mainly on ways the inclusion of non-scientists in research can improve the *use-value* of the resulting scientific knowledge for different groups – an orientation which is perhaps implied by the Council's choice of "user involvement" as its term for these processes. The weight on the word "user," in itself, points toward the instrumental lens which seems to underpin these policy documents.

User involvement as a vaccine against the scientific legitimacy crisis

Another stated aim of the forms of involvement described in Note 3, as well as of the open science policy overall, is to "build faith in research" among "society" and "the public." This was also mentioned in one of the CoGS group's interviews with staff at the Research Council, although framed as a personal thought:

> And maybe I also think that – this is just my own thought – but related to what I said earlier, about society losing faith in scientific knowledge, maybe user engagement can be a kind of vaccine against that. That you take knowledge production out of the ivory tower and make it so that it's produced more together with users. So then you might avoid it losing legitimacy, if that's what is happening.
>
> Special Adviser (I19), Research Council of Norway

Unlike this Special Adviser, who mentioned the idea of the "ivory tower," Note 3 and the other documents laying out the background material for the Research Council's policy on open science are noticeably positive in their orientation. While focusing on the potential benefits of open science, they avoid diagnosing any problems with "closed science" which the policy is presumably seeking to mitigate – except by implication. The closest Note 3 comes to directly pointing to a problem with older models of scientific inquiry is this question: "How to challenge traditional expert roles in open research and innovation processes?" The suggestion of a need to

challenge traditional expert roles clearly seems to imply that these expert roles have previously been problematic in some way.

In general, Note 3's diagnosis of problems with previous scientific models is firmly located between the lines. For example, the sentence "to make research relevant and useful, it is important to ensure increased engagement and influence from the users of research…" implies that research before or without this engagement has not been sufficiently relevant or useful. Similarly, the statement quoted above, that "research and innovation to an increasing degree are about developing knowledge which contributes to solving large societal challenges," implies that creating this kind of knowledge was the focus of research and innovation to a *lesser* degree previously.

The background documents for the Research Council of Norway's policy for open science as such seem fairly aligned with other voices calling for open science internationally. Although the Council avoids making any of these claims directly, the documents imply the problems with closed science I described in Chapter 2 as the primary justification for the push towards increased openness – lacking public faith in science, a deficit of democracy, and a perceived tendency of scientists when left to their own devices to be insufficiently in tune with societal needs and priorities (Mirowski 2018). Although between the lines, then, Research Council appears to be joining other proponents for open science in calling for a siege on the ivory tower.

However, it is less clear whether the Council's instrumental definitions of the purpose of user involvement call directly for building the agora. This idea – of a free and open dialogue between scientists and other societal actors leading to a more inclusive or democratic form of production and dissemination of scientific knowledge – is alluded to in the background notes for the policy for open science. Even the language used in the Council website's first blurb about the user involvement and citizen science hint toward this agora map of science in society:

> In note 3 "User involvement and citizen science" we describe how researchers can involve civil society and *fellow citizens* in different ways in the research process. *Real and equitable participation* can build faith in research and benefit society.
>
> (RCN 2018c, emphasis mine)

In Note 3 and its appendix, too, these ideas are referenced. The section on citizen science mentions "democratisation" of research, and the part on RRI mentions that solving large societal challenges requires involvement by a broad spectrum of societal actors in order to "lift up different perspectives." As suggested by the Research Council Special Adviser quoted above (I19), it appears to be this very democratisation which is intended to "build faith in research" among society and the public.

As such, although its definition of user involvement appears primarily informed by an instrumental understanding of the concept, ideas of knowledge democratisation are also present in the Research Council's policy documents on open science. The two lenses – in Bremer and Meisch's (2017) terms, of iterative interaction and extended science – appear side by side, although they do not occupy an equal amount of space. The instrumental lens takes centre stage, through the call "to make research relevant and useful." The notion of knowledge democratisation, in turn, plays more of a supporting role, serving to legitimate how open science and user involvement are intended to "build faith in research and benefit society." Viewed as cultural cartography of science, the Research Council's conceptualisation of open science and user involvement in these documents position the two aims of instrumentalism and knowledge democracy as very much a part of the same landscape, although instrumentalism appears to be the capital city and democratisation its supporting farmlands.

In light of the assertion by Lövbrand (2011) that there exist significant trade-offs between what she describes as the "logic of accountability" and "logic of ontology" ways of conceptualising co-production, this begs the question: are these two aims as complementary as they are positioned to be in the Research Council's policy documents? Is this, in fact, all part of building the same landscape of science-society relations – the open and democratic agora? I will return to these questions in Chapters 5 and 6. For now, I will examine another part of the architecture laid out by the Research Council to promote increased user involvement in science – the funding mechanisms used to bring this rearrangement of science-society relations into being.

4.3 The Research Council's mechanisms for promoting user involvement

The background notes for the Research Council's policy for open science talk about the need for "increasing the application of user involvement," and mentions that user involvement is already "well incorporated in some focus areas and activities," mentioning the themes of health, innovation, energy, climate and environment as examples. It does not go into specifics on how the Research Council seeks to promote, and already promotes, increased user involvement – and perhaps this is a lot to ask of two three-page documents. However, in order to understand the way these policy shifts are playing out in practice in the Norwegian research sector, it is important to look into the actual mechanisms the RCN uses to promote the increased involvement of users in scientific research projects.

Almost all of my informants in CICERO described experiencing an increased pressure to work on projects involving different stakeholders or user partners. Although some described this as a general trend within international climate science (and science overall), many also cited the Research Council of Norway as a primary driver of this push toward increased user involvement, influenced particularly by the EU and Horizon 2020. Several of my informants listed a number of non-financial reasons for involving user partners in research projects, which I will discuss in Chapter 6. However, demands from the Research Council were also clearly impactful in directing the Center toward this kind of work. In the words of one participant:

> And it's science policy, right? I mean, we're dependent on money to keep the wheels running. We're a commercial business in the sense that we have less than 15% basic funding, and we need to cover the remaining 85% to keep it afloat. So then we have to go where the money is, and if the money is programmed as user-financed project funds – well, then we have to do that. Or we have to find another job.
>
> Senior Researcher (I16), CICERO

The following section gives a brief outline of "where the money is," by describing the funding mechanisms that have been used by the Research Council of Norway to incentivise increased user involvement in scientific research. Then, it looks into how

these mechanisms have been used in the Council's first call for research project applications in 2019 (the April 10th call).

Programmes and application types: the building blocks of the Research Council's funding mechanisms

As mentioned above, the Research Council of Norway is Norway's primary research funding body, which according to their last-published annual report administered a budget of NOK 9.7 billion in 2017 (RCN 2017).[16] In addition to providing basic funding to different academic and research institutions, the Council organises the distribution of these funds along two axes: programmes and application types. The information in the following section is derived from the Research Council's web pages, where the different programmes and application types are described, and calls for project applications are published (RCN 2019c).[17]

During 2003 the Research Council of Norway went through a restructuring, part of which was the organisation of their project funds through thematically-oriented and interdisciplinary "large programmes," many of which receive earmarked funding from Norwegian government ministries to support research within prioritised areas (Brandt et al. 2019, 515). Two current examples which fund a number of CICERO's research projects are ENERGIX or "large programme on energy," and KLIMAFORSK, "large programme on climate." They respectively finance research and innovation for "sustainable development" of the energy system; and research to help society adapt to and "meet" climate changes (RCN 2019a, d).

For each funding call, the programmes allocate their funds across a number of different "application types." The application types set out requirements and evaluation criteria for different kinds of research projects, organised by research "function." One of the main factors distinguishing the different types appears to be which kinds of institutions can apply for the allocated funds, and what kinds of stakeholders are to be involved (Appendix VI). As such, the distribution of funds

[16] At the time of writing, the report for 2018 is not yet available.

[17] The pages were originally accessed in January and February of 2019 for the first draft of this analysis, and in the time right before this thesis was to be submitted the RCN's website was going through a redesign which was only to be completed after the thesis deadline. As such, I am not certain whether all of the URLs included in the bibliography will continue to lead to the pages that were used to develop this description.

among different application types seems to be the primary mechanism by which the Research Council can influence the extent to which scientific institutions work with different kinds of user partners.

While I was writing this thesis, RCN was in the midst of another restructuring of their funding programmes, which involved a number of changes. First, all project proposals, regardless of programme and application type, would now be assessed by the same three criteria: excellence, impact, and implementation (RCN 2019i). Second, most calls for proposals under the same application type would now be given the same deadlines, rather than being dispersed throughout the year as they had been previously. And third, the Council was moving from using what was described by one RCN informant as "seventeen or something like that" application types, to using seven. These seven new application types are listed in Appendix VI, although detailed information on them appeared to still be under development at the time of writing this thesis (RCN 2019g).

The fact that the Research Council was going through this restructuring during the spring of 2019 means that there were a fair amount of moving pieces in the systems which the following description is based on. Below, I describe three of the RCN's application types: the first two being *Researcher Projects* and *Collaboration Projects on Societal Challenges and Business Development*, which were used in the April 10th call for proposals; and the third being *Knowledge-building Projects for Industry* (KPNs), which my CICERO informants often mentioned as the sites of their primary experiences with user involvement. However, following the April 10th call for proposals, it appears that the Council's new set of seven application types may collapse Collaboration Projects and KPNs into a single application type titled *Knowledge-building and Collaboration Projects.* Detailed information on the requirements for this new project type is not yet available. As will be discussed below and in Chapter 6, however, the way these requirements are structured is likely to have significant implications for which kinds of actors are engaged as user partners, as well as the relationships between researchers and users.

In addition, the description in this chapter excludes research funds and projects which are "owned" primarily by non-academic user partners rather than by the researchers themselves. Prior to the increased use of funding models like

Collaboration Projects and KPNs, bilateral research contracts between specific public- or private-sector actors and research institutions, as well as industry-led and RCN-funded Innovation Projects, have been some of the primary mechanisms for collaboration between researchers and non-academic stakeholders. However, the models discussed here, for projects which are led by research institutions but take non-academic user partners on board, represent a shift in these collaboration mechanisms. Contract research and Innovation Project models seem to foreground the user partner's needs and priorities in a more clear-cut way, with researchers taking a position as "contractors" who are intended to make a specific contribution defined by the public- or private sector actor who owns the project. Meanwhile, the Collaboration Projects and KPN models discussed below appear to be based on an idea of a more two-way collaboration model, combining academic aims with those of the user partners.

Researcher Projects, Collaboration Projects and KPNs

The informally and descriptively-named Researcher Projects application type encompasses projects where funding is given entirely to one or more research institutions to enable free or basic research. In addition to several smaller thematically-targeted funding programmes, the largest funder for this type of research – and perhaps the largest single funding programme overall, with NOK 820 million earmarked in 2019 – is FRIPRO, which is described on the Research Council's website as follows:

> Funding is available under the FRIPRO scheme for independent, basic research projects in all subject areas. The FRIPRO scheme provides support for this kind of research because it is crucial for scientific and academic renewal, and it can form the foundation for more applied research, industrial development and policymaking.
>
> (RCN 2019h)

Interestingly, the very first statement on the webpage describing FRIPRO begins with a "because," signalling a concern with justifying the programme's existence. Almost as if anticipating a challenge, the Council immediately offers an argument for why free and basic research should be funded. Even more interestingly, they partly ground this justification in highlighting the (potential future) use value of such

research, by stating that it can "create a foundation for more applied research, economic development and policymaking."

Although it seems like most of the other programmes publishing calls Researcher Projects also make use of other application types, FRIPRO only offers funds for Researcher Projects. While they offer funding for "pure" Researcher Projects, many of the other RCN funding programmes are directed towards specific areas of research aligned with different ministries' priorities, and intended to support research which contributes to solving "large societal challenges" (Brandt et al. 2019). As such, the FRIPRO scheme might be one of the only RCN funding sources which does not centre research making a specific contribution to society – however, in line with the 2019 restructuring, FRIPRO project applications are now also judged by the "impact" criterion, with applicants asked to describe the "long-term changes in society to be brought about by the project results and outcomes" (RCN 2019f).

Collaboration Projects on Societal Challenges and Business Development (henceforth Collaboration Projects) are an application type used in the April 10th call for project proposals "in which one or more research organisations collaborates with relevant actors from the public and/or private sectors." The objectives for these types of projects were to be "to help to find solutions to societal challenges and enhance business development in priority areas." In addition, Collaboration Project proposals should involve one or more "relevant actors from the private and/or public sectors" who have made a binding agreement to participate in the project. The funds distributed for these calls "may include costs for project partners," meaning that the funding allocated by the Research Council could also be disbursed to non-scientific partners in order to cover their own project costs (RCN 2018a).

The third application type of interest to this thesis, Knowledge-Building Projects for Industry (KPN), has been in use by the Research Council for almost 20 years, since 2000 (DAMVAD 2013). This project type was often mentioned in my interviews as one of the primary sites for my informants' experiences with user involvement. The purpose of KPN projects is "to contribute to industry-oriented researcher training and long-term competence development within topics that are crucial to the development of business and industry." To do this, the projects are to be carried out "in binding cooperation with relevant actors from Norwegian trade and industry." Perhaps most

importantly distinguishing KPN projects from other application types, these partners "must contribute funding for the research activities conducted at the research institution(s)." Up until 2019, the required proportion of funding to be contributed by user partners has been 20% of the project's total budget. Currently, there is no information available on any required co-funding proportion for KPN applications in 2019 (RCN 2019e).

These last two application types – Collaboration Projects and KPNs – appear have been two of the primary mechanisms by which the Research Council could promote increased user involvement in science. One of the main differences between them seems to be one of funding – while Collaboration Projects open for the possibility of user partners *receiving* funding from the money disbursed by the Research Council based on the research project proposal, KPNs require that user partners *contribute* part of the funding. In addition, Collaboration Projects focus on a broader set of stakeholders "in the private and/or public sectors," while KPNs are focused specifically on "business and industry."

As such, the requirements of these application types serve to concretise the broad definition of "users" given in the RCN policy notes described above. In the case of KPNs, user partners are likely to be only those private-sector actors who have the resources to co-fund a research project. For Collaboration Projects, there appears to be a broader scope for different kinds of potential users, as the possibility of funding covering non-scientific partners' costs related to the project opens for the inclusion of partners who do not have the resources to contribute by co-funding. At the same time, it may only be a certain type of "business, public sector, authority or civil society" actor who has the institutional capacity to participate in a research project. It will be interesting to see which kinds of groups and institutions end up being engaged as partners in Collaboration Projects after the April 10th call.

By requiring for both Collaboration Projects and KPNs that project proposals include already-established agreements of binding cooperation with partners, the Research Council has also made negotiation and reaching agreement with these partners an important part of the proposal development process. I will return to the ways these funding mechanisms have influenced which actors act as user partners, and how they impact scientist-user relations, in Chapter 6. In addition, the fact that these two

application types as of 2019 appear to have been collapsed into a single application type is likely to have interesting implications in light of the impacts of the RCN's funding structures and requirements which are discussed here and in Chapter 6.

The allocation of funds in the April 10th, 2019 call for applications

For the new joint April 10th deadline, calls for two application types went out in February 2019: Researcher Projects and Collaboration Projects. 24 calls were posted for Researcher Projects totalling a potential budget of NOK 2.3 billion, and 10 calls were posted for Collaboration Projects totalling a potential budget of NOK 557 million (Appendix VII). At first glance, then, it appears that the majority of the Research Council's funding is still being directed toward "free and basic" research, rather than projects with user involvement. In fact, the budget for FRIPRO alone far exceeds the combined budgets for the 10 calls for Collaboration Projects.

However, this excludes funds for KPNs, as these applications have a different deadline (September 4th), for which information on funding allocations was not available at the time of submitting this thesis. In addition, in the appendix to Note 3 for their policy on open science, the Council mention climate, energy and environment as three of the areas where the involvement of users has already been institutionalised to a greater extent than in other fields, and appear to present these more advanced fields as a model for where other priority areas should eventually end up in terms of user involvement (RCN 2018d). When my informants in CICERO mentioned that they felt a greater pressure to work on projects that focused on user involvement, this is also in relation to their focus being on climate and environmental research.

A large number of the April 10th funding calls mention climate, environment, or sustainability in some way, either as a primary goal for the research call, or as one of several dimensions to be taken into account in project applications. This includes 7 of the 24 Researcher Project calls, and 7 of the 10 Collaboration Project calls – or, in other numbers, 29% of RP calls and 70% of CP calls. This proportional contrast becomes even starker when focusing on the calls that not only mention climate, environment or sustainability as one of several topics, but take one of these topics as their primary focus.

Three programmes with climate and environmental topics as their primary themes released calls for Researcher Projects in 2019: MARINFORSK, KLIMAFORSK, and ENERGIX, offering a total of NOK 194 million. MARINFORSK offered NOK 134 million for research on marine ecosystems and the consequences of different human activities on marine environments. KLIMAFORSK offered NOK 40 million for "free climate research" (or, as translated on their English web page, climate research "within an open thematic framework"). And ENERGIX offered (approximately) NOK 20 million for research projects "to promote the long-term, sustainable development of the energy system to enhance the competitiveness of Norwegian trade and industry and facilitate the transition to a low-emission society."

Meanwhile, 4 of the 10 calls for Collaboration Projects had climate or environmental topics as their primary focus: BIONÆR, KLIMAFORSK, and two calls from MILJØFORSK, for a total of NOK 220 million. As such, of the total funding in the April 10th call that was earmarked specifically for climate and environmental research (NOK 414 million), 53% was designated for Collaboration Projects. In contrast, across all research programmes, Collaboration Project funds only made up 20% of the total funds available in the April 10th call. The proportion of funding allocated for Collaboration Projects, then, appears to be much higher for climate and environmental research than for research overall. As mentioned above, the funding allocations for KPNs are not listed on the RCN's website at the time of writing. However, it is likely that including these numbers would tip the balance even further in the direction of projects focusing on user involvement.

This lends credibility to my CICERO informants' statements that they felt an increased pressure to work on projects that include user involvement – an impression which is bolstered by taking a closer look at two of the main programmes for climate-related research, KLIMAFORSK and ENERGIX. KLIMAFORSK, the largest targeted climate research programme, was offering "only" NOK 40 million for Researcher Projects, while offering "approx. NOK 100 million" for Collaboration Projects. Meanwhile, ENERGIX, while having no calls out for Collaboration Projects, included the following stipulation in their call for Researcher Projects:

> Funding may only be sought for Researcher Projects with a special need to remain independent of public or private-sector user participation and/or financing. Projects in need of such independence are those in areas where user involvement may cast doubt on the legitimacy of the results, for example in cases where:
>
> - the research radically challenges the status quo;
> - the research is especially controversial due to conflicting societal interests, such as environmental conflicts.
>
> A separate assessment will be carried out to determine the degree to which independence from users is necessary for the project. Applicants will be asked to explain why it is important to organise the project without the involvement of and financing from users in a separate attachment (to be made available later). (RCN 2019b)

In other words, in the ENERGIX programme, Researcher Project funds are only available for project proposals where the applicants can justify that there is a substantial reason that the research *cannot* be conducted in collaboration with users. While ENERGIX had no funds allocated for Collaboration Projects in 2019, they are listed as intending to allocate funds for both Knowledge-Building Projects for Industry (KPNs) and Innovation Projects. As such, it appears that any project proposal for energy research which fails to justify, per the conditions listed above, that it cannot be conducted in collaboration with users, will need to instead be applied for as a KPN or Innovation Project.

This description of "where the money is," as phrased by I16, gives a clearer image of the mechanisms by which the Research Council of Norway is likely to "increase the application of user involvement," as they write in the background notes to their open science policy. By channelling a larger proportion of funds into Collaboration Projects, KPNs and other application types that require collaboration with different kinds of societal actors, they can place pressure on scientific institutions to develop project proposals which include such groups as user partners. As shown by the distribution of funds for climate and environment research, the open science policy notes' claim that user involvement is already "well established" in these fields is far from empty. With more than half of the funds being offered for climate and environmental research in the April 10th call being earmarked as Collaboration Projects – a proportion that would likely shift even further if allocations for KPNs

were included – it is not strange that my informants within CICERO are feeling the pressure to work on these kinds of projects to an increasing degree.

4.4 Reviewing the RCN's toolbox for user involvement

In this chapter, I have sought to provide a background for contextualising the experiences of my CICERO informants with the increased demand for user involvement in research, which will be discussed in Chapters 5 and 6, by looking into the Research Council of Norway as a primary driver of this demand. I have discussed what can be gleaned from the background documents for the Council's new "comprehensive policy for open science" about how they define and legitimate the call for increased user involvement in science, and looked into the way the Council currently uses its funding mechanisms to incentivise increased involvement of user partners in research projects. The findings in this chapter, which I will summarise below, point to a number of interesting questions and issues which will be the focus of the following two analysis chapters.

As described by Brandt et al. (2019), the Research Council has in recent years worked to position itself as an "active agent of change" in the Norwegian research system, an effort which has focused particularly on strategically directing the research implementing sector toward knowledge production which is in line with societal priorities and contributes to solving "large societal challenges." Part of this push has been the increased demand by the Research Council that researchers include non-academic actors, particularly from the public and private sectors, as user partners in research projects.

My analysis of the background documents for the Research Council's 2019 policy on open science shows that the concept of user involvement which is employed in these documents appears primarily informed by an instrumental lens or "logic" of co-production which positions user involvement as primarily a means to "make research relevant and useful." However, to legitimate this approach, and particularly to justify how it is intended to "build faith in research" among society and the public, the documents partly draw on ideas related to the map of science-society relations which I describe in Chapter 2 as the "agora" – the idea of an open, democratic dialogue

between different societal groups creating more inclusive scientific knowledge. Although between the lines, the documents appear to draw on the idea of an ongoing scientific legitimacy crisis and the perceived undemocratic and out-of-touch nature of traditional "ivory tower" academia as part of the justification for the need for user involvement approaches and open science more generally.

As such, the Council positions what Bremer and Meisch (2017) describe as the iterative interaction and extended science lenses of co-production, or what Lövbrand (2011) describes as the "logic of accountability" and the "logic of ontology," as very much a part of the same landscape. In the conceptualisation that is used in the policy documents analysed here, the "agora" appears in part to be used as a legitimating device to support a more instrumental conceptualisation of user involvement. However, Lövbrand's (2011) assertion that there exist significant trade-offs between the "logic of accountability" and the "logic of ontology" raises questions about whether these two ideas are as unproblematically aligned and mutually-supporting in practice as they are positioned to be by the Research Council of Norway in these documents.

In order to also lend a more material focus to this analysis, I then turned the attention to how the Research Council currently uses its funding mechanisms to promote increased user involvement in research projects. I found that, as also described in the open science policy documents, the Council appears to focus primarily on increasing user involvement in certain prioritised areas of research. Looking into the call for research project applications by April 10th, 2019 wherein funds were available for "purely" academic Researcher Projects as well as user-involved Collaboration Projects, I found that over half (53%) of the funds designated for research on climate and environmental topics were set aside for Collaboration Projects. This proportion would be likely to shift further if the not-yet-announced funds allocated for KPNs were taken into account. In addition, I showed that the "large programme on energy," ENERGIX, requires researchers applying for Researcher Project funds to justify why their research *cannot* be conducted in collaboration with user partners in the private or public sectors, requiring applicants that cannot give this justification to instead apply for KPNs or Innovation Projects.

In addition, while the background documents for the policy on open science describe "users" as a very broad category, potentially encompassing almost any societal group, I found that the requirements set by the Collaboration Project and Knowledge-Building Project for Industry (KPN) application types may in practice place limitations on which groups can be engaged as users. Both application types require a binding commitment to participation from potential user partners before applications are submitted to the Research Council. In addition, while the Collaboration Project application type opens for RCN-disbursed funds to cover partners' costs in relation to the research project, KPNs have required user partners to commit to co-financing 20% of the total project cost. This means that while the scope of potential partners is slightly broader for Collaboration Projects (although being engaged as a partner in a research project may still require some level of institutional capacity), partners in KPNs are likely to be only those private-sector institutions with the resources to contribute a potentially large amount of project funding.

I will further discuss how the requirements of these funding mechanisms have contributed to shaping user involvement projects and relationships between researchers and user partners in Chapter 6. In addition, building on these findings, it will be interesting to see to what extent the requirements for the new combined application type *Knowledge-building and Collaboration Projects* resemble either Collaboration Projects or KPNs, and what implications this may have for shaping user involvement in the Norwegian research sector going forward.

5 Making science useful? On relevant scientists and useful knowledge

5.1 From overview to street view

In Chapter 2 and the previous chapter, I gave an overview of what has been described as efforts to build a new relationship between science and society, characterised by calls for the involvement of a broader variety of non-academic actors in the governance and conduct of scientific research (Kershaw 2017). To look into how these changes are taking place in the Norwegian context, I began by turning the attention to the Research Council of Norway. I drew on the concept of cultural cartographies of science to explore what kind of "map" of science-society relations the Research Council's conceptualisations of user involvement and open science, and their funding mechanisms for bringing these into being, appeared to be drawing up. In particular, I questioned whether the push for open science and user involvement in Norwegian science policy is in fact laying siege to the ivory tower to build the landscape of science-society relations which I have termed the "agora" – a space for open and democratic dialogue between various different societal groups – or whether these shifts are perhaps characteristic of another map of science-in-society.

In this chapter, I will move from this bird's eye description of Norwegian science policy for user involvement towards a "street view" perspective of the same landscape. Drawing on my interviews with staff at CICERO Center for International Climate Research (as well as three of their partner institutes), I seek to explore how their experiences with user involvement in research projects begin to show the effects of these broader policy shifts in practice. In particular, I will focus on how my informants themselves act as cultural cartographers of science and engage in boundary work while discussing the demands for science to be made relevant and useful through user involvement, seeking to explore the second and third thesis sub-questions described in Chapter 1:

- How do my informants engage in boundary work when describing the role of the "relevant scientist" and ideals of science-society relations in the context of user involvement?

- According to my informants' descriptions, what kinds of shifts in scientific knowledge production are entailed in the production of "useful knowledge"?

In order to address the first question, I will begin with a brief overview and discussion of research within STS relating to different ideals science-society relations, before looking into what kinds of ideals of these relations were expressed by my CICERO informants. Then, I will describe some of the discussions that have taken place around the concept of "useful knowledge," seeking to contribute to opening the black-box that often surrounds this concept by describing how my informants defined the concept in the context of user involvement.

5.2 Who is the relevant scientist?

Ideals of science-society relations – from the separatist model to Mode 2

Much has been written in a number of different fields discussing the "ideal" relationship between science and society, with theorists describing several different sources of scientific authority and legitimacy. There are perhaps two main divisions in these discussions of different theories of science. One key division is between those that see the source of scientific authority as arising from qualities inherent to scientific inquiry, such as the Mertonian ideals of communalism, universalism, disinterestedness and organised scepticism – and those that view scientific authority as a property that is produced "downstream," less to do with the actual form and content of scientific research as with the way scientific knowledge and expertise is presented, performed and received in the different contexts where science advice and science-based decision making take place (Gieryn 1999; Hilgartner 2000).

As described in the literature review, researchers like Gieryn (1999) and Jasanoff (1990) have discussed how the epistemic authority of scientific knowledge in society is often produced downstream from the actual sites of scientific research. In this conception, rather than being based on an inherent objectivity or superiority of

scientific knowledge, or the actual practices of scientific research "first time through," as phrased by Gieryn, the authority of particular scientists to provide expert advice for decision making is based on the ability of scientists to successfully *perform* the attributes associated with scientific epistemic authority, as well as the negotiation of these attributes and the boundaries between science and non-science, or between authoritative and non-authoritative forms of knowledge (Jasanoff 1990, 2004; Jasanoff and Simmet 2017; Gieryn 1999; Hilgartner 2000).

A related division in theories of science is that between the different ideal models of science-society engagement. Mertonian ideals informed the traditional "separatist model," wherein science has been constituted as "a realm apart: it can be trusted to operate largely on its own, setting its own research priorities, and organizing or regulating its internal conflicts, held adequately in check by nature and peer criticism, without need of significant external supervision" (Jasanoff 2011, 5). However, with the advent of major public funding programs for science, the calls to ensure a return on investment by directing scientific inquiry towards policy relevance began. This led to the development of the "linear model" of science-society relations, which continued to conceptualise the scientific process itself as a realm apart from the rest of society, but which highlighted science's role in "finding relevant facts and informing policy makers" (Jasanoff 2011, 5). However, these facts should only be used as inputs to the decision making process, "untouched by the later political tasks of balancing information with other relevant factors to arrive at public decisions" (ibid). The linear model of science-policy engagement in climate science is exemplified by the IPCC's stated aim of being "policy relevant, but not prescriptive." This represents an ideal of science-policy relations "in which the interaction between science and politics is conceived of as unidimensional, linear, and one-way: from science to policy ('truth speaks to power')" (Beck 2011, 298).

However, as discussed in Chapter 2, the separation of science and society as two distinct realms has been criticised in STS and related fields (Sundqvist et al. 2017). In practice, a number of value judgments as well as social and political agendas shape the construction of scientific facts, and these facts in turn shape the social and political landscape – the process which Jasanoff (1990) described as the co-

production of science and the social order.[18] The recognition of these multidirectional flows between science and policy have been the foundation for the argument by some researchers that the ambition of science advice being "policy relevant but not prescriptive" is not, in fact, possible in practice (Beck and Mahony 2017). To bridge this artificial dichotomy between science and society, researchers in STS and other fields have proposed alternative models of science-society engagement focused on dialogue and democratisation of knowledge production, such as "Mode 2" science (Gibbons et al. 1994).

However, both the separatist and linear models of science-society engagement continue to hold sway in public understandings of science, as well as in the dominant understanding of a scientist's ideal role in relation to society and decision making within a number of scientific disciplines (Jasanoff 2011). While the interpretive social sciences and fields that centre on constructivist understandings of the world might often subscribe to a more dialogic model of science-society engagement, the natural sciences and more positivist social sciences such as economics tend to hold fast to the ideals of the linear (or even separatist) model. However, these are simplified and generalised categorisations, and a number of different understandings exist within and between academic disciplines and fields. These understandings correspond to vastly different conceptions of which kind of role the "ideal" scientist should play in relation to society (Pielke 2007).

In addition, researchers have pointed out that (at least the appearance of) a boundary between "objective" scientific knowledge and the "muddied, value-laden" world of social and political dynamics is a traditional prerequisite for the epistemic authority of scientific expertise, and that without this boundary scientists might lose their claim to having their knowledge serve as a legitimate basis for decision making (Gieryn 1999). In the face of shifting relationships between science and society and new calls for scientists to be relevant, useful and accountable to a broader range of societal groups, then, attempts by scientists to maintain and negotiate this separation between science and society, facts and values, are described as boundary work (Beck and Mahony 2018).

[18] As described in Chapter 2, this is the descriptive lens of co-production, not to be confused by the instrumental uses of the word discussed elsewhere in this thesis.

Mixed ideals of CICERO-society relations

Informed by the understanding that ideals of the relationship between science and society, as well as understandings of the individual scientist's ideal role in this dynamic, are negotiated and variable between different contexts, I sought in my interviews to examine whether any prevalent idea was evident among my informants of an ideal relationship between CICERO and Norwegian society and decision making spheres. Did CICERO staff primarily subscribe to a linear model ideal of being "policy relevant but not prescriptive," or did other understandings dominate within the organisation? In addition, how were my informants' understandings of the role of (CICERO's) science in relation to society shaped by calls to become more relevant and useful through user involvement?

To address this question, I led each of my interviews by asking broadly what kind of demands or expectations were placed on CICERO as an advisor or as a provider of information to policymaking and other societal spheres. I followed this by asking how, if imagining a kind of ideal type, my informants thought the relationship between CICERO and society *should* look. Leading my interviews with this question allowed me to somewhat place my informants within different "theories of science," which was useful for understanding what perspectives on science-society relations might inform their understandings of the processes of (and political demands for) user involvement.

Rather than present a uniform organisational ideal, the CICERO staff I spoke to gave a variety of different answers to these questions – however, there were some common themes. Most prevalently, several of my informants gave an answer to the first question about demands and expectations along the lines of "well, it's in our mandate." There was a broad understanding that an essential part of CICERO's organisational mandate was to act as an advisor and provider of scientific information in different fora: in dialogues with the Norwegian Environment Agency and other government decision makers, to the public through media engagement, as well as to the private sector.

> To do research, advising and informing about climate-related national and global environmental questions and national and international climate politics with an aim to create knowledge

> which can contribute to reducing the climate problem and strengthen international climate cooperation.
>
> *CICERO's mandate as listed in their by-laws* (CICERO 2017b)

Several staff described this advisory role as part of the core purpose of CICERO's existence, as well as part of the original reason for the institute's foundation – a historical context which I have discussed in Chapter 2. Some also described how moving to CICERO from more traditional scientific institutions like universities marked a shift in many scientists' careers, where they were suddenly expected to engage with society far more than they had been previously. As such, it was fairly evident that it would be difficult to be a CICERO scientist and subscribe to the separatist model. To work at CICERO, evidently, meant at least in part to be required to produce and present relevant knowledge for political and societal decision making.

However, beyond the broad recognition that CICERO was supposed to have some kind of relationship with policymaking institutions and other spheres of society, there was a large amount of diversity in terms of how my different informants thought this relationship should look in practice. Some expressed perspectives associated with the linear model, describing that although it was part of CICERO's mandate to be policy *relevant*, they had to be careful not to mix in their own opinions about specific policy decisions, and that the scientist's role in societal decision making processes should end at providing relevant information. As one Senior Researcher with a background in climate modelling described it:

> You want to communicate the whole breadth, show that if you choose to do this then this will happen, and if you want to reach this target then this and this and this can work – but not give advice. So that what you want is to inform about the entire span – all the possibilities and the whole spectrum, but not give concrete advice about "this needs to be done rather than this." Because there the value judgments and choices start to come in. […] So it has to be clear, of course, not coloured by self-interest or own opinions or that kind of – that's not how the communication should be, it should be science-based.
>
> Senior Researcher (I10), CICERO

Or, more briefly summarised by another Senior Researcher (I14) with a background in social sciences: "I think it's important that researchers take the researcher role, and

don't mix in too many personal opinions and speculations." Some of the informants that expressed these views also seemed to see this kind of clear science-society separation and the ideal of a neutral, value-free scientist as a fundamental aspect of the role of science in society. The climate modeller quoted above gave this answer to a question about whether there was an ideal role that CICERO scientists should play in relation to Norwegian society:

> I think there is one, anyway. I mean, researchers – that kind of lies in the nature of research, I think, and in science communication, that what you communicate should be based on science, and not coloured by personal interests, business interests you might have, and such. I think that's a pretty fundamental thing pretty much with all researchers. That's what you want to do and be as a researcher. So I think that comes pretty naturally on its own.
>
> Senior Researcher (I10), CICERO

However, despite this idea among some of my informants that a value-free approach was inherent to the scientist's societal role, others explicitly challenged this linear model of science-society engagement and the "loading dock" approach to science communication. In particular when discussing the reasons for involving users in scientific knowledge production, some informants highlighted that these kinds of dialogues with societal stakeholders were an important step in moving away from old-fashioned ideas of the scientist as a mere provider of information, and towards a deeper engagement and dialogue. In addition, it was mentioned by several of my participants that there were different opinions within CICERO on the extent to which the organisation should subscribe to a linear model approach of positioning themselves only as a provider of background information for decision making, and the extent to which they should take a position as advocates, or otherwise attempt to influence decision making.

> In my experience, it varies on a scale of – some people think we should start having lots of opinions, and be more political. And get impatient on behalf of CICERO, thinking we need to be out there, bringing solutions. And say this and this, and two lines.[19] Down to the other end of the scale, which is maybe a more conservative

[19] "Two lines under the answer" (*to streker under svaret)* is a Norwegian expression which refers to giving a clear-cut, unambiguous answer to a question, derived from the practice of drawing two lines under the solution to a mathematical equation. It is often used in the context of a speaker implying that an issue is not so simple that two lines can be drawn under the answer.

> researcher attitude, that we shouldn't have any opinions, we should only give background facts, and then all advice needs to happen out there. So I think we span from one end to the other.
>
> Senior Researcher (I17), CICERO

Research institution or NGO? Different orientations toward science communication impacting CICERO's public identity

The fact that views and preferences among their colleagues varied on the question of engaging with society was broadly recognised by my informants in CICERO. Several people described the different orientations toward science-society engagement as a matter of personal preference, stating that although CICERO had an overall mandate to provide relevant information, there was no particular requirement on the individual scientist to act as a policy advisor or science communicator. Instead, individual CICERO employees were free to choose to what extent they wished to engage in these spheres, based in part on how comfortable they were appearing in the public eye.

One social scientist described this diversity of opinion, particularly relating to different "theories of science," as an unavoidable element of working in an interdisciplinary institution, tracing their fellow researchers' different understandings of science-society relations to differences in their academic training and backgrounds. Rather than see this as a problem, however, they viewed it as an unavoidable and potentially beneficial consequence of CICERO's interdisciplinarity.

> I think there will always be different views on [theories of science]. I think that's hard to avoid. And I think that it's a good thing. We learn a lot from it, too. To be sparring a little with each other. But sometimes it creates discussion and conflict – and frictions. But also productive discussions, where we learn a lot from each other. That's the other reason I like to work here – the first is the combination of the subject matter [climate] and an academic approach, the second is the interdisciplinarity. I'd be very bored if I just had to sit and work with people who think along the same academic lines as me. That wouldn't be very exciting, and then we'd just have one piece. While the climate issue is a huge puzzle, where each of us hold different pieces. And here we have a lot of pieces in the same place. They don't always

> fit perfectly together, but that doesn't mean we shouldn't continue working on it, and trying to get it to fit better.
>
> Senior Researcher (I16), CICERO

However, some of my informants also expressed concerns about the effect that different approaches to societal engagement might have on CICERO's legitimacy as a provider of scientific knowledge – or in other words, how it might impact their epistemic authority. Three informants mentioned that they thought CICERO was sometimes perceived by others as an NGO or an advocacy group rather than as a scientific institution, and expressed concerns that this could have a problematic impact on the institution's image:

> And it has something to do with reputation too, right? That's something we're very concerned with. What kind of identity do we have? Is it an identity as a research institution, or is it an identity as an NGO? And none of the researchers here want us to have an identity as an NGO.
>
> Research Director (I3), CICERO

The Research Director who made the above statement linked the "NGO-ification" of CICERO's image to the Center's communications department, which they felt might "want to be out there to too great a degree." In contrast to this focus on communicating for the sake of communicating and "making headlines," they said that they and other researchers wanted to take a more cautious approach, expressing a desire to "disseminate when we have something important to disseminate." They linked this divide to different understandings within the centre of what kind of goals their mandate should encompass – "Is it really to do research that can bring people knowledge, or is it also to create change? Like, actually pushing change?"

As discussed in Chapter 2, discussions and boundary work around which side of the science-society boundary CICERO should fall on trace back to the origins of the Center (Nilsen 2001). It was clear in my interviews that this discussion continues to be a going concern, seemingly brought to the fore by calls for research to be made increasingly relevant and useful through user involvement. As such, despite the broad consensus among my informants that CICERO's role and mandate centred on producing and disseminating policy relevant knowledge, there were different ideas about how this role should best be fulfilled, and to what end. A Senior Researcher

(I14) who also described a concern that CICERO could sometimes be seen as an advocacy group rather than as a research institute, linked this to the challenges of embodying a role as a neutral, detached scientific advisor in a field like climate change, where facts are politically controversial.

Those of my informants who highlighted this challenge were also concerned with emphasising that CICERO's rightful place was to be aligned more with the world of academia, in part because this was where the centre could claim their epistemic authority as an advisory institution. I14 expressed a concern that the knowledge produced by CICERO could be influenced through too much user involvement at every stage of the research process, which could have the effect of delegitimising and therefore devaluing their outputs.

> Public authorities ask for evidence for their policies. They want an external actor to carry out assessments, evaluations or investigations to be able to point to that study as a trustworthy source. I think that's important. […] That you can point to something that is independent.
>
> Senior Researcher (I14), CICERO

They were concerned that stepping away from this role as a neutral and detached advisor and toward a greater degree of involvement and influence by users could create the impression that the information produced by research was "bought and paid for," and that this could potentially present a challenge to CICERO's legitimacy. Speaking on the importance of distinguishing the researcher's role from that of the user partner, they said: "If you mix it too much, you undermine your own credibility as a research institution."

These concerns speak to a core tension which has been documented in other research in contexts where increased demands to be relevant come up against the scientific ideals of objectivity and neutrality (Shaw 2005). This detached scientific role is part of the foundation for the negative characterisations of out-of-touch "ivory tower" scientists described in Chapter 2 – however, as pointed out by I14, it also remains a source for the legitimacy and credibility of scientific knowledge (Betz 2013). Without their ability to enact this image of neutrality, does a scientific research institution become just another advocacy group? And why then should their

knowledge have a privileged place in informing policy and decision making, taking precedence over purely value-based NGOs? These were questions that some of my informants appeared to be grappling with. At the end of an interview with one of CICERO's Senior Communication Advisors, when I asked them whether there was anything else they wanted to tell me, they made this argument:

> My philosophy is that the less you look at science communication as so incredibly special, compared to all kinds of other communication, the more relevant I think you become. Because there's something about how if you're always thinking – "oh, we're so special, we're doing something completely different"… Then it's like, that decision maker, who's out there in the real world, has maybe fifteen, twenty, thirty different interests trying to influence them. And then I think we have to be – I mean, those of us who do science communication – not change the content, not mess with our product itself, but look at how we package it. And in what channels and how we kind of use it, I think. We have to get even better at that, or you eventually lose the battle over what's defined as knowledge and what's not.
>
> Senior Communication Advisor (I2), CICERO

I2 chose an interesting euphemism for the scientific information CICERO produces, calling it "our product." As will be further highlighted in Chapter 6, a research institute like CICERO is dependent on selling the scientific knowledge they produce by securing funding from research funding agencies, as well as research contracts from private and public sector actors. In this context, the concerns of I14 and others about the consequences of CICERO being perceived as an NGO or advocacy group rather than a scientific research institute speak to a concern about the devaluation of this product.

If scientific knowledge is valued based on the perception that it represents neutral, non-politically aligned fact, then the perception that politics have been mixed in to the knowledge production may serve to reduce this value. This poses a core challenge for the cultural cartography of "relevant and useful" science. If the goal for the new relationship between science and society is to break down the walls of the ivory tower, cultural cartographers of open science must, like my informants in CICERO, grapple with the fact that these walls – the culturally constructed

boundaries between science and politics – have also at least partially been the source of scientific knowledge's epistemic authority.

Negotiating tensions between relevance and objectivity

The tensions experienced by CICERO in reconciling the demand to be relevant, to be "out there" communicating, and to be heard by decision makers, with the credibility-building role of the neutral scientific advisor, are a clear example of boundary work. With the increased demand for researchers to involve – and even intentionally co-produce knowledge with – users, the boundaries between science and society are being challenged and re-defined, and so scientists have to negotiate and define their positions on this new cultural map.

Like I2, who highlighted that CICERO should not mess with "the product" but rather change the packaging, several of my interviewees attempted to negotiate these tensions by delineating at what stages in the research process users could legitimately be involved, and which stages should be left to the researcher. For example, several informants brought up the idea that "co-design" was a better term to use than "co-production," because what one really wanted to do was involve the users in the design of the research and in determining which questions should be asked, but not in the actual analysis of results. Similarly, several (though, as described above, not all) also highlighted the importance of keeping scientists out of decision making. By delineating these different areas of responsibility in the process of user involvement, these informants drew up a clear cultural map of ideal CICERO-society relations. However, others mentioned that this kind of delineated partial collaboration was not "real" co-production, a more involved process of complete involvement at every stage of the research process which CICERO did not have the resources to undertake (more on this in Chapter 6).

As so poignantly phrased by I2, these tensions boil down to defining CICERO's stance in a "battle over what's defined as knowledge and what's not." On the one hand, there are the challenges to traditional "ivory tower" academia and the perceived out-of-touchness of traditional scientists, leading to calls for increased relevance and involvement with society. This, alongside a more general challenge to the concept of scientific objectivity and a perception that scientific knowledge no

longer enjoys the privileged position and epistemic authority it once did, constitutes what has been described as the "scientific legitimacy crisis."

As described in Chapters 2 and 4, part of the reasoning for the science policy push towards "opening up" academia and promoting user involvement in science is an attempt to counteract this scientific legitimacy crisis and shore up the epistemic authority of scientists. However, as described here, calls to be relevant and to abandon the position of the neutral, detached scientist may pose their own challenges to scientific legitimacy – as it is from this image of neutrality that science has traditionally drawn its epistemic authority. Particularly in the case of climate science, accusations that scientific research has been influenced by social and political interests have been one of the weapons used by voices seeking to delegitimise scientific consensus in this field (Luton 2015). However, "climate scepticism" has also been shown to relate more to complex matters of knowledge, values, policy framing and public engagement than simple "faith in science" or proof of scientific consensus for the establishment of fact (Pearce et al. 2017; Sarewitz 2004).

What, then, remains for climate researchers to win the "battle over what's defined as knowledge"? In the next section I will move from examining boundary work relating to the identity of the "relevant scientist" in science-society relations, to looking into what kind of "useful knowledge" this relevant scientist produces.

5.3 What is useful knowledge?

> I think that a lot of that drive for working with user partners is because you want what you work on as a researcher to be useful for someone. Right? That the knowledge we obtain is useful and relevant for the area we're working in. Otherwise there's kind of no point in a way, right? There might be something there. That if what we work on can't be used… But I think that there's a kind of difference from more traditional types of research. But in a sense all research should be useful, then – useful for society, or what.
>
> Senior Researcher (I4), CICERO

Defining and debating useful knowledge

The Research Council of Norway's policy for open science and user involvement, which was discussed in the previous chapter, sets out user involvement as a tool "to make research relevant and useful" in order to contribute to solving "large societal challenges" (RCN 2018b). Instrumental concepts of co-production and user involvement employed in research on these topics centre on the same ideal, highlighting the need to involve different stakeholder groups in research in order to ensure that the knowledge produced is useful for these groups.

Particularly in the context of climate change research, researchers have discussed the "climate information usability gap" as a key concept explaining the disconnect between the information which is produced by scientists, and which kinds of information can actually be implemented by user groups (Lemos, Kirchhoff, and Ramprasad 2012). This is often framed as a supply and demand issue, taking as its basis that there is a significant gap between the information produced by scientists, and stakeholders' information needs (McNie 2007). A number of different researchers have attempted to address the question of what constitutes useful or "usable" knowledge, and how climate science can be made useful for decision makers and other groups (Prokopy et al. 2017; Kirchhoff, Lemos, and Dessai 2013; Feldman and Ingram 2009; McNie 2013).

McNie (2007) identifies three "value demands" that determine whether decision makers are likely to identify particular information as useful: saliency, credibility, and legitimacy. Saliency refers to knowledge which is "relevant to the specific

context in which it will be used" and which responds to the specific knowledge demands of the decision makers. A number of different dimensions of saliency are identified, including ecological, temporal, spatial, and administrative scales, as well as timeliness (ibid, 20). Information should be "context-sensitive" to each of these dimensions in order to be considered salient. The second demand, of credibility, refers to knowledge which is "perceived by the users to be accurate, valid, and of high quality." The author mentions that although credibility is usually afforded by peer review, other approaches can satisfy this criterion, including "government sponsored-research, industry sponsored-research and collaborative projects between several actors" (ibid, 20). Finally, the demand for legitimacy refers to knowledge which is "perceived to be free from political suasion or bias," as well as sensitive to the interests of the user (ibid). Transparency and social capital are mentioned as two means for achieving legitimacy. McNie also cautions that there may be trade-offs between the three dimensions of salience, credibility and legitimacy, and that too much focus on one can risk undermining others.

However, the focus on producing useful knowledge has also been problematised. As discussed in Chapter 2, Lövbrand questions "usefulness as an appropriate principle of scientific accountability," noting that a shift toward producing knowledge "in the context of application" entails that the knowledge produced will be limited by the interests of specific user groups, and designed to slot into existing policy frameworks and plans for action (Lövbrand 2011, 226). This, she cautions, may close down opportunities for more transformational research and the production of knowledge which fundamentally challenges or presents alternatives for reshaping the status quo. As such, she notes, it should be critically considered in what contexts and on what questions knowledge should be co-produced with different stakeholders, and when scientific knowledge needs to be instrumentally useful.

Despite these theoretical discussions, the concept of useful knowledge is largely used in a fairly uncritical way in policies and discussions around user involvement in science. It is central to the descriptions of user involvement in the background documents for the Research Council of Norway's policy for open science, but the documents analysed in Chapter 4 never define the term or describe exactly in what way scientific knowledge is to be made useful. Similarly, several of my informants

used the term in their descriptions of user involvement and co-production of knowledge as though it had a clear and unequivocal meaning. When I asked each of them the question "What is useful knowledge?" many seemed to think this was a strange question, or that the answer should be obvious. I was given several answers along the lines of "Well, it's knowledge that can be used." However, some of my informants also gave more nuanced answers.

The need to produce useful knowledge and to fill the information usability gap is used as one of the primary justifications for research systems to be reshaped toward co-production of knowledge and user involvement (Lemos, Kirchhoff, and Ramprasad 2012). As discussed in Chapter 4, the call for making knowledge useful by involving stakeholders and decision makers in the research process also suggests that the information produced by science when left to its own devices is insufficiently useful to these stakeholders. At the same time, "useful knowledge" is a concept that is to some extent black-boxed, used as if it has a clear and unequivocal meaning that does not require definition. In order to contribute to opening this black-box, I was interested to examine how my informants defined the concept of useful knowledge in the context of their experiences with user involvement.

In the following section, I will discuss the descriptions given by my informants of the demands placed on them to produce useful knowledge. Like the rest of this thesis, this is based on researchers' own descriptions of how they work to make scientific knowledge useful, and what kinds of knowledge they perceive their user partners to be interested in. The analysis below could certainly benefit from being expanded by looking into this topic from the user's perspective, although as discussed in Chapter 1 that was outside the scope of this thesis. With that in mind, I seek below to explore two questions: What is useful knowledge, and how does it differ from the kind of knowledge usually produced by scientific research on climate change? What changes to knowledge production and dissemination are involved in making scientific knowledge useful?

Perceptions of the concept of useful knowledge

In order to examine perceptions within CICERO on the topics outlined above, I asked each of my interviewees the same set of two questions, mostly towards the end

of my interviews. First, I would mention that something that's often set out as a goal for user involvement in science is to produce useful knowledge for different stakeholders (usually, my informants had brought this up themselves as one of the reasons for doing user involvement, and I was able to refer to that). Then, I would ask a question that was often met with laughter: "What is useful knowledge?" Once my informants had given an answer to this question, I followed it up with another: "Do you find that there is any conflict between knowledge that is useful and knowledge that is scientifically interesting?"[20] In addition to this, when speaking to informants who had experience from working on projects that included users, I usually asked what they perceived to be their user partners' motivation for getting involved in the research projects, and what the partners expected from the research.

As with most of the other questions in my interview guide, my informants gave a broad range of answers to these questions. However, there were some interesting patterns that emerged among the responses, and certain ideas which were repeated several times. In particular, there were five overlapping components of "usefulness" which reappeared in several informants' accounts of the concept: packaging, particularity (or salience), interest, simplicity, and certainty. I will describe each of these components below, noting that they are imperfect categories that overlap to some extent, but are still useful for summarising the main ideas my informants expressed about the concept of useful knowledge.

Usefulness is in the packaging?

> I really think there's a sort of interpretive role, or communicating role, that's really important. Because, very simplistically, when an IPCC report comes out, it's hundreds and hundreds of pages with some rather complex graphics, and the amount of time that a […] decision maker pays attention to that might be two or three minutes, at best. […] I think it's probably more likely they're reading in the newspaper what's happening, or reading the Guardian coverage of it or something. So they get a summary version, and then there's a need to dig deeper. And when they get to that point, I think it's hard to turn to the IPCC reports and just dig in, when you're starting from a pretty low level of climate

[20] In hindsight, it may have been better to use a word like "difference" rather than "conflict" in this question, as some informants seemed to find it to be somewhat of a loaded question.

> knowledge, and you're not an environmental person at all. So then I think there is a gap there […] I think there's a big need to fill that, and I think that is a role that CICERO can play.[21]
>
> Research Director (I8), CICERO

Some of my informants brought up the idea that the core of making scientific knowledge useful was not as much a matter of fundamentally changing the research process or the type of knowledge produced, as it was of repackaging relevant scientific information in a way that would be understandable to and tailored to the needs of different stakeholders. Scientists discussed visual aids such as graphical representations, as well as summary documents such as policy briefs, which could contribute to making (the presentation of) scientific knowledge useful. A key challenge that was often brought up in relation to this dimension of usefulness was that of conflicts between academic incentive structures centring on publication in disciplinary top journals, and the need to produce publications which were more accessible and interesting to user groups. This has also been documented in previous research on making scientific knowledge useful to different stakeholders (McNie 2007).

Although the packaging and presentation of scientific knowledge appears to be a central aspect of knowledge usefulness according to many researchers, the way the Research Council of Norway and other actors pushing for increased user involvement frame this goal suggests that it is not the only component of "making knowledge useful." After all, user involvement generally calls for involving users in more stages of the research process than simply the communication or dissemination of results. In the RCN policy documents analysed in Chapter 4, the potential for user involvement was identified at almost every stage of the research process. This suggests that in addition to packaging, there is some kind of substantive shift in the way knowledge is produced – which questions are asked, what kind of data is collected, perhaps even how results are analysed – required for making knowledge relevant and useful through user involvement.

[21] Details that identify the sector that I8 is primarily working with have been removed for anonymisation.

Answering particular questions

> Useful knowledge is knowledge that's relevant for the processes that are happening in society right now, like for example – in my field, we know there's a lot happening around biofuels. And a lot of uncertainties – is it good, is it bad? Should we have it, should we not have it? And the politicians have made some decisions already. So, it's making sure to be relevant, to be up-to-date […] Useful information can also be information where you can react a little quickly when a question comes up. Because a project you have to apply for funding for, and then do research for four years… So having the opportunity to have some flexibility, to work quickly and answer questions quickly, that's something you often don't have space for in the daily life of a scientist. But it would make it more useful. "Yes, that – I'll just run some models, and then I'll get back to you in two years" – I think that's less useful. […] So it's information that you can relate to your own daily life, or your own workday, or your own challenges – then it suddenly gets a lot more useful.
>
> Senior Researcher (I10), CICERO

In the context of these two questions on knowledge usefulness, as well as in general discussions around user involvement, my informants often focused on the notion that there was significant variation between different users – particularly in terms of information needs. I will partly return to the topic of understanding differences between users in Chapter 6, but the focus on these differences highlights another dimension of knowledge usefulness which often came up in my informants' accounts: particularity. Often, researchers gave answers about what kinds of knowledge constituted "useful knowledge" by describing what information specific users were after in specific contexts: modelling data on the likelihood and severity of flooding in a specific geographic area, projections related to impacts on a certain industry, solutions for restructuring energy systems, et cetera. In fact, uncovering which specific questions were of relevance to their users was often held as one of the primary reasons for involving user partners in research design. The focus on these kinds of context- and user-specific questions relate to the requirement for knowledge salience described by McNie (2007).

One particular aspect of salience which was often brought up was the dimension of "timeliness," or time-scales. Researchers, like I10 above, talked about how part of

the demand to be useful was the ability to be ready "at the drop of a hat" with relevant information when a particular question came up in the media or in policy processes. When asked about the difference between useful and scientifically interesting knowledge, many informants expressed an epistemology posing that (practically) all knowledge could be seen as useful in some way. This view held that the primary difference between the immediately useful knowledge produced by applied research, and the more abstractly useful knowledge produced by basic research, was a matter of time: eventually, the results of basic research might come to be useful in a way no-one expected.

> Research is useful by being able to give advice to decision makers in the short term, but if you think kind of about the history of science then it's also – big breakthroughs in science are also extremely important for society. A good example is this technology you're recording with [I9 points to my audio recorder]. The cell phones we have – you couldn't have that without basic research on computer technology, many years ago. So it's an example of how important basic research is. People didn't see the usefulness in a short time-scale, when they started it.
>
> Research Director (I9), CICERO

In fact, this was cited by some informants as one of the primary reasons for the importance of basic research: alongside the known challenges facing society in the present day, we might come up against unknown or unexpected challenges in the future, and knowledge previously thought to be useless might suddenly come to use. In addition, extending the knowledge base could lead to accidental discoveries in the future, or form a foundation for new applied research down the line. According to Nowotny, this narrative represents a prevalent "political imaginary of science" among scientists, which calls for "suspending the belief of immediate returns, while emphasizing the long-term perspective that comes with the impossibility to foresee scientific and technological breakthroughs" (Nowotny 2014, 18).

In contrast to this focus on particularity, when speaking about specific research projects and the reasons for user groups to get involved in them, some informants gave a slightly more vague answer, stating that they thought their users had joined projects out of a general curiosity about new knowledge and desire to know what's happening in the field. However, the same informants often followed this up by

questioning the direct applicability of the knowledge they had produced to their users' work, and some expressed concerns about the difficulty of bridging the gaps between a theoretical sort of usefulness and actual application (or between knowledge which is "usable" versus knowledge which is "useful"). The users may have been more generally informed about relevant topics, but it might be more challenging to point to a specific impact of the collaborative project.

Working toward users' interests

> It's hard, you can't expect… and I feel that to some degree, you can't expect that decision makers are interested in contributing money to something that's critical towards them. I mean, so if it stays on that overarching level… "Please join this – spend hours on us criticising you." Very few are interested in that. [I6 laughs]
>
> Professor (I6), CICERO Partner Institute

Overlapping with the point on particularity or salience, one core topic that arose frequently when discussing knowledge usefulness was that of the knowledge produced corresponding with and helping to further the interests of the project's user partners. The fact that the funding models for user involvement centred on projects which the user partners were required to co-finance – or otherwise invest resources in participating in – meant (quite naturally, according to some informants) that user partners were only likely to participate in projects which they had some kind of self-interest in contributing to the results of. In particular, as pointed out by I6 above, user partners were unlikely to invest resources into projects which were critical of their own activities, or which produced knowledge which could be damaging or contrary to their own aims.

One of my non-CICERO informants (I18) spoke at length about this, describing how they felt the Research Council of Norway had, through their incentive structures for user engagement, in effect equated the idea of research having *relevance* for society or specific user partners, with that research being of *interest* to those partners. They described that the RCN had a stated tendency to use the ability (or lack thereof) of a research project to get co-funding from user partners as a measurement of that project's relevance to society. However, as they pointed out, it could potentially be highly relevant to a particular sector to conduct critical research on the practices of

key actors within that sector – without the results of that critical research necessarily being within those actors' interests. They highlighted that they had not observed this having the effect of steering the actual results of research to any particular extent – "but it's definitely a steering of the topics and questions that are researched – that's completely clear."

This challenge was also highlighted by other informants, although often with some caution, as there was a general reluctance to implicate specific central user partners as steering research in a problematic way. Overall, researchers spoke about these challenges on a general level, but were quick to point out that they had not experienced any such problems in their own projects or with the specific user partners that they had worked with. With user involvement projects comprising a large and increasing proportion of RCN's funding for climate-related research (as shown in Chapter 4), and considering the fact that the continued ability to "land" such projects might depend on maintaining a good relationship with central user partners (as will be discussed more in Chapter 6), this reluctance to speak specifically about such challenges is understandable. This, of course, assumes that there were any specific challenges to speak of – perhaps my informants had indeed only had positive experiences with user involvement in their projects, but were concerned about the more overarching implications of these trends in science policy.

I will return to this topic of the influence of users' interests, and the questions it raises about power relations between scientists and user partners, in Chapter 6.

Numeric oracles and solution architects: addressing the demands for simplicity and certainty

Perhaps one the most common challenges raised by my informants when discussing the topic of reconciling demands for useful knowledge with their own "knowledge supply" were related to calls from users for information which was simple, straightforward, concrete, and certain. This was sometimes represented as a matter of "packaging," or in other words of science communication. However, part of the challenge described by my informants was that communicating scientific information in simple terms might risk leaving out complexity, nuance and uncertainty which they saw as centrally important aspects of the information itself. In other words,

over-communicating the certainty or simplicity of a piece of scientific knowledge might misrepresent that knowledge, leading knowledge users to draw misinformed conclusions based on the information. At the same time, this certainty and/or simplicity might be necessary in order for the knowledge to be useful and understandable to stakeholders. This appeared to be a cross-cutting issue for both natural and social scientists, although it manifested slightly differently in the different fields.

Several of the natural scientists I interviewed, all of whom worked with climate modelling, described the expectation by some users that they serve as what might be described as a "numeric oracle." User partners, they described, generally wanted to be given a clear number projecting the likelihood of a specific change with a high degree of certainty – although the level of certainty required seemed to vary somewhat between sectors, with one informant pointing out finance as an example of a sector which was used to dealing with uncertainty. As described by one Research Director (I8), however, most users were "typically after an easy-to-handle number that they can target the rest of their business model to."

However, as also discussed in Chapter 2, climate modelling is a science characterised by uncertainty, with models based on a range of assumptions about societal change and other systemic aspects which cannot necessarily be definitively projected (Beck and Mahony 2017; Hulme 2011).[22] In addition, it is also a science which is highly complex, with results that may not always be straightforwardly interpreted by the un-initiated. As such, researchers faced at least two tricky choices. They could attempt to communicate the full extent of this uncertainty and the assumptions their models were based on, but this required time and capacity on the part of their user partners to understand the complex information – which was not always available. As described by one climate modeller, in the context of research results which were counter-intuitive and could present a misleading picture without context:

> It's often a problem of communication. If you have a lot of time and you can explain everything, and people have days to spend to understand the background and so on, I think it's not a problem –

[22] Some of this work specifically criticises climate modelling for claiming epistemic authority by self-representing as "oracles" – however, the climate modellers I spoke to were generally cautious of and concerned about these expectations, as well as the challenges of meeting them.

> but usually [that's] not the case. So sometimes, it's maybe better to not show this counter-intuitive result, and focus on the things that are much easier to understand.
>
> Senior Researcher (I11), CICERO

On the other hand, researchers could give in to the demands and present simple numbers based on only one – or a highly limited range of – scenario projections. However, this presented its own set of challenges, as some of the researchers I spoke to were then concerned about the implications of users making decisions based on very limited data. As described by the same modeller quoted above:

> So, if we only have [one] model […] we're always like, "Oh yeah, but this is just one model, and if we had more, then it would be a bit different." We always say that, "You shouldn't take any decisions based on this number." And then of course they are like, "Yeah, okay, but then – then we can't do anything."
>
> Senior Researcher (I11), CICERO

On the part of the social scientists I interviewed, some of them described a related challenge of being expected to take on a role as what may be described as "solution architects." Described by one Senior Researcher (I17) as arising from an "instrumental idea of what research should be," several social scientists found themselves facing an expectation to provide simple, straightforward solutions to the climate problem, which was not always compatible with their own preference for critical, qualitative research. In fact, according to I17, this demand was something the social scientists at CICERO had recently held a meeting about before my interview with them. They brought this up at the end of the interview when I asked if there was anything else they thought I should know, and I will quote their description at some length because it gives an interesting glimpse of what appears to be somewhat of an internal tension at CICERO with regard to how the institute should position itself as relevant and useful:

> We just had a meeting about how we feel – some social scientists feel that we're standing in a squeeze. Because we experience that there's some lacking understanding of what social scientific research can contribute to the climate problem, internally here as well. Which creates this appeal, both from the leadership and the

> natural scientists – "Can't you soon come up with some solutions that we can communicate out?"
>
> And it's easier to communicate – we get put a little in check mate, because it's easier when you don't have knowledge about social science, I think, to think "But we just have to do this." And then that gets communicated. And it gets a little frustrating for those of us sitting on nuances here and – "But this is political, or this has other sides which we've done research on, which we should also make clear." Which makes it so – we're not as interesting in that media world, because there they want quick fix and big words, right? Which is a lot easier for those who don't have the competence.
>
> And we can't arrest anyone for doing that, but there's still a feeling that – "oh, we're coming up short." I think that might be interesting to include in this description of – maybe not exactly this thing about co-production, but why there are different views on what's useful – but also the role, then, of social science. In the climate field.
>
> Senior Researcher (I17), CICERO

As I17 mentioned, a core of this issue lies in the existence of "different views on what's useful." In the "battle over what's defined as knowledge," simplicity and certainty appear to have the upper hand – particularly in a conception of science-in-society which favours instrumentalism and asks scientific research to be solution-oriented. At the same time, as highlighted here, certainty and simplicity may come at the cost of reflecting the nuance, complexity and uncertainty which are in many ways the strengths of scientific research. When discussing these topics, I5 described the challenges of having to take on the role of "the difficult climate scientist."

> If you take the big story, then it's… if we're going to avoid large-scale climate change then emissions have to be reduced drastically, and we need political measures. And then the difficult climate scientist comes and says: "No, things are more complicated – introducing biofuels has lots of negative consequences." But if we look at it in the big picture, then maybe it's good that those political measures – that they happen.
>
> Senior Researcher (I5), CICERO

This is interesting in the context of Lövbrand's (2011) argument that the call to produce knowledge "in the context of application" may restrict space for critical

research which more fundamentally challenges the status quo – showing some of the tensions between what she describes as the "logic of accountability" and "logic of ontology" ways of conceptualising relevant science. When I17 above describes feeling that the potential of nuanced social scientific research in the climate field is undervalued or misunderstood, it may be these tensions in particular that she is speaking to. The pressure to act as a "solution architect" in effect may push social researchers into a limited role where they do not feel that there is space for using the fullness of their expertise, and where nuance has to be dropped in order to produce solutions. A similar challenge appears to be present in the call for natural scientists to act as "numeric oracles," producing simple and certain numbers to feed into partners' strategies and planning processes.

5.4 Building the agora? Different maps of relevance and usefulness

In the effort in this chapter to show a "street view" perspective of the cultural cartography of relevant and useful science, the descriptions of my CICERO informants' attempts to negotiate the role of the relevant scientist and the nature of useful knowledge through boundary work have followed a few twists and turns in the landscape. In this conclusion, I will attempt to weave these diverging paths together into an outline of what the descriptions in this chapter tell us about the effects of these shifts in science policy on the changing cultural maps defining the role of the scientist and the nature of scientific knowledge.

My interviews in CICERO showed that there was no one accepted role within the institution for a "relevant scientist" to play in relation to society and user partners. However, my informants' different descriptions and concerns reveal that taking on this role requires a complex negotiation of the tensions between the scientific ideal of objectivity and neutrality, and the ideal of relevance, as has also been described in other contexts (Shaw 2005). This was particularly evident in the concern of some CICERO staff that they felt the Center was sometimes mistaken for an NGO or an advocacy group rather than a scientific research institute.

Some informants were also concerned that CICERO's "product" could be devalued by the perception that in terms of the boundary between science and politics, the

Center was located too much on the side of politics. In other words, a perception of CICERO being too political could compromise the image of the scientific knowledge they produced as neutral and objective, thus compromising their epistemic authority. On the other hand, there was a contrasting concern raised by other voices that too little societal engagement could lead to the Center's scientists losing in the "battle over what's defined as knowledge," as they would struggle to be heard among other societal voices speaking loudly and with more certainty.

Some informants attempted to negotiate this challenge by engaging in boundary work and delineating clear areas of responsibility for user involvement. While users could be involved in developing research questions, scientists should then take charge of research and analysis, and users could again be brought in in the communication and dissemination of results. However, this map of user engagement was not universally accepted as an ideal – other informants saw a need for users to be involved in more stages of the process, including in research and analysis.

The chapter then moved to a description of "the product" – what does it actually entail to produce "useful knowledge"? Based on the interviews in CICERO, useful knowledge generally seemed to require a combination of the factors packaging, particularity (or salience), interest, simplicity and certainty. In essence, useful knowledge would often constitute simple and certain pieces of information or solutions which could feed directly into particular processes or questions of interest to the users, packaged in such a way to be understandable and relevant to these users. However, this conceptualisation of useful knowledge appears to restrict the space for critical, nuanced and complex research, as well as for less immediately useful basic research – a fact which was of concern to some of my informants. This relates to the concerns raised by Lövbrand (2011) about the problems of producing knowledge "in the context of application."

What, then, does this indicate about the way calls for relevant and useful science may be reshaping the cultural landscape of scientific knowledge production? Despite pointing in slightly different directions, the findings in this chapter do paint a fairly coherent picture of the new role of the researcher in this dynamic. The demand to be both relevant and neutral, as described here, often appears to become a demand for scientists to answer relevant *questions* as directed by their users, but not to mix in

their own opinions or judgments. Alongside the demand to produce useful "bits" of information which can feed into existing policy frameworks and strategies – to pose as solution architects and numeric oracles – the role of the scientist in this new arrangement of science-in-society appears somewhat restricted. Knowledge is to be produced on order for solving specific societal challenges, presented in a form that fits in with existing frameworks and agendas (Prainsack and Leonelli 2018; Lövbrand 2011). This lends credibility to those who argue that the demand for solution orientation in climate science entails a call for climate research to operate in a mode similar to a regulatory science (Beck and Mahony 2018).

At this point, it is relevant to return to a question which was posed in Chapters 2 and 4 – is this role of the scientist, as a neutral-yet-relevant solution architect or numeric oracle, compatible with the culturally cartographic image of open science which I have termed the "agora": the idea of these science policy shifts tearing down the ivory tower to create a space for free and democratic dialogue between different societal groups? The siege on the ivory tower is clearly present in the calls for science to become relevant and useful through user involvement. However, it is perhaps not as certain whether what is being constructed in the rubble of the tower is, in fact, an agora. Rather, the demand for scientists to produce useful bits of information on-demand call up a somewhat different image, perhaps bearing closer resemblance to the production lines in a knowledge production factory.

This is not to say that the scientists at CICERO – or scientists in general – are necessarily being reduced to a role as exploited factory workers in this new map of science-society relations. Nor that the construction of a "factory" of scientific knowledge production is necessarily something sinister, as I will discuss in Chapter 7. However, this interpretation does complicate the image painted in the Research Council of Norway's policies for open science, analysed in Chapter 4, of instrumental and knowledge-democratising ideals of user involvement standing side-by-side as complementary aims. It also raises another question – if scientists in this metaphor can be understood as "factory workers," who owns the factory? In effect, who is ordering the knowledge that is produced? This question will be the focus of the next chapter, when I turn to examining the role of the user, as well as the relationships between scientists and their user partners.

6 Useful for whom? Defining the user and examining scientist-user relations

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Me: What is useful knowledge?

I18: [Pause] I think the concept is a little strange, I have to admit […] But... I think that it might not be that useful, this concept of useful knowledge. You at least have to ask – useful for whom?

Senior Research Fellow (I18), CICERO Partner Institute

6.1 The role of the user

In this thesis, I attempt to describe how an increased call for user involvement in science is currently being implemented in the Norwegian context, in particular focusing on how it contributes to drawing up a new "map" of the relationship between science and society. In Chapter 4, I took a bird's-eye view of this landscape, describing the so-called new mode of scientific governance and examining how the Research Council of Norway is using its policy and funding mechanisms to promote open science and user involvement. From this structural view, I moved in Chapter 5 toward a "street view" perspective, beginning to examine how my informants in CICERO engaged in boundary work when describing their experiences with meeting demands for relevant and useful science. This discussion focused on two elements: defining the relevant scientist and different conceptions of that scientist's ideal role in relation to society; and unpacking and discussing the concept of useful knowledge.

In this chapter, I will move from examining the role and identity of the useful scientist to the other half of the user involvement picture: the role of the user. Clearly, this is an essential piece of the puzzle. The concept of "relevant and useful" science in itself implies relevance and usefulness to *someone,* and the very core of the shifts in science policy which I seek to describe in this thesis is the call for increased involvement of "user partners" in scientific research projects. But what does this involvement actually look like in practice, in terms of the relationships and

engagement between scientists and users? These questions will be the focus of this chapter.

As shown in Chapter 4, the definition of "users" in the background documents for the Research Council of Norway's policy for open science is very broad. In the background note on user involvement and citizen science, the Council defines "users" as "those who have a direct use for the research, from business, the public sector, authorities and civil society" (Appendix IV). In other words, users according to this definition could potentially encompass almost any societal group. However, the Council's funding mechanisms for user involvement, also described in Chapter 4, appear to set certain limitations on which groups can in practice act as users to scientific research projects, depending on the project's application type. In KPNs, users are restricted to those private-sector actors with the resources and inclination to co-fund research projects. By opening for research funding also covering users' own costs, Collaboration Projects potentially offer a broader scope for which kinds of groups can be involved as users – but involvement in a research project still presumably requires some level of institutional capacity in order for a group, organisation or institution to be able to participate.

As such, the aim of this chapter is to move from a broad definition of potential users to describing what kinds of actors actually can, and do, take on the role of users in the context of CICERO's efforts for user involvement. In doing so, I aim to address the final sub-question of this thesis: *How do my informants perceive the role of the "user" in user-involved science, and how are relationships between scientists and users shaped by the Research Council's funding mechanisms for user involvement?* As this thesis is based primarily on interviews with informants within CICERO, I will not be able to describe this part of the cultural cartography of user-involved science from the perspective of the users themselves. Rather, I focus on scientists' understandings of user partners, in terms of their perceptions of users' needs and priorities, as well as how my informants in CICERO described their own relationships and engagement with users. Viewing the role of the user from this perspective, rather than from the perspective of users themselves, is a limitation, as discussed in Chapter 1 – but it is also interesting, as it serves to form a fuller picture of researchers' own experiences with user involvement.

"Not some ethereal group" – on defining users

Toward the end of my interview period, I sat down with a CICERO Research Director who I will call I8. According to other informants, I8 was one of the people in CICERO who worked most closely with user partners. While discussing the differences between different kinds of user partners and the importance of understanding specific users' needs by understanding the structures of their companies or organisations, I8 told a story about a meeting they had attended in Brussels for the projects that had received funding from an EU funding scheme for climate services.

> I went to the first meeting in Brussels. It was a year ago, for all the climate services projects to get to know each other, and to learn – it was like a kick-off meeting. We had to discuss who our user groups were, and every project had to present. And of all the presentations, we were the only one that actually knew our users. And I thought that was really interesting. Because I think there's a sort of theoretical space that sort of misses this aspect that first you have to know your users. So the users are discussed as this potentially homogenous, or at least very unknown grey area.
>
> Research Director (I8), CICERO

They went on to illustrate this point by digressing to a story of how, in the case of one of their own projects, putting a face on a particular user partner by getting to know the partner's representative had made them realise that their preconceived notions of what kind of information the users needed were wrong. They described going into the first meeting expecting that the project were going to "do this cool website with these fancy maps," but that one of the partners (whose expertise and power within her field I8 was sure to point out) had taken issue with this.

> This woman says to me: "But we don't need maps!" [I8 laughs] Okay... "I just need some numbers I can feed into my risk models!" I was really naïve, and I didn't know that – but now there's a face, there's this woman that we speak to who sits on mass amounts of money, and has the ability to make decisions with that money. And she's telling me these fancy maps are not what she needs.
>
> Research Director (I8), CICERO

I8 used this sub-story of the powerful user partner's disdain for maps to highlight their point that "the users are not some ethereal group, you have to define them, and talk to them, and get to know them," suggesting that this process of individual engagement was essential for truly understanding users' needs and priorities. They then returned to the EU projects meeting, describing:

> And at this meeting in Brussels, where we had all these climate services projects, there were people saying: "Oh, yeah, users! You know, uh… we're talking about some municipal users, and – and maybe some national policy users... oh, businesses too! And, oh! Some researchers too..." And I mean, it was just – throw everyone into this bag, and that's your target audience. And I think that's not enough. [I8 laughs] It's not enough.
>
> Research Director (I8), CICERO

The "throw everyone into a bag" description of user groups which I8 was criticising is quite similar to the way potential users are defined in terms of broad societal groups in the Research Council of Norway's policy documents, as described above. However, although some of my informants also used these kinds of broad descriptions, most of my interviews highlighted the need for a more specific understanding of who the users actually were – both for individual research projects, in order for scientists to understand their partners' information needs; as well as perhaps in order to understand the role of "users" in a broader science policy context.

6.2 What is co-production or user involvement, and why do it?

A spectrum of lenses on co-production

The literature on co-production of knowledge, which has been discussed in Chapter 2, distinguishes between several different lenses or definitions of the concept. At the root lies the distinction between the descriptive lens as discussed by Jasanoff (1990) among others, and the normative lens as used in more instrumental definitions of the concept (Bremer and Meisch 2017). In addition to these two more overarching streams, Bremer and Meisch (2017) also distinguish between eight different sub-lenses within the two fields, suggesting that these can be used to paint a more

nuanced picture of the use of the co-production concept within climate science. Within the normative field, these different lenses are distinguished by the aims they set out for knowledge co-production – whether it is seen as an instrument for producing more useable climate information; extending science by including different forms of knowledge; improving the delivery of public services; building capacity within governance institutions; facilitating social learning; or empowering traditional knowledge systems (ibid). Each of these understandings of co-production brings with it a different understanding of the role of non-scientific stakeholders within these processes.

Informed by this literature, I sought in my interviews to find out whether any particular lens on co-production was more prevalent within CICERO, seeking in turn to understand how this affected prevalent notions of the roles of CICERO's stakeholders or user partners in these kinds of projects. Not all of my informants were familiar with the term co-production of knowledge, and instead discussed many of the same practices under the term user involvement. On the other hand, some informants were very familiar with the concept, and even with the very same literature on co-production which I refer to in this thesis.

Among those informants who were more familiar with the term, the prevalent impression was that the concept was most commonly used by CICERO in an instrumental sense focused on the production of useful knowledge (towards what Bremer and Meisch describe as the iterative interaction lens), although not necessarily for a lack of wanting to use lenses focusing on knowledge democratisation or more critical descriptive analysis. This, at least according to one informant, was largely because of the kinds of co-production being incentivised by funding agencies.

> Yeah, it's definitely more the kind of instrumental co-production. Not out of a lack of wanting it to be more critical, but because the funding is not there to do a lot of critical work. And it's because of this clear move towards more – to demonstrate the value of science and the value of research. It's very much about how to make better climate information or better information for adaptation, so it's a very instrumental… It's trying to increase the uptake, and the value and the quality of that data, rather than asking more critical questions, about how do science and society co-constitute one

> another, how are nature and culture? Like, those bigger debates, which are the other side of co-production – which really gets far too little attention, right? So, it's a very specific form of co-production that's emphasised, say, in the European Commission's view of climate services. It's an instrumental view.
>
> Senior Researcher (I1), CICERO

The Senior Researcher quoted above drew on both a descriptive lens as well as concepts focusing on knowledge democratisation and empowerment of non-scientific knowledge systems when they talked about what they felt to be the true purpose of co-production, in contrast with the instrumental concepts that were most often used. At the same time, even some of my participants who seemed to be informed by a more instrumental concept of co-production questioned whether the kinds of user involvement projects CICERO was engaged in – or even the way user involvement was taking place in Norway overall – could actually qualify as "real" co-production.

> I mean, if you're really, really supposed to do co-production, then I think almost no-one is doing co-production. Because co-production should actually be that you produce the research question completely together, that you also set up the studies together, that you analyse the results together, and also that you get the policy implications together. […] But I don't think the projects are like that. And that can – I mean, I think, in Norway at least, I almost don't think there are any projects like that – because they don't have time, right? The ones we call "users" can't go in in that way.
>
> Research Director (I3), CICERO

Rather than this kind of complete involvement, the roles taken by users in CICERO's user involvement projects seemed (at least mostly) to be somewhat more limited. I3 and other informants ascribed this more limited role of the users to a lack of time and resources – both on the part of the users themselves, and because of the limited time available to researchers to undertake the kind of in-depth engagement processes required for this kind of involvement. Although some of my informants held this more in-depth involvement up as an ideal which would have to be met in order for CICERO to "really" do co-production, others expressed that they saw a more limited role for the users as more appropriate – a difference of opinion which relates to the different concepts of ideal science-society relations discussed in Chapter 5. However,

I3 as well as others said they thought what CICERO did in user involvement projects was still co-production – although perhaps a "lite" form.

Beyond these discussions about what co-production really is or should be, there were some clear common themes among my informants' descriptions of what it actually *was* in the context of CICERO's current user involvement work. Three primary lenses or explanations were prevalent in terms of what kinds of roles user partners played in collaborative research projects, and what the primary reasons to involve users in research were. Although they partially overlapped, several informants described the three as fairly distinct reasons to do user involvement.

Instrumental lens – to make science useful

> Well, I see great value in [co-production] if it's done correctly. Because it would help us researchers shape research questions in a way so the outcome of the research is more useful. That it helps industry, or that it helps politicians to understand the problem, and find actionable solutions. And not just, we hand you something and – they don't know what to do with it, because it doesn't fit in their decision making frames, or in their perception of things, or in the way they do things, in their operations. It just doesn't fit. And so they see it, they notice it, but they cannot take action. And true co-production I would say would lead to a common understanding, a mutual understanding between the stakeholder and the researchers, and then research towards actionable solutions.
>
> Research Director (I15), CICERO

The first reason to do user involvement, which was perhaps cited most commonly in my interviews, was as a means to produce more useful knowledge for key societal stakeholders and equip them with the knowledge and information needed to address the challenges of climate change and the "green shift" – a combination of Bremer and Meisch's iterative interaction and institutional lenses. According to this understanding, users should be involved in research projects in order to ensure that the right questions were asked and that research was steered towards relevant topics, and that information was produced in a way that would "fit in their decision making frames," as described by I15 above. In addition, continuous interaction with users through involvement in research projects would enable scientists to more effectively disseminate key scientific information to their partners and build partners' capacity

to understand and make use of this information. Involvement in research projects was also thought to ensure uptake of scientific information through the partners feeling a certain "ownership" of the research results.

Knowledge lens – incorporating users' expertise

> A lot of that – what should I call it? The practical knowledge that they have, the experience they have, is very useful to correct perceptions of the field itself which maybe we had wrong, or exciting research questions that we might have overlooked. And also the interpretation of results, which it was useful to get inputs on. So it was a good way to involve them. And they also helped us find a case – they have a good overview of the field.
>
> Senior Researcher (I17), CICERO

Through a second and partially related lens, user involvement was seen as a means for scientists to benefit from users' own knowledge and expertise within their fields. In this understanding, involving user partners in research projects was seen as a resource for the scientists as much as it contributed to giving their partners useful knowledge. Viewing users as experts in their own fields, several of my informants described that they felt their research had become better through being able to incorporate practitioners' knowledge and non-scientific perspectives.

Several mentioned users bringing in new ideas for research questions which the researchers would not necessarily have thought of on their own. This was described by some of my informants through an instrumental lens, in terms of their users having specific practical knowledge and understandings of their sectors which could contribute to in turn making their research more useful. However, others drew on understandings more related to Bremer and Meisch's extended science and even empowerment lenses, emphasising the plurality of different kinds of "knowledges" and the knowledge democratisation aim of incorporating non-scientific ways of knowing about the world into scientific inquiry.

Science policy motivation – a requirement from the funding sources

> It's motivated both by a desire to be more relevant, to create more relevant science – which is very urgently needed. You need all sorts of science, obviously, but at the moment especially where it

> comes to climate, we need very relevant science that needs to be applicable as soon as possible. That means that it has to be contextualised, and that means that you need users to discuss your science with. And at the same time – it's not only our desire, it's also specifically written in the calls for proposals. We very often need to secure 15–20 percent of user participation in our calls, so we are basically forced to become more relevant also.
>
> Senior Researcher (I12), CICERO

The third reason given by my informants for doing user involvement had less to do with theoretical understandings of co-production of knowledge, and more to do with science policy. As discussed in Chapter 4, funding structures in the EU and Horizon 2020, as well as in the Research Council of Norway, to an increasing degree incentivise user involvement in science – or even require it within certain fields. As such, in order to continue to obtain funding for research, CICERO in part were being "forced" to orient themselves toward increasing degrees of involvement.

The informants who brought up this aspect often also cited other reasons for involving users, either as part of their own motivation or as the reason they perceived science policy instruments to be moving in this direction. However, it was frequently mentioned that an unavoidable secondary reason for doing user involvement was that it was required by the Research Council. Some of my informants suggested that they, or other colleagues of theirs, would not necessarily prioritise involving users in their research if they didn't have to in order to secure research funds.

As such, the prevalence of co-production and user involvement in Norwegian climate science can itself be understood as an instance of co-production in the descriptive sense. While the concept originated in research within a variety of fields, particularly in STS, it has been adopted by science policy and is now being promoted through these policies in a way which in turn influences how scientific research is done. As Bremer and Meisch suggest, this dimension calls for a closer examination of "the co-production of co-production" (Bremer and Meisch 2017, 12), which this thesis seeks to contribute to.

Several of my informants laughed when confessing that science policy pressures were part of their reasons for doing user involvement, or otherwise seemed slightly uncomfortable with admitting this. This may be because of the normative ideal of

scientific neutrality which has been discussed previously in this thesis. Although the very act of involving users in scientific research in a way breaks with this ideal, admitting that users were involved in research for such a "political" reason as to secure funding might still be perceived as in breach of the value that decisions made to guide research should only be made based on factors related to scientific quality. Once again, this dimension of navigating the demand for user involvement required researchers to engage in boundary work.

An empty ritual?

Some of my informants also described another potential problem with this reason to do user involvement. They were concerned that it could lead to a kind of pro-forma engagement, done not because specific user partners had something of particular value to contribute to making research more relevant, or to expand the knowledge base and incorporate valuable alternate perspectives, but simply for the sake of involvement.

> Particularly where I've worked in East Africa, people are – grassroots actors are so used to being consulted for so many different projects and initiatives. Development, many increasingly in climate change. There's a huge sense of fatigue with engaging with external researchers, or even government, NGOs, UN organisations. It's just part of the – it can become a very empty ritual. When you're just engaging people to tick the box of co-production. Which is unfortunate, because it's a waste of people's time. And it's very discouraging as a researcher involved in those kinds of efforts, to see that really there was no commitment to necessarily addressing that – or there's actually no way of addressing it, in terms of, say, the scientific or other expertise that's involved in the project from the start. So, there are a lot of challenges.
>
> Senior Researcher (I1), CICERO

Apart from I1, none of my informants described their concrete experience with user involvement in specific research projects as having been this kind of "empty ritual" (perhaps partly due to the imperative to present specific research projects as successful, discussed in Chapter 3). However, it was present in several interviews as a concern about the possible consequences of the Research Council "pushing" user

involvement in more and more projects. With co-production beginning to become an end in itself – rather than a means to the end of producing better, more inclusive or more relevant knowledge – some of my informants were concerned that user involvement could end up becoming a kind of tick-box engagement.

As I1 brought up, a similar challenge has previously been documented in development studies, in the context of "participation" becoming a mainstream ideal in the development field, which ended up producing "participatory" approaches that were not, in fact, very participatory, and instead included stakeholders largely as a means to legitimate pre-defined development projects and aims, and obscured power relations (Cornwall and Brock 2005). Lemos et al. also raise this issue in the context of co-production approaches, talking about how in the current science policy emphasis on the concept, "co-production risks becoming an end in and of itself rather than the means for substantive, more-effective engagement and knowledge use in decision making" (Lemos et al. 2018, 723). They suggest that there is a need to carefully consider in which contexts, and for what ends, co-production is a suitable strategy to achieve the goals of a specific research project.

Part of the reason that some of my informants were concerned that user involvement may become an "end in itself" was that the Research Council of Norway now requires user involvement in certain application types, as discussed in Chapter 4. This requirement also led to the process of finding user partners to involve in projects becoming an important part of the development of some research project proposals. In the next section, I will discuss how the RCN's funding mechanisms appeared to shape this process, and what effects they have on relationships between researchers and their user partners.

6.3 The challenge of finding user partners

The process of getting users on-board for a project application to the Research Council was a core topic in many of my interviews. Some of the user involvement activities that my informants discussed took the form of "reference groups" in Researcher Projects, which are not required by the Research Council. However, the majority of my informants' experiences with user involvement came from project types like KPNs, which require a certain proportion of a project's total funds to be

co-financed by user partners – a commitment which must be made before the project application is sent to the Research Council. This requirement appeared to significantly shape the dynamics of how user involvement took place in practice.

Where do users come from?

In those of my interviews where my informants described specific projects they had been part of where user partners had been involved, I generally asked them to list the partners they had worked with and describe why they had chosen to work with those specific partners. Overall, many gave expected answers to this question, describing how they had chosen partners because they were important actors within the sector their research was located in, or because they had useful expert knowledge which could be incorporated into the research. However, two other answers came up a surprising number of times: that partners had been involved because they were simply the ones who were interested in participating – in other words that they were the partners the project had been able to get; and, somewhat relatedly, that partners had been involved because the project group had a previously established relationship with them.

This appeared to be in part because finding user partners to engage in projects was often challenging, and would involve trial and error processes of approaching different potential partners, trying to generate interest, and negotiating with them over project aims. "Sometimes I feel like we are trying to create a market," said one Senior Researcher (I11), describing a process of trying to convince potential partners that they were in need of scientific information which they "don't know yet that they need." One Research Director (I15) also described a challenging process of "running around" after user partners to include in calls for project proposals that required user involvement.

> Now we are asked to do this co-production, and we are asked to involve and get engaged with stakeholders, but usually we don't have the contacts. We usually don't have the time to talk to them, to understand them, and we also don't know what would be the right stakeholder for the questions we deal with. So every time we get a call, then, "Oh, we need stakeholders! Oh my god," and then we run around like headless chickens, and try to find stakeholders. And what is a stakeholder? And who could be interested? And then

> we call, and write emails, and we try to get some interest. And that's not co-design or co-production, because we come with a – "we want to do this and this, would you be interested?" And if we are lucky they are interested, but they almost never want to give money, and… So this is how I experience it right now, how the incentives of the research calls to do co-production end up.
>
> Research Director (I15), CICERO

Several of my informants mentioned that an important factor in gaining these elusive user partners was having a previously established relationship. If they had a history of collaborating with a particular research institute or group of researchers, partners might be more willing to enter into future projects with the same group. Often, I was told, this particularly came down to having established a good working relationship with the individuals representing the user partners, highlighting the importance of social relationships and "building trust over time."

> I mean, for participation, this has to do with building up a network over several years. For example, with this one user partner, we can always call Siri, right? And then we know that there's a fund they have, an energy fund, or climate fund or environment fund. And it's never hard to get some money out of her. And that has to do with that we've built up a relationship over a lot of years.[23]
>
> Research Director (I3), CICERO

I3 also talked about the challenges when these kinds of social relationships with user partner representatives were altered by turnover – a particular partner leaving their organisation, or people changing positions. However, these kinds of changes could apparently also be a benefit. Another Research Director, I8, talked about a case where a user partner which their project had built up a good working relationship had started out with fairly limited internal power within his organisation, and as such their collaboration had fairly little impact on the organisation as a whole. However, the same partner had since been promoted, and as his influence within his organisation grew, so did the uptake of the scientific knowledge produced and communicated by the research project.

[23] The name of the partner institution has been replaced with "this one user partner" and the individual partner's name has been changed in order to anonymise the information.

This highlights one interesting aspect of the question "useful for whom?" In several cases, there seemed to be a fuzzy distinction between a user partner being an organisation or company as a whole, and the partner being an individual within that organisation. Several of my informants highlighted the importance of meeting the right person in order to get user partners on board in a project, in the sense of finding an individual who was interested and engaged in the research – and who worked well with the rest of the research group. When asked whether it was ever challenging to get new partners on board in a project, I8 nodded enthusiastically and said this:

> Yes, a lot. That's why once you have a user that's engaged, then we just – stick. [I8 laughs] Very loyal. We have to be loyal, because, for example, we ran a series of interviews […],[24] and we had a pretty low response rate to that, and we had to go back to the people that we knew that would sit down with us for an hour. And it was through the individual relationships that we could get responses. And then there's other organisations where we just can't make the right contact. We try to knock on different doors. […] It can be a real challenge. So maintaining the few relationships that we have is really, really critical. And that's part of my role here at CICERO, is to make sure that we are responding if they have questions, and reaching out to them. […] I think it's more important to have really good engagement with a few people, than to try to reach out to a lot of people.
>
> Research Director (I8), CICERO

These descriptions serve as a rather stark contrast to the broad societal groups described in the Research Council's definition of potential user partners. Rather than the "user" that is involved in research being a representation of "relevant societal groups" or even categories like the private sector or the energy sector, the role of the user seems in many cases to be taken by specific engaged organisations, or even specific individuals within those organisations. This highlights the importance of specifying *who* "relevant and useful" science actually becomes relevant and useful for – a point I will return to later in this chapter.

[24] The topic of the interviews has been removed to anonymise the research group.

Know your users: negotiating and understanding users' needs

Another aspect of getting users on-board which was often brought up was that of convincing users that the research projects would be able to offer them useful knowledge, which also required developing an understanding of the potential users' needs and priorities. This required, as highlighted by I8 in the beginning of the chapter, knowing one's (potential) users. My informants often stressed that different kinds of organisations – and even different individual companies and institutions – had different needs when it came to the form and presentation of scientific knowledge. For example, private companies were highlighted as having different demands when it came to information privacy, finding limited use for data and decision making systems which would be publicly available to all. Several also highlighted the different time-scales users operated on, and how these interacted with the time-scales of scientific work – for a company operating at a faster pace with decision making cycles of only a few months, the slower pace of a scientific research project would not necessarily be useful.

My informants' descriptions of different users' needs and priorities formed the basis for the discussion of the concept of "useful knowledge" in Chapter 5. Although some of my informants admitted to mostly assuming or guessing what the users wanted, however, many others highlighted that their understandings of users' needs were hard won. As they described it, getting to the bottom of what kinds of knowledge user partners could actually *use* required long processes of engagement and dialogue. As I8 pointed out:

> You can't just knock on someone's door and ask for a meeting and say: "What do you need from climate science?" I mean, you can, but you're probably not going to get very far.
>
> Research Director (I8), CICERO

This was because, as highlighted by I8 as well as others, user partners often did not have a clear understanding of what kind of information scientific research could actually provide, or what would be feasible within the timeframe and budget of specific projects. This led to one of the core tasks of user involvement becoming the clarification and management of expectations, a process which needed to happen

both at the outset during the design of a collaborative research project, as well as continuously throughout the project period.

> I think it's important to clarify what the expectations are of the stakeholders up front. Or at least as early as possible, given what the needs are, and the gaps or the knowledge that they would like are, and whether or not you can provide it in the project. You have to really manage expectations early on and say – "look, we're not going to be able to do this, but we could do this, is this going to be useful?" Or, "how could we improve it?" So, it has to be a dialogue that goes on throughout the project.
>
> Senior Researcher (I1), CICERO

The way I1 framed this process of clarifying expectations, as a kind of negotiation ("Look, we're not going to be able to do this, but we could do this, is this going to be useful?") was echoed by several of my other informants, who described gradual and iterative processes of negotiating research outputs which would be both a) useful and interesting to user partners, and b) feasible and possible for scientists. However, carrying out these negotiations was described as a process which was both challenging and time consuming.

> [In real co-production] we have time to explore – what are the expectations, what kind of information do they need? We can explain that science is not doing this, but if we do it a little bit differently we could give you this. But that takes time, it takes a lot of time, because usually there's a huge gap between the expectations of the stakeholders and what research is doing.
>
> Research Director (I15), CICERO

However, with the structure of project applications to the Research Council being as it was, this "time to explore" appeared occasionally hard to come by. Several of my informants highlighted the challenge of finding time to negotiate with user partners and manage expectations during a project's proposal phase, citing as one reason the limited funding available for working on project proposals. Like many research institutes, CICERO has funds set aside for proposal development, but according to some informants it was still difficult to find sufficient time to do in-depth engagement with partners during the development of a new project. The time spent on these engagement activities also competed with time for actually doing research.

As described by one informant who said they had spent the better part of their year working on project proposals, in particular one large proposal where they had put a lot of effort into getting user partners on-board and ensuring that they would commit to co-funding the project:

> It's enormously time consuming. We started with this in spring, and it has gone through – well, until just last week, basically. [I interviewed I12 in October] Continuous, every week you're working with that. And if you in addition do other proposals, because you never know if you're gonna get this one! Right? So you're spending a lot of time on it, without actually having any certainty. And at the same time – well, I had like 7 other proposals going, several of them also requiring user inputs. So you're working with them at the same time, in the same way. And it's – I've not done a single bit of research this year. [I12 laughs]
>
> Senior Researcher (I12), CICERO

A rush on users

Another reason these processes became challenging and time consuming, some of my informants described, was because of potential user partners' sometimes lacking availability for long engagement processes. At the outset, many user partners did not necessarily have large amounts of time to spare for research projects.

> We always want more time from the users than they can give. We'd love to sit them in a room for a whole day and pick their brains and get their reactions to things. They don't have the time to do that.
>
> Research Director (I8), CICERO

This challenge seemed to be compounded in certain sectors where more and more pressure was placed on central core actors to participate in research projects, due to the increased pressure from the Research Council to conduct user-involved research within those fields. One such challenging area was the energy sector, which as described in Chapter 4 is one of the areas where the Research Council has a strong focus on promoting user involvement. In fact, as also shown in Chapter 4, the large funding programme ENERGIX now requires applications for "pure" Researcher Projects without any users involved to justify why the research cannot or should not

be conducted with users. One Senior Researcher (I14) described these criteria for justifying a lack of user involvement as challenging to meet, particularly as even though a research project might be relevant to a certain sector, user partners may not be able – or willing – to prioritise it (as also discussed in Chapter 5). My informants also mentioned other sectors where this was beginning to be a challenge.

> Norway is not a very large country when it comes to users – especially when you focus on certain sectors, when you think of transport or something. There's three-four-five large players, that can contribute with – well, the kind of money that I was just indicating. And if these are already picked up by other projects, these actors – let's say the Public Roads Administration or something, they cannot commit to too many projects at the same time, because if all these projects get through and are selected, then that means that they have to spit in a hell of a lot of money, which they perhaps don't have then, right? So there's an unwillingness then, or an uncertainty from the user side – shall we commit ourselves to this project? How binding is this? Because there's a lot of risk for them involved, if a lot of projects are selected.
>
> Senior Researcher (I12), CICERO

As a consequence of this increased demand for user involvement in research projects, several of my informants now described a "rush" to capture core user partners in the time leading up to deadlines for submitting project applications to the Research Council. The list of potential user partners was limited not only by which actors were the large players within a certain field, but also – at least in the case of KPNs, which have been the primary application type used by the ENERGIX programme among others – by which actors would be able to contribute enough funding.

As indicated in the quote above, this did not just impact the time available for in-depth discussions about project aims. Some informants expressed a concern that the in-demand user partners were not necessarily equipped with the capacity to deal with such a large volume of requests from different research projects. As pointed out by I12, it could also be risky business for the partners to commit to too many research projects before finding out how many of them would actually receive funding from the Research Council. If they did, the partners might end up having over-committed themselves to too many projects. At the same time, for both KPNs and Collaboration Projects, the Council required a binding commitment to participate from the project's

potential user partners in order for applications to be accepted. When asked about changes in the context of user involvement and co-production of knowledge in climate science, one Senior Researcher particularly highlighted this challenge:

> The user partners get swamped. Previously that didn't happen to the same degree. But I've experienced it before as well, that a [government] ministry has said: "No, now we're getting so many requests that we're going to wait to say yes – we'll wait to see who wins." The problem is that you won't win if they're not in to begin with. But they also can't tie themselves to ten projects, because they don't have the capacity to follow up on all of them.
>
> Senior Researcher (I14), CICERO

According to some of my informants, this was also creating a situation where users' commitments to participating in research projects were often uncertain. Faced with a variety of different projects to choose from, potential partners would delay responding to requests for involvement, and might promise to commit to a specific project only to drop out after some time, and then re-commit again later. Since there were a number of research outputs and project aims associated with each partner's involvement, this had consequences for the researchers, who would have to revise large portions of their project proposals with each change in a partner's commitments. One of my non-CICERO informants expressed their frustration with this situation, recounting cases where budgets of several million NOK had "yo-yoed" in and out of project proposals in accordance with partners' changing commitments, meaning that research questions and even collaborating scientific institutions had to be dropped and then re-introduced, often at short notice.

> And it's completely hopeless to get a good scientific proposal on that foundation. I think we've managed it, but it creates significant challenges as you go. […] There's a big variation in the user partners' willingness and competence in these kinds of processes. They're not used to it. This is still pretty new in Norway. And especially when the Research Council has put so much pressure on this now, there are a lot of strange things happening. And I know several projects that have dropped out because they haven't gotten enough funding. It's not as unproblematic as the Research Council make it out to be.
>
> Senior Research Fellow (I18), CICERO Partner Institute

A new competition for research projects

Apparently in an effort to mitigate some of this rush, some actors like the Norwegian Water Resources and Energy Directorate (NVE) have begun to hold their own application processes for researchers who want them to join projects at user partners. NVE's 2019 call for applications describes that "in connection with the Research Council's calls, NVE receives a lot of requests from external research groups to support applications for new projects. The deadline to apply for this support is set to 30th April [for projects applying to the Research Council's KPN deadline of 4th September]" (NVE 2019). I was told in some of my interviews that other institutions had also set up similar processes.

Although promising to make the process slightly less chaotic, these pre-application processes had apparently not completely lived up to this promise, and were still characterised by delays and uncertainty. In addition, as pointed out by a couple of my informants, they – as well as the general rush to capture user partners – effectively served to create a new, informal round of competition for research project proposals. Before projects could reach the point of being evaluated by the Research Council's expert reviewers, they had to make sure to find enough user partners – and survive the gauntlet of uncertain commitments that muddled the proposal development process. In effect, this meant that core user partners might end up with a great deal of power to select which research projects get through – particularly within fields where more and more funding is channelled toward user involvement.

> But when all researchers are running like crazy after the same institutes… You don't have a competition on the basis of research quality, because it's the reviewers at the Research Council who judge that. But you have a new competition before that, where public authorities and the private sector judge.
>
> Senior Researcher (I14), CICERO

Winning in this "new competition" requires a somewhat different set of skills than winning a competition based on more traditional research quality. Researchers not only need to be able to offer useful knowledge that is of interest to potential user partners, they also need to build, manage and maintain relationships with those partners, as described above. It has been documented in research on boundary organisations that these organisations generally require a different set of capacities

than those required for more traditional research (Cash et al. 2003). However, for CICERO, this demand came alongside a continued demand that they also engage in "excellent research."

> Because [the Research Council] want both. They want excellent science and they want stakeholder engagement, and then they want it within the frame of this – and we can't do both with the same… You can do both, but you can't do both perfectly. There are trade-offs.
>
> Senior Researcher (I1), CICERO

In addition, I14's concern that succeeding in this new round of competition to engage core user partners did not depend primarily on research quality expresses a concern that central user partners are being put in a "gatekeeper" position of deciding which research project proposals are able to get through to evaluation by the Research Council. As such, these partners are being given the authority to decide what constitutes "good science" in the context of user involvement, in a sense outsourcing some of the evaluation of research project proposals from the Research Council to core user partners. Whether or not these partners' authority to make these selections was legitimate appeared to be a point of contention, relating to Gieryn's point that the epistemic authority that is contested and allocated in credibility contests is not only the authority to claim a position as a "good scientist," but also the authority to determine what constitutes "good science" (Gieryn 1999).

Overall, these descriptions of the way the Research Council of Norway's funding mechanisms for user involvement shape the process of acquiring user partners for research projects reveal several challenges which complicate the picture of these mechanisms serving to make scientific research relevant and useful for society. In particular, they highlight the importance of the question which opened this chapter: "You at least have to ask – useful for whom?" The answer to this question seems to be rather more complex than the broad categories described in the RCN's policy documents on open science.

6.4 Opening up? The question of power relations in user involvement

I opened this chapter with an anecdote from I8 about the importance of defining "users" beyond the broad categories used by some researchers – as well as in the background documents in the Research Council of Norway's policy for open science. In this chapter, I have attempted to move closer to a more concrete understanding of users, by looking into the way my informants describe the role of users in user-involved science. I have looked into the reasons given by my informants for doing user engagement and the roles of users attached to these reasons, as well as how my informants described the process seeking out specific user partners to involve in research projects.

In the background documents for the Research Council's policy on user involvement, the definition of potential users is a broad list of societal groups – the kind of description which I8 termed "throw everyone into a bag." However, the experiences described in this chapter may shed some light on which actors actually serve as user partners in a more concrete sense. In particular, it appears that in the context of much climate and environmental research in Norway, the list of relevant user partners is relatively short. Several of my informants described a "rush" on core user partners, a result of the fact that Norway only has a few major players within each sector who have the capacity and resources to participate in and co-fund research projects.

As such, while the Research Council seeks to ensure societal relevance by promoting the inclusion of "those who have a direct use for the research," their current funding mechanisms seem primarily to promote the inclusion of a few core user partners. At the same time, the increasing demand on researchers to include users in their research appears to place some of these in-demand partners in a rather powerful position. As described above, the many requests from different research projects give these actors the ability to pick and choose the projects which most serve their interests, which creates a new competition for research projects, where they must gain the favour of potential user partners before they reach the point of being evaluated by the Research Council's experts. This may effectively serve to delegate some of the Research Council's epistemic authority over defining what constitutes "relevant and useful research" to these private- and public-sector institutions.

In the context of how efforts to make research relevant and useful through user involvement are currently playing out in the Norwegian context, then, the answer to the question "useful for whom?" appears to not necessarily be "society," or the even broader categories such as "public institutions" and "the private sector" as employed by the Research Council in the background documents for their open science policy. Rather, the structures for user involvement appear to be geared toward making scientific knowledge relevant and useful for a list of specific institutions and companies who are in-demand as user partners – or even specific individuals within those institutions. However, this is combined with a discourse where, as described in the Research Council policy documents analysed in Chapter 4, the aim of user involvement is to contribute to solving "large societal challenges."

In Chapter 4, I described how Prainsack and Leonelli (2018) argue that the way the concept of "responsible science" is used by actors like the European Union is effectively contributing to de-politicising the concept of responsibility, re-shaping it to constitute a responsibility on the part of scientific researchers to become useful to existing systems, and to partner with industry. The findings discussed in this chapter, as well as in Chapters 4 and 5, suggest that this discussion of the ongoing de-politicisation of concepts attached to co-production and user involvement should perhaps also be expanded to the concepts of "relevance" and "usefulness."

This relates directly to a science policy context in which co-production or user involvement appears to be in a process of becoming "an end in itself," as seen in the Norwegian context in the Research Council requiring user involvement in an increasing proportion of research funding calls. As shown in this chapter, the Research Council's funding structures and the increasing dependence of scientists on acquiring – and keeping – core user partners may also serve to create a power differential wherein certain institutions and companies are in effect in a position to select winners and losers among scientific research groups within certain fields. However, these dynamics are not acknowledged in the language of inclusivity and broad societal relevance and usefulness used by the Research Council to legitimise the demand for user involvement.

In a discussion of the history of the concept of co-production in global sustainability, Miller and Wyborn argue that "turning co-production into an aspiration […]

obfuscates the inevitable power differences and political conflict in and among scientists, communities, and others with an interest in local or global outcomes" (Miller and Wyborn 2018, 3). In a similar vein, while discussing what they describe as the "integration imperative" in transdisciplinary environmental science, Klenk and Meehan assert that "the integration imperative conceals the friction, antagonism, and power inherent in knowledge co-production" (Klenk and Meehan 2015, 160). In light of this challenge, Lepenies et al. argue that "instead of calling for just 'doing' coproduction, reflexive governance would ask 'what kind, to what end, with whom, and how?'" (Lepenies et al. 2018, 10)

The importance of asking these questions is highlighted by the findings of this chapter. In addition, these findings once again highlight the importance of Lövbrand's (2011) argument, referenced throughout this thesis, that there exist significant trade-offs between instrumental and knowledge-democratising aims of co-production, or what she describes as the "logic of accountability" and the "logic of ontology." The second aim, described by Bremer and Meisch (2017) as the extended science and empowerment lenses of co-production, is based precisely in an understanding that social and political dynamics are core to the production of scientific knowledge, that these dynamics should be "opened up" and made transparent, and that a broader variety of voices and perspectives should be incorporated into knowledge production. It is this understanding of co-production which informs the map of new science-society relations which I have described as "agora." However, the instrumental use of the concept that seems to primarily form the background for its implementation in the Norwegian – and European – science policy contexts, combined with the use of the agora as a legitimising device, may ironically serve to obfuscate these social and political dynamics.

Rather than ensuring broad societal relevance, the findings discussed in this chapter suggest that the current structures for user engagement in fact ensure relevance to a rather limited group of organisations. This in itself is not necessarily problematic. These actors are large players within their respective sectors, doubtlessly in need of useful knowledge in order to address the pressing challenges of climate change and the demands of the so-called "green shift." However, it may be more problematic if this rather narrow definition of relevance and usefulness is obscured with claims that

these efforts for user involvement are in fact ensuring relevance and usefulness for all society. In effect, this may serve to substitute the needs and interests of "society" with the needs and interests of certain powerful user partners.

The way in which user involvement and the call for useful knowledge explicitly introduce interest and relevance as aims of scientific knowledge production holds the potential to make the power relations and social dynamics inherent to scientific knowledge production, which as discussed in Chapter 2 have long been a focus in STS research, visible in a new way. However, "throw everyone into a bag" descriptions of relevance and usefulness may once again serve to obscure these power relations. This also adds an additional dimension to the questions about the mapping of science-society relations which I described in the conclusion to Chapter 5: whether science policy initiatives for user involvement are in fact building an "agora" of open and democratic dialogue between different societal groups.

In addition, it raises questions about whether this "agora" and the more instrumental understandings of user involvement and co-production are complementary aims, as they appear to be framed to be by the Research Council. The power of core user partner institutions in this context, and the narrowing of the field of who actually acts as users to specific powerful institutions or even specific individuals within those institutions, does not quite fit the image of a democratic agora filled with "all the many voices of society." Indeed, these dynamics may better fit the alternative map of science-society relations which I introduced in Chapter 5, and which I will discuss further in Chapter 7: the knowledge production factory.

7 Conclusion – Redrawing the map of science in society

7.1 The landscape so far

The aim of this thesis has been to contribute to turning an analytical eye to science policy shifts seeking to promote open science, which some describe as building a new relationship between science and society (Nerlich et al. 2018b). In particular, I have focused on initiatives to include non-academic stakeholders in scientific research, otherwise known as co-production or user involvement in science (as well as by other terms), by studying the way this has been implemented in the Norwegian context through the experiences described in interviews with staff at CICERO Center for International Climate Research.

In Chapter 4, I described how "user involvement" is defined in the background documents for the Research Council of Norway's new policy for open science, as well as how the Council uses its funding mechanisms to promote increased user involvement in research. In Chapter 5, I looked into how my informants in CICERO discussed the concepts of "relevant science" and "useful knowledge" in the context of increased calls for user involvement. And in Chapter 6, I turned the attention to how my CICERO informants described working with "users," examining how different understandings of the purpose of co-production or user involvement position the role of the user in user-involved science, as well as how the Research Council's funding mechanisms contribute to shaping scientist-user relations.

This chapter seeks to bring the different strands of this analysis together by returning to the overarching question of this thesis: *What do CICERO's experiences with user involvement in science tell us about how this science policy shift is being implemented in the Norwegian context? In particular, how does it (re)constitute the relationship between science and society?* Are science policy shifts toward "open," user-involved science in this context drawing up what I, informed by Gieryn's (1999) concept of cultural cartographies of science, have described as the "agora" map of science-society relations? This notion is central to many descriptions of a proposed new relationship between science and society: The idea that the "ivory tower" should

be broken down in order to build an open and inclusive "agora," where all the many different voices of society can meet in a democratic dialogue and create better, more inclusive and more relevant knowledge to solve common challenges. However, do the experiences from CICERO – and the boundary work and cultural cartography undertaken by my informants when discussing the demand for increased user involvement – suggest that science policy changes toward open science and user involvement in Norway may be better described with a different map?

In order to lay out the foundation for answering these questions, I will in this section briefly summarise the main thesis findings that were discussed in Chapters 4–6, before moving on to discussing how these different findings tie together and what they reveal about open science and user involvement in the Norwegian context – as well as perhaps for the international implementation of these policy shifts.

The Research Council of Norway's frameworks for user involvement

The Research Council of Norway has in the last two decades worked to position itself as an "active agent of change" in the Norwegian research system, seeking to strategically direct research toward prioritised fields, particularly where it comes to meeting large global challenges such as climate change (Brandt et al. 2019). One of these strategic moves can be seen in the Council's push to increase user involvement in science, likely influenced by a similar move in the EU's Horizon 2020, which strongly emphasises Responsible Research and Innovation (RRI) and co-production as means to create a new relationship between science and society, characterised by greater "social responsibility" on the part of scientists – an agenda they describe as "science with and for society" (Peter et al. 2018).

The Research Council has selected climate and environment research as one of its prioritised areas for user involvement, as shown by the fact that more than half of the funding allocated for climate and environment research in the call for research project proposals in April 2019 was set aside for Collaboration Projects. In addition, the Large Programme on Energy, ENERGIX, now requires those researchers who wish to apply for Researcher Projects without users involved to justify why their research could or should not be carried out in collaboration with users. Similar mechanisms may be likely to be used when the Council, as stated in the background

documents for their policy on open science, seek to "increase the application of user involvement" in other fields of research.

My analysis of the background documents for the Research Council's 2019 policy on open science shows that the Council's definition of user involvement appears to be based on an instrumental logic, wherein user involvement is primarily seen as a means to "make research relevant and useful" for societal stakeholders. However, although this idea is central to the RCN's policy for user involvement, the concepts of "relevance" and "usefulness" are not unpacked or defined in these documents. In order to legitimate the proposed benefits of user involvement, the Research Council's policy documents also partially draw on ideas related to the democratising "agora" map of science-society relations. This idea is drawn on by the Research Council to justify how open science and user involvement are intended to mitigate the perceived current scientific legitimacy crisis, and "build faith in research." As such, instrumental and knowledge-democratising logics of user involvement are positioned side-by-side as mutually supporting aims in the RCN's policy documents.

The concept of "users" is also very broadly defined in these policy documents. However, examining the Research Council's funding mechanisms for promoting user involvement shows a more limited range of societal actors which may in practice take on the role of users in a scientific research project. The requirements for the application types KPNs and Collaboration Projects both require a pre-existing binding commitment from potential user partners in order for a project proposal to be considered by the Research Council, and KPNs require a specific proportion of research costs to be co-funded by user partners, which may impact which kinds of institutions are engaged.

This analysis of the Research Council of Norway's policy and funding mechanisms for user involvement form a useful backdrop for contextualising the experiences with user involvement described by my informants in CICERO. Pressures from the Research Council (as well as from Horizon 2020) appeared to be a key reason that CICERO and other research institutions are now engaging in these kinds of projects to an increasing extent. As such, the Research Council's funding mechanisms appear to play a significant part in shaping how CICERO's efforts of user involvement take

place, and perhaps in shaping the context of such efforts in the Norwegian research sector more generally.

Who is a relevant scientist, and what is useful knowledge?

There appeared to be significant diversity in what my informants thought of as the "ideal" relationship between CICERO as a scientific research institute and the rest of society. Although all agreed that part of CICERO's core purpose was to contribute relevant knowledge to policy- and decision making, there were different ideas about how this engagement should take place in practice. Some informants appeared to subscribe to a linear model ideal of science as relevant to, but essentially separate in its production from, social and political concerns. Some were also concerned that too much involvement from non-academic user partners in research and analysis may devalue the Center's "product" by compromising the perceived neutrality and independence of the scientific knowledge they produced. Other informants seemed to subscribe to more dialogic concepts of science-society relations.

There was a broad awareness that different people within CICERO had different views and opinions when it came to engaging with society, and some did not see this as particularly problematic, but rather a consequence of working in an interdisciplinary institution. However, other informants expressed a concern that public perceptions of CICERO's identity might occasionally fall on the "wrong side" of the science-society divide, with the institute perceived in some contexts as an NGO or advocacy group rather than as a research institution. My informants' attempts to reconcile these tensions and negotiate CICERO's place on the cultural map distinguishing scientific research institutions from the social and political spheres of NGOs and advocacy groups represent a clear example of boundary work.

In the context of user involvement, this boundary work often took the form of attempts to distinguish clear areas of responsibility in scientific research projects, detailing at which stages users could be involved, and which stages should be left to scientists alone. However, these maps were not unanimously accepted by all, with some informants seeing the co-production ideal as a deeper level of involvement at all stages of the research process. This highlights one of the core challenges which have been previously documented in research on boundary organisations and calls

for "relevant science" – the need to negotiate the tensions between demands for relevance and continued demands for objectivity as the basis for scientific epistemic authority (Shaw 2005).

The concept of "useful knowledge" is core to discussions of co-production and user involvement. However, this concept is to a large extent black-boxed and often used as though it has a clear and unambiguous meaning, as shown in Chapter 4's analysis of the background documents for the Research Council's policy for open science. I sought in my research to contribute to opening this black-box by unpacking how my informants described the concept of useful knowledge in the context user involvement, and what kinds of shifts in scientific knowledge production (and dissemination) were entailed in the production of useful knowledge.

Based on my interviews in CICERO, the useful knowledge requested by user partners appeared to require a combination of the factors packaging, particularity (or salience), interest, simplicity and certainty. In essence, useful knowledge would primarily constitute simple and certain "pieces" of information or solutions which could feed directly into particular processes of interest to knowledge users. However, this conceptualisation of useful knowledge appears to leave limited space for critical, nuanced and complex research, as well as for less immediately useful basic research. This manifested in concerns among some of my informants within both natural and social sciences that they were being asked to operate as what may be described respectively as "numeric oracles" and "solution architects."

Useful for whom? Revisiting scientist-user relations

As discussed in Chapter 2, there are multiple different ways of conceptualising the aims of – and processes for – co-production or user involvement. Each of these concepts also corresponds to different conceptions of the role non-academic stakeholders should play in scientific research projects. My interviews in CICERO showed several different understandings of the purposes of user involvement and the role of the user in these processes, with three main concepts recurring most frequently: user involvement as a means to create instrumentally useful knowledge for key stakeholders; user involvement as a means to improve scientific knowledge production by incorporating users' perspectives and practical expert knowledge; and

user involvement as a means to attain funding for CICERO's research, due to requirements from the Research Council. The latter led to a concern among some informants that user involvement could risk becoming an "end in itself" rather than a means to the end of producing more useful or inclusive knowledge.

As the Research Council's funding mechanisms were apparently one of the main reasons for increased user involvement in CICERO, the structure of these funding mechanisms had implications for shaping the relationships between scientists and their user partners. Several of my informants highlighted the challenges of finding user partners to engage in research projects, a process which seemed to require an understanding of users' information needs and priorities; an ability to convince them that the project would be able to offer useful knowledge according to these needs; as well as the ability to find the right people within potential partner organisations and build up social relationships and networks over time. In many cases, the line between a project's user partner being an organisation as a whole and an engaged individual within that organisation appeared to be blurred.

In addition, some of my informants brought up the challenge that within certain sectors, there is only a limited number of core actors with the resources and capacity to participate in research projects. This, they described, had contributed to a "rush" on these core partners, creating a situation where partners' commitments to participate in projects were often uncertain. In addition, in-demand user partners in effect appeared to gain significant power over which project proposals would make it through to evaluation by the Research Council, with some of these organisations already creating their own application processes for groups seeking to engage them as user partners in scientific research projects.

This raises questions of power relations between scientists and their user partners. In addition, some of my informants were concerned that these dynamics could serve to limit the space for critical engagement, with scientific researchers needing to be "loyal" in order to retain core partners. This situation also lends an additional dimension to the question of defining useful knowledge – when calls for user engagement are intended to make science "relevant and useful," this begs the question: relevant and useful for whom? In many cases, the "user" appears to be not society as a whole or even broad societal groups, but specific institutions within

certain sectors, or even specific individuals within those institutions. When the Research Council of Norway positions user involvement as a tool for ensuring broad societal relevance, this could lead to a situation where the needs and interests of "society" are substituted with the needs and interests of certain powerful user partners.

7.2 A new map – or several? The agora, the factory and the ivory tower

What, then, do these findings tell us about the landscape of user involvement as it is currently being implemented in Norwegian science policy? Throughout this thesis, I have referred to a culturally cartographic representation of open science and user involvement which I have chosen to describe as the "agora": the call to break open the ivory tower in order to create an open and democratic dialogue between different societal groups, in order to create more relevant and inclusive knowledge. This idea is often called on by proponents of a new, more open relationship between science and society, whether implicitly or explicitly (Liberatore and Funtowicz 2003; Jasanoff 2011; Nerlich et al. 2018b). In the context of co-production, this idea relates to what Bremer and Meisch (2017) describe as the extended science and empowerment lenses of co-production, and what Lövbrand (2011) describes as the "logic of ontology."

However, the findings in this thesis indicate that, much like Lövbrand (2011) found of the EU, the Norwegian science policy measures promoting increased user involvement in science appear largely to be informed by a more instrumental logic. This is shown both in my analysis of the background documents for the Research Council of Norway's new policy for open science, and in my informants' experiences of user involvement in practice. If I am to try my own hand as cultural cartographer of science, I might describe this alternate map of the new science-society relations as "the factory."

As shown in Chapter 5, the call for science to produce societally relevant useful knowledge, combined with tensions between the ideals of relevance and objectivity, can serve to effectively limit the role of scientists in collaborative research projects to that of answering relevant questions, defined based on the needs and interests of user

partners. This limited role also has scientists producing simple and certain "bits" of information or solutions on order, tailored to easily fit into the users' existing plans and suit their organisational and decision making structures – which could potentially limit the scope for more critical and transformative research. In addition, Chapter 6 shows that the current RCN funding structures for user involvement may serve to place a limited number of core user partners in a position of relative power over scientific research groups, potentially giving them the ability to restrict researchers' access to Research Council funding – a situation which becomes more challenging as an increasing proportion of the Council's project funds (and internationally available funds through Horizon 2020) are channelled toward user involvement.

This is not to say that building a knowledge production factory is necessarily a bad thing. Factories are, after all, very useful for a particular purpose. Advocates of an instrumental lens of co-production highlight the fact that public and private sector actors are in need of useful knowledge in order to tackle the challenges caused by complex global issues like climate change (Feldman and Ingram 2009; Kirchhoff, Lemos, and Dessai 2013). It has also been noted by several researchers that there exists a distinct gap between the scientific information being produced on climate change, and the kinds of information needed by decision makers (Lemos, Kirchhoff, and Ramprasad 2012; McNie 2007). In many cases, knowledge production "factories," where simple and certain "bits" of information are produced on order in accordance with users' needs and priorities, may present an effective way of filling this gap.

However, the analysis in this thesis highlights the point brought up by Lövbrand (2011), that there exist significant trade-offs between these two different ways of conceiving co-production and open science: between the "logic of ontology" and the "logic of accountability," or in other words between the agora and the factory. The Research Council of Norway appear to position both as part of the same landscape, or even as mutually reinforcing goals, using the democratising ideals of the agora as a legitimating device for the benefits of the factory, and as a justification for why open science will serve as a vaccine against the scientific legitimacy crisis and "build faith in research." The findings discussed in this thesis indicate that the relationship between the two ideals might be somewhat more complicated.

In particular, the findings in this thesis, and particularly those discussed in Chapter 6, raise questions about the concept of "societal relevance." According to the Research Council policy for open science analysed in Chapter 4, the purpose of science policy shifts toward open science and increased user involvement is to ensure that scientific knowledge is made relevant for solving "large societal challenges." This is also an important element of various descriptions of a new relationship or "new social contract" between science and society: the idea that scientific knowledge production should be "held to account" in order to ensure that the knowledge it produces is relevant and useful to society at large (Nowotny, Scott, and Gibbons 2002; Gibbons et al. 1994; Gibbons 1999). This accountability is, in part, what is to be accomplished by including different societal stakeholders in scientific knowledge production.

However, as highlighted by the findings in Chapter 6, this runs the risk of ignoring the fact that "society," or even more specific societal groups like "the private sector," are not a single unit. Different groups or even different individuals within any particular social group have a variety of different goals and interests, as has been often highlighted in social scientific research. When the actual user in a scientific research project becomes a specific company or public institution, or even a specific individual within that institution, their interests may not always coincide with "societal interests" – if there can even be said to exist such a thing as societal interests as an overarching concept.

Somewhat ironically, this very idea – that different social groups (including scientists) have different perspectives, goals and interests, and that these should be uncovered and incorporated in an inclusive process in order to democratise scientific knowledge production, are part of the foundation for calls to build the agora (Liberatore and Funtowicz 2003). However, this contrasts with an instrumental concept of open science which uses the agora as a legitimising device, implementing instrumental tools for the stated overarching aim of creating more inclusive and democratic knowledge. In other words, the claim that the inclusion of specific public and private sector actors in the scientific research process ensures that science becomes broadly societally relevant holds some inherent tensions.

This highlights a problem with the use of RRI and co-production (or user involvement) as "buzzwords." Bensaude-Vincent (2014) argues that the use of these

kinds of buzzwords in science policy creates a "trading space" that enables dialogue and engagement between different groups with different interests, meaning that these words serve as boundary objects. However, they accomplish this in part by obscuring tensions between different interpretations of the same concept – which, in the context of ideas of knowledge democratisation, may end up black-boxing the very same processes which were intended to be opened up (Klenk and Meehan 2015). To Prainsack and Leonelli's (2018) concern that the current use of the concept of "responsible science" by actors like the EU may serve to de-politicise the concept of responsibility in scientific research, then, one might add a similar concern about the potential de-politicisation and black-boxing of the concepts of "relevant science" and "useful knowledge."

There appears to be a risk that these concepts, as well as "co-production" and "open science," could join in the ranks of previous critical concepts which have been enlisted through de-politicisation and re-framing to serve the status quo, as has been observed with words like "participation" and "gender" in the development field (Cornwall and Brock 2005; Cornwall, Harrison, and Whitehead 2007) These dynamics beg the question – where is the line drawn between buzzwords serving as a trading space between different ideas and interests, versus as a space where tensions and conflicts between different concepts can be concealed, enabling one idea to act as a "Trojan horse" for another, conflicting concept?

Returning to the description given in the literature review of calls for a new relationship between science and society, many of these calls have been based in an understanding that the image of scientific neutrality, of science as "a realm apart" from social and political concerns, was complicated by research uncovering the ways science has historically been entangled with society and politics (Jasanoff 2011). Proponents of responsible science have argued for making *visible* the ways these dynamics – of power, interest and social relations – influence scientific knowledge production, and the way scientific knowledge influences political decision making (Prainsack and Leonelli 2018). However, as this thesis has shown, making these dynamics visible in the context of user involvement in science requires a careful unpacking of the concepts of "relevant science" and "useful knowledge" as they are

actually applied in different contexts, and it requires continuously asking the question: Useful for whom, and to what end?

Importantly, my intention in this conclusion is not to claim that science policy initiatives for open science and user involvement using the "factory" as their guiding map of science-society relations is necessarily a bad thing. As described by Gieryn (1999), no cultural cartography of science is necessarily wrong or right or represents – or constitutes – a correct or incorrect image of science and its relation other societal spheres. Much like geographical maps give different representations of the same landscape based on the needs and interests of the cartographer, different cultural maps of science-in-society serve different purposes. A factory serves one purpose, and an agora another. Although the ivory tower is much-maligned, towers, too, have their purposes – one of which is defending the autonomy of those inside them.

Rather than hold one of these ideals up over others as the true place of science-in-society, it may be more helpful to be aware of the fact that they are applicable in different contexts, for different ends. Science policy initiatives seeking to re-constitute the relationship between science and society should be clear about what they are building, as painting the walls of a factory to resemble an agora might have problematic consequences. In addition, looking back to the description in the literature review of how moves toward open science are interpreted very differently by different commentators, it might be said that the multiple different meanings of the concepts involved in this shift – open science, co-production, RRI – are as much "trading spaces" as they are Rorschach tests. When scientists defend the ivory tower against open science, they are often seen to be seeking to block the construction of the democratic agora – but in some cases, they may be resisting the factory.

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Appendix I: Example interview guide

Description of the research project and presentation of informed consent form

Can you briefly describe your role in CICERO?

CICERO's Societal Role

What demands and expectations are placed on CICERO as an advisor or communicator of information to policy and other societal spheres?

- To what extent have these demands or expectations changed over time? How and why?
- Do you have any opinion on what this change means?

What kind of role do you think CICERO *should* play in relation to these spheres?

- How can this role best be played out?
- Are there any obstacles for CICERO to fill this role?
- What is your personal role in this work?

Co-Production of Knowledge

Does CICERO do a lot of work with co-production of knowledge with non-academic partners?

- How would you define co-production of knowledge?
- How does this work take place?
- How have ideas on co-production within climate research changed over time?
    - Has this change affected CICERO's work? How?
    - What is the motivation behind doing co-production?

Experiences with User Involvement

What projects are you currently involved or have you been involved in that include user partners?

What kinds of partners do you have in these projects, and why those specific partners?

- Why do you involve non-academic partners in projects? More generally, why should non-academic partners be involved in research?

- What kinds of expectations or demands do you find the non-academic partners have from the partnership?

    - How do those expectations/demands affect your work?

    - Have you experienced any conflict between the expectations/demands of different partners?

    - How do these expectations/demands coincide with CICERO's priorities? (Conflict?)

In the descriptions of several CICERO projects, the production of useful knowledge is mentioned as a project aim.

- What is useful knowledge?

- Is there any conflict between knowledge that is useful and knowledge that is scientifically interesting?

To what extent does the focus on user involvement and co-production come from outside – and where does it come from?

- Does it come from Norway or is it an international movement?

- Do you find that there is a difference between the Norwegian approach to co-production and user involvement and what is done in other countries?

Finally

- Is there anything else about these topics you think I should know, or which you would like to say?

- Can you recommend anyone else in CICERO who I should speak to about these topics?

Appendix II: List of informants

Code	Title and Affiliation	Field
I1	Senior Researcher, CICERO	Social science
I2	Senior Communication Adviser, CICERO	Communications
I3	Research Director, CICERO	Social science
I4	Senior Researcher, CICERO	Social science
I5	Senior Researcher, CICERO	Natural science
I6	Professor, CICERO Partner Institute	Social science
I7	Department Director, CICERO	Natural science
I8	Research Director, CICERO	Social science
I9	Research Director, CICERO	Natural science
I10	Senior Researcher, CICERO	Natural science
I11	Senior Researcher, CICERO	Natural science
I12	Senior Researcher, CICERO	Natural science
I13	Researcher, CICERO Partner Institute	Engineering
I14	Senior Researcher, CICERO	Social science
I15	Research Director, CICERO	Natural science
I16	Senior Researcher, CICERO	Social science
I17	Senior Researcher, CICERO	Social science
I18	Senior Research Fellow, CICERO Partner Institute	Social science
I19	Special Adviser, Research Council of Norway	-

Appendix III: List of NVivo coding categories

- Academic incentive structures
- Financial dependence
- Ethical concerns
- Interpretive flexibility (buzzword)
- RCN policies
- Reasons to do co-production
- Relationships with users
  - Powerful users
  - Influencing funding
  - Space for critique
  - Uncertain commitments
  - Social relationships
  - User fatigue
- Resource demands of user involvement
- Science-society relations
  - Critique of linear model
  - Ivory tower
  - Personal preference / different orientations toward engagement
  - Scientific independence
  - Scientific legitimacy
  - Scientific neutrality
  - Tension neutrality v relevance
- The value of science
- Useful knowledge
  - Applied v. basic research
  - Complexity v. simplicity
    - Role of natural science
    - Role of social science
  - Users' interests
  - Communication / packaging
  - Particularity
  - Useful v. usable
- When to do co-production
- Understanding and defining users
  - Defining the user
  - Differences between users
  - Understanding users' needs

Appendix IV: Note 3 on involvement and citizen science

Bakgrunnsnotat: Involvering og folkeforskning

Involvering av brukere i forskning er en innarbeidet praksis i flere forskningsområder og i mange av Forskningsrådets programmer. Det primære målet er å øke forskningens relevans for brukere av forskning. Siden forskning og innovasjon i sterkere grad handler om å utvikle kunnskap som bidrar til å løse store samfunnsutfordringer blir åpenhet og involvering stadig viktigere.

Nye delingsteknologier gjør det mulig å involvere stadig nye grupper i forskning. Både internasjonalt og nasjonalt er det de senere årene tatt stadig nye initiativer for å involvere allmenheten, som ikke selv er brukere eller direkte berørt, i forskning. Det er vanlig å omtale slike prosjekter som citizen science eller folkeforskning. Prosjektene kan ha vitenskapelige, samfunnsmessige eller politiske mål avhengig av hva slags form for folkeforskning det er snakk om.

I dette dokumentet beskriver vi tre ulike former for involvering; Forskningsrådets aktivitet knyttet til brukerinvolvering, store samfunnsutfordringer knyttet til ansvarlig forskning og innovasjon (RRI) og folkeforskning.

1. Brukermedvirkning/ involvering

For å gjøre forskning relevant og nyttig er det viktig å sikre økt medvirkning og innflytelse fra brukere av forskningen i prioritering, planlegging og gjennomføring. I tillegg til å øke forskningens relevans, kan brukermedvirkning i forskningsprosessen bidra til å øke den anvendte forskningens kvalitet. Medvirkning fra ulike brukergrupper kan i tillegg bidra til bedre implementering av resultatene fra forskning og innovasjon.

Brukere kan bidra med å:

- identifisere aktuelle tema/problemstillinger hvor det er behov for forskning
- identifisere faktorer som kan fremme/hindre deltagelse i prosjekter
- bringe inn nye perspektiver i analyse og fortolkning av resultater
- gi innspill om språkbruk, fremstillingsmåter og formidlingskanaler
- formidle resultater i aktuelle miljøer

Brukere er i denne sammenheng de som har direkte nytte av forskningen fra næringsliv, offentlig sektor, myndigheter og sivilsamfunn. Hvilke grupper som er aktuelle å involvere vil variere avhengig av forskningens tematikk og formål. Eksempelvis vil aktuelle brukergrupper innenfor helseforskning være pasienter, pårørende, fagpersonell og beslutningstakere.

2. Store samfunnsutfordringer fordrer nye former for samarbeid

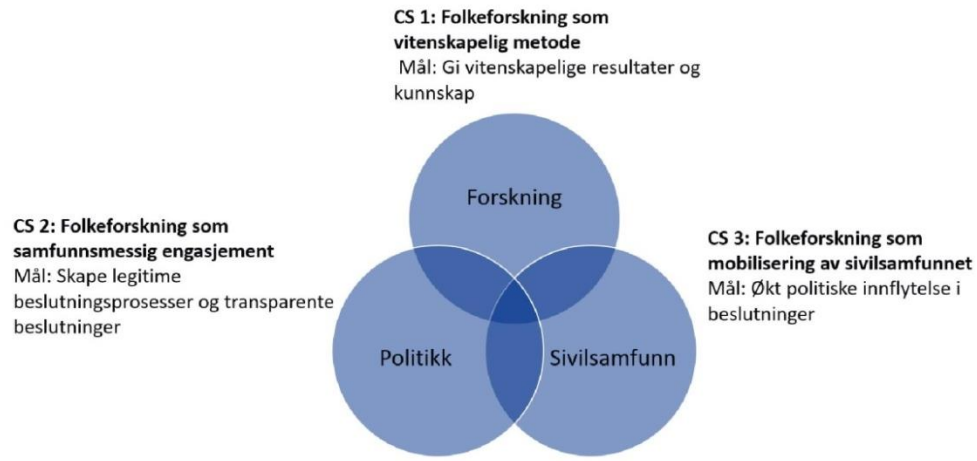
Sentrale nasjonale og globale temaer, som klima og bærekraftig utvikling, overgang til fornybarsamfunnet, flyktningeproblematikk og innvandring, bærekraftig matproduksjon og helse, er komplekse og uforutsigbare. Disse prosessene krever at et bredt spekter av aktører fra forskning, næringsliv, offentlig sektor, myndigheter og sivilsamfunnet involveres for å løfte fram ulike perspektiver.

Et mål er å avklare hvilke utfordringer og muligheter man står overfor gjennom involvering og deltakelse. Prosessene bør stimulere til samfunnsansvarlig forskning og innovasjon (RRI), slik at man øker de positive effektene og unngår de negative.

3. Folkeforskning

Folkeforskning innebærer å engasjere folk som ikke har forskerbakgrunn i forskning, i samarbeid med forskere eller forskningsinstitusjoner. Slik kan allmenheten få innsikt i vitenskapelig tenkemåte og tilegne seg forskningsbasert kunnskap.

Vitenskapsteoretikeren Dick Kasperowski skiller mellom tre former for folkeforskning (se figur 1):
CS 1) Folkeforskning som metode for å oppnå vitenskapelige resultater, for eksempel ved at frivillige deltakere bidrar til storskala datainnsamling eller -klassifisering i forskningsprosjekter definert av forskere.
CS 2) Folkeforskning som samfunnsmessig engasjement for å skape legitimitet for politiske beslutninger basert på vitenskapelig kunnskap. Dette skjer gjerne i form av ulike typer dialog initiert av myndigheter eller profesjonelle eller frivillige organisasjoner.
CS 3) Folkeforskning der sivilsamfunnet søker økt politisk innflytelse i konkrete saker. Grupper som engasjerer seg i spesielle problemstillinger bruker forskningsmetodikk for å belyse disse. Dette blir særlig brukt i lokale helse- eller miljøspørsmål.



Figur 1: Oversikt over Kasperowskis tre former for folkeforskning[1]

Folkeforskning har potensial for å demokratisere og øke tilliten til forskning. De ulike formene for folkeforskning involverer allmenheten på ulike måter og ut fra ulike mål. Derfor vil betydningen for sivilsamfunnets tillit til vitenskapelig metode, vitenskapen som institusjon og vitenskapelige resultater være avhengig av hvilken form for folkeforskning konkrete prosjekter representerer.

Alle de tre formene for folkeforskning har noen felles problemstillinger. Det vil være viktig å finne gode allmenne modeller som kan brukes i utvikling av konkrete prosjekter på disse områdene:

- Standardisering av datakvalitet ved innsamling og lagring av data
- Implementering av nødvendig teknologi for å utføre prosjekter
- Kommunikasjon mellom deltakerne innad i prosjekter og mellom ulike prosjekter
- Utvikling av etiske og juridiske rammeverk for prosjekter

I spørreskjemaet på nettsiden kan du besvare spørsmålene under som er særlige relevante for deg eller din institusjon/organisasjon/bedrift.

[1] http://www.formas.se/Om-Formas/Formas-Publikationer/Rapporter/Medborgarforskning-och-vetenskapens-demokratisering/

Barrierer og dilemmaer innenfor brukerinvolvering

Ekspertrollen og behov for åpne læringsprosesser

For å få til reell brukermedvirkning må det inviteres til åpne og lærende prosesser, slik at det blir interessant for ulike beslutningstakere og interessenter å delta.

- Hvordan involvere bredt i åpne forskning- og innovasjonsprosesser?
- Hvordan utfordre tradisjonelle ekspertroller i åpne forsknings- og innovasjonsprosesser?
- Hvordan skal man stimulere til økt læring for alle parter i forsknings- og innovasjonsprosesser?

Bredere anvendelse av brukermedvirkning

Brukermedvirkning er godt innarbeidet i noen satsinger og aktiviteter, for eksempel Forskningsrådets helseforskningsprogrammer.

- Er det områder der brukermedvirkning har spesielt stor nytteverdi?
- Bør Forskningsrådet øke innslag av brukermedvirkning, og i tilfelle på hvilke områder?
- Hvilken merverdi kan brukermedvirkning gi her?

Barrierer og dilemmaer innenfor store samfunnsutfordringer

- Hvordan skal man best legge til rette for gode involveringsprosesser der relevante aktører kan bidra til løsninger på konkrete samfunnsutfordringer?
- Hvilke faktorer kan hindre god involvering og hvordan kan dette løses?

Barrierer og dilemmaer innenfor folkeforskning

Hvilken verdi har folkeforskning?

Folkeforskning som vitenskapelig metode (CS 1) har lang tradisjon i naturvitenskaplig forskning og har særlig blitt brukt til kartlegging og overvåking av arter og biologisk mangfold. Med nye delingsteknologier blir det mulig å gjennomføre folkeforskningsprosjekter på stadig nye områder og på nye måter, og internasjonalt har antallet prosjekter økt sterkt de senere årene. Folkeforskning kan bidra til involvering og gi ny innsikt som kan supplere annen type forskning. En utfordring ved folkeforskning kan imidlertid være å kvalitetssikre metoder for å måle og vurdere data.

- Hvilken verdi kan folkeforskning ha innenfor det feltet du jobber med?
- Er det temaer som utmerker seg der folkeforskning er spesielt egnet som tilnærming?
- Hvilke ressurser (datasikring, teknologi, rammeverk) er nødvendige for å kunne utføre folkeforsknings-prosjekter?

Utfordringer i folkeforskningsprosjekter

Folkeforskning blir ofte trukket fram som viktig for å engasjere allmenheten i forskning, og for å øke deres forskningsforståelse. Det er imidlertid en risiko for at folkeforskning vil forsterke allerede etablerte kunnskapsskiller og sosial status ved at det primært er de ressurssterke som involveres seg og dermed får innflytelse.

- Hvordan skal man engasjere større deler av befolkningen i slike aktiviteter?
- I hvilken grad kan folkeforskning bidra til å øke tillit til forskning?
- Folkeforskning som metode (CS 1) er mest etablert i naturvitenskap. Hvordan kan denne tilnærmingen brukes på andre fagområder?

Det er behov for å etablere etiske og juridiske retningslinjer for folkeforskningsprosjekter.

- Hvilken status skal deltakerne i folkeforskningsprosjekter ha? Skal de betraktes som medforskere? Hvis ikke, hvordan skal de få anerkjennelse for sitt bidrag?
- Hvilke interessekonflikter er det i slike prosjekter?
- Hvordan sikre personvernet i prosjekter der deltakerne bidrar med data om seg selv?
- Er det behov for å utvikle felles etiske og juridiske rammeverk for folkeforskningsprosjekter? Hva vil i tilfelle være viktige elementer i et slikt rammeverk?

Det er også politiske utfordringer knyttet til folkeforskning, blant annet i prosjekter der forskningsinstitusjoner deltar i prosjekter som har en politisk agenda.

- Hvordan påvirkes forskerrollen dersom interesseorganisasjoner eller politiske grupperinger med tydelige agendaer får sette premisser for prosjekter? Hvordan sikre forskerens integritet?

Norsk betegnelse for citizen science

Vi mangler foreløpig en innarbeidet norsk betegnelse for citizen science. Her har vi oversatt det med folkeforskning. Andre betegnelser som har blitt brukt er dugnadsforskning og medborgerforskning.

- Er folkeforskning en god betegnelse for citizen science på norsk? Hvis ikke – har du andre forslag? Begrunn gjerne.

Appendix V: Appendix to the note on involvement and citizen science

Mer om involvering og folkeforskning

Internasjonale prosesser: nye former for involvering

Inkluderende arbeidsmåter og RRI

Involvering av brukere av forskning og innovasjon er selve kjernen i rammeverket for ansvarlig forskning og innovasjon (RRI). RRI er blitt et viktig begrep i europeisk forsknings- og innovasjonspolitikk. Samfunnsansvarlig forskning og innovasjon er en tverrgående utfordring i Horisont 2020, og i 2014 la det italienske presidentskapet for EUs Ministerråd fram The Rome Declaration on Responsible Research and Innovation. RRI skal inspirere til eksperimentering, utviklingsarbeid og læring på tvers av etablerte grenser, sektorer og disipliner.

Folkeforskning

En arbeidsgruppe i Open Science Policy Platform, som gir EU-kommisjonen råd om åpen forskning, har utformet anbefalinger for citizen science i 2018. Dette er innarbeidet og understreket i de førende dokumentene for utforming av Horisont Europa hvor det heter at citizen science "will play a central role within Horizon Europe".

Horisont 2020 har et eget program (SWAFS) der ulike dimensjoner som er relevante for åpen forskning, som forskningsintegritet, etikk, involvering av allmenheten og økt tilgang på forskningsresultater, inngår.

Et eksempel på et banebrytende H 2020-prosjekt innenfor folkeforskning er CIMULACT (”Citizen and Multi-actor Consultation on Horizon 2020”) [1]Partnere fra 30 europeiske land samarbeidet om å involvere flere stemmer og perspektiver i diskusjonen om mål og prioriteringer for EUs forskningsprogrammer. Teknologirådet har vært ansvarlig for den norske delen av prosjektet.

Den europeiske citizen science-organisasjonen, European Citizen Science Association (ECSA) jobber for å styrke citizen science som felt, utvikle metoder, koordinere europeiske prosjekter og skape nettverk. Den europeiske organisasjonen samarbeider med liknende organisasjoner i Australia (ACSA) og USA (CSA), blant annet om den faglige tidsskriftsportalen, Citizen Science: Theory and Practice.

I Sverige brukes begrepet medborgerforskning, og det det er stor aktivitet knyttet til dette. Alle svenske CS-prosjekter skal samles i en felles webbportal. Den vil ha etiske og juridiske retningslinjer og vil gjøre det enklere for forskere og allmenheten å finne fram til prosjekter med høy kvalitet.

USA har en offisell nettside med en katalog over offentlig finansierte prosjekter, verktøykasse for å utforme citizen science-prosjekter og nettverksfunksjon.

Eksempler på folkeforskning i Norge

Folkeforskning er et relativt nytt fenomen i norsk sammenheng, men feltet er i sterk vekst. Dette gjelder særlig prosjekter der målet er å samle inn og rapportere data om økologiske forandringer. I andre prosjekter kan fokus være rettet mot lokalmiljø eller tilrettelegging av offentlige tjenester og infrastruktur. Her er noen eksempler på pågående prosjekter:

Det største prosjektet som har pågått i flere år er artsregistrering i artsdatabanken. Pr. 11.9. 2018 er det gjort over 19,5 millioner artsobservasjoner i artsdatabankens base, og av dem er 1,4 millioner gjort i år. Kampanjen "Artsjakten" arrangeres årlig, der man mobiliserer bredt for å prøve å registrere så mange arter som mulig.

[1] . https://teknologiradet.no/norge-2030/disse-folkeforslagene-nadde-frem/

Forskningsrådets faste samarbeidspartner i Forskningskampanjen, Nettverk for miljølære, har spesialisert seg på nettbasert datainnsamling fra skoler og tilgjengeliggjøring av dataene på nettsiden. Miljolare.no har nå flere folkeforsknings-prosjekter som inviterer til samarbeid mellom forskere, organisasjoner og skoler som "Undersøk marint avfall", "Hagefugltellingen", m.m.

Nettverk for Miljølære er også knyttet til Naturfagsenteret, som sammen med Norsk design- og arkitektursenter og Kommunal- og moderniseringsdepartementet tilbyr "Barnetråkk" – et verktøy der klasser kan utforske lokalmiljøet og stille krav om det de vil skal bli bedre, og kommuner kan bruke lokalkunnskap om barn og unges arealbruk på en direkte måte i planleggingsprosesser.

Det gjøres en også del prosjekter i regi av universitetsmuseene. Naturhistorisk museum lanserte i samarbeid med Den norske turistforeningen appen *Natur i endring* i mai 2018 der man kan registrere trær i fjellet til bruk i klima- og økologiforskningen. I et SAMKUL-finansiert prosjekt ved museet skal folk inviteres til å registrere bruk av planter i mat og medisin.

NILU har gjennomført store europeiske prosjekter i Norge, som CITI-SENSE og nå hackAIR der folk kan bidra til måling av luftkvalitet. I CITI-SENSE kunne innbyggere i flere europeiske byer samle miljødata ved hjelp av sensorer og annet elektronisk utstyr.

Hva gjøres i Forskningsrådet

Brukermedvirkning i Forskningsrådets programmer

I Forskningsrådet benyttes både brukermedvirkning og brukerinvolvering som begreper. Begge begrepene har vært benyttet i ulike programmer og aktiviteter og beskriver samme prosess. Dette betyr å involvere brukere i et spenn fra deltakelse i referansegrupper og innspillsprosesser til deltakelse i prosjekter. Graden av involvering og hvem som involveres vil variere avhengig av tema og problemstilling.

Det er satt i gang en rekke aktiviteter der målet er å stimulere til tverrfaglighet, involvering og nye måter å samarbeide på. Aktivitetene har fokus på nye arbeidsmåter og samspill mellom ulike aktører fra forskning, næringsliv, offentlig sektor og andre relevante samfunnsaktører og er rettet mot teknologiutvikling, innovasjon og samfunnsperspektiver. I programmer og aktiviteter innenfor helse, innovasjon, energi, klima og miljø er brukermedvirkning en innarbeidet arbeidsform. Brukere er representert i styrende organer, råd og utvalg. Brukere er aktivt deltakende i prioriterings-, planleggings- og beslutningsprosesser fra begynnelse til slutt.

I søknader om forskningsmidler innenfor for eksempel helse skal søker beskrive hvem brukerne er og hvordan de er involvert i planlegging, gjennomføring og utnyttelse av resultatene. Søker skal redegjøre for betydningen av brukermedvirkning og hvordan brukerperspektivet ivaretas i prosjektet. Programmene stiller også krav til at forventet nytteverdi for brukerne, forskningsfeltet og samfunnet for øvrig omtales i søknadene. Søker skal også beskrive forutsetningene for at forskningsresultatene kan implementeres i praksis.

Inkluderende arbeidsmåter og RRI

Forskningsrådets teknologiprogrammer har utviklet et rammeverk for ansvarlig forskning og innovasjon, RRI, der bred involvering av ulike brukergrupper står sentralt. Rammeverket fokuserer på selve forsknings- og innovasjonsprosessene, kort sammenfattet ved at de bør være fremadskuende, reflekterende, inkluderende og fleksible. Det legges vekt på å utvikle diagnoser og prospekter for å forstå utfordringer og mulighetsrom på lengre sikt, herunder drøftinger av forutsetninger for forsknings- og innovasjonsarbeid i form av antagelser og forståelsesrammer, usikkerhet, kompleksitet og dilemmaer. Rammeverket er utviklet for å lede forsknings- og innovasjonsprosesser i ønsket retning.

Det er også utviklet et kunnskapsgrunnlag for grønn innovasjon hvor målet er å til å bidra til det grønne skiftet ved å utvikle virkemidler for å stimulere næringslivet i samarbeid med andre aktører til utvikling av grønne løsninger. BIA-X er en første satsing på feltet.

Videre har Forskningsrådet et eget program for Innovasjon i offentlig sektor hvor det vektlegges at sammensatte samfunnsutfordringer skal løses på tvers av fag og sektorer i et samspill mellom offentlige virksomheter, forskningsmiljøer, innbyggere, sivilsamfunn og næringsliv.

Involvering av allmenhet

Forskningsrådet har ingen egne programmer eller satsinger rettet mot folkeforskning, men har enkelte aktiviteter der allmenheten involveres på ulike måter.

Forskningskampanjen

Forskningskampanjen er et landsomfattende folkeforsknings-prosjekt, som Forskningsrådet tok initiativ til i 2003. Inntil 15 000 elever ved 300 norske skoler deltar årlig. Elever i grunnskolen og videregående skole hjelper forskere med å samle inn og registrere data som ellers ville vært vanskelig å skaffe. Målet er å frembringe ny kunnskap, men kampanjen har også som mål at deltakerne ved å bli introdusert for forskning, forskningsmetode og kampanjens forskningstema skal få interesse for og engasjere seg i forskning. Både i Sverige og Danmark arrangeres det nå liknende kampanjer inspirert av den norske.

Behovsidentifisert forskning ved CFS/ME

Formålet med behovsidentifisert forskning er å støtte prosjekter som der brukerne sammen med forskerne identifiserer kunnskapsbehov. Konseptet stammer fra Storbritannia og National Institute of Health Research (NIHR). Forskningsrådet gjennomførte i 2017 en pilot som et tillegg til ordinære utlysninger innenfor helseforskning. Hovedformålet var å trekke brukere av forskningen inn i beslutningene om hva det skal forskes på. Pilotprosjektet startet våren 2016 og ble avsluttet høsten 2017.

Folkets klimaforskning

I 2013 spurte Forskningsrådet "folket" om hva de ville at klimaforskere skulle forske på. Gjennom samtalegrupper og en nasjonal spørregruppe ble et sett av forskningsspørsmål definert. To søknader ble innvilget, og i 2014 startet prosjektene opp.

Involvering av ungdom i IKTPLUSS

Ungdom fra videregående skoler med forskerlinje ble i 2016 og 2017 invitert til workshop for å komme opp med problemstillinger som IKT-forskning kan gi svar på. To av innspillene ble en del av utlysningen og endte opp i to prosjekter. En gruppe av ungdommene møtte forskere fra ett av prosjektene året etter.

Appendix VI: Overview of RCN application types as of 2019

Application type	Who can apply	Objective	Aim
Researcher Projects	Approved Norwegian research organisations.	To promote renewal and development in research across all disciplines and thematic areas.	To contribute to important new insights, scientific publication, researcher training and international research collaboration.
Innovation Projects	Companies and public sector entities that are not research organisations.	To encourage value creation and renewal in the business and public sectors.	To help to enhance competitiveness in new and existing business areas, strengthen the restructuring capacity of the Norwegian economy and the public sector, and increase interaction and knowledge transfer across stakeholders.
Knowledge-building and Collaboration Projects	Approved Norwegian research organisations in cooperation with relevant actors from the private and/or public sector or other public or private organisations.	To promote cooperation to develop R&D expertise and capacity in areas of importance to society and business and industry.	To help to develop and promote new knowledge and to improve interaction and knowledge transfer between R&D groups and stakeholders in society in order to find solutions to important societal challenges.
Coordination and Support Activities	Approved Norwegian research organisations, companies, public sector entities, non-governmental organisations and groups of such entities.	To fund the planning, coordination and dissemination of R&D activities.	To promote researcher mobility, national and international networks, publication, dialogue, dissemination activity and more in connection with R&D activities.
Commercialisation Projects	Technology Transfer Offices (TTOs), approved Norwegian research organisations and micro-businesses originating in research organisations and/or TTOs.	To promote greater commercial utilisation of R&D results from publicly-funded research in Norway.	To clarify uncertainties related to the commercial utilisation of high-potential research results by answering questions that will prevent the project from moving forward in the commercialisation process if they remain unanswered
Centre Scheme Funding	Approved Norwegian research organisations. Many calls for proposals require collaboration with trade and industry or stakeholders in the public sector.	Targeted, long-term investment to strengthen and further develop outstanding and creative research and innovation groups, or to build up research groups in areas of key strategic importance.	To provide a framework for calls under several different centre schemes that are designed to support the best research groups and lead to pioneering research and new innovations, or to strengthen key priority areas.
Research Infrastructure	Approved Norwegian research organisations and publicly funded administrators of research infrastructure who cooperate closely with Norwegian research organisations.	To promote and strengthen infrastructure that leads to innovative research and development.	To provide Norwegian research groups and companies with access to relevant, updated infrastructure that facilitates high-quality research.

Source: Research Council of Norway web page (RCN 2019g)

Appendix VII: Funding allocations in the April 10th, 2019 call

This information is taken from the calls as they were described in February of 2019, as the redesign of the RCN website has unfortunately removed some of this information. In addition, some of these funding allocations were listed as approximate figures at the time this data was collected.

RESEARCHER PROJECTS		**COLLABORATION PROJECTS**	
Programme	**Funds allocated (in millions NOK)**	**Programme**	**Funds allocated (in millions NOK)**
FRIPRO	820	BIONÆR	40
HAVBRUK2	115	FINNUT	50
IKTPLUSS	72	HELSEVEL	50
KLIMAFORSK	40	KLIMAFORSK	100
NORRUSS	32	MATFONDAVTALE	80
BEDREHELSE	70	MILJØFORSK	80
BEHANDLING	115	POLARPROG	47
DEMOS	25	PROFESJON	70
ENERGIX	20	TRANSPORT	40
FINNUT	90	* Programmes whose calls for applications mention climate, environment or sustainability are marked in light green, and programmes whose calls primarily focus on climate, environment or sustainability are marked in dark green.	
HELSEVEL	150		
MARINFORSK	134		
NANO2021	90		
NORGLOBAL2	120		
PETROMAKS2	20		
SAMISK	20		
SAMKUL	54		
UTENRIKS	45		
VAM II	250		
SUM Researcher Projects	2282	SUM Collaboration Projects	557
SUM Mentioning climate & environment	379	SUM Mentioning climate & environment	387
SUM Climate & environment as primary focus	194	SUM Climate & environment as primary focus	220

Source: The Research Council of Norway web page