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'Futuring' in Transdisciplinary Sustainability Research

On the Assemblage, Stabilization and Contestation of Collectively
Imagined Futures in the Production of Anticipatory Knowledge

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1. Introduction – Debating Sustainable Futures

“Prediction is very difficult, especially about the future.” (Niels Bohr)

“Who cares, who cares what the future brings” (Nick Cave: Higgs Boson Blues)

Imagine a room. It is barely furnished, dimly lit and filled with cigarette smoke. There are French windows and glancing through we realize that it is dark outside. It seems to be night or maybe late evening. Although we can't see much, we are able to identify what might be a garden or a park. Next to one of the windows we see an elderly man very obviously buried in thought. He is repeatedly murmuring a phrase we can hardly understand. It sounds as if he is saying something like: “Prediction is very difficult, especially about the future.” This is an odd thing to say. What could prediction be about if not the future? Still pondering about what the man could have meant we suddenly notice a second man in the room (we appear to be in some sort of men-only smoking chamber). It is a tall and lean man with long dark hair and sharp facial features. He's the one smoking in this room. With a frustration palpable in his voice he snarls: “Who cares, who cares what the future brings!”

Of course this scenery and its dialog are fictional. To my knowledge Danish physicist Niels Bohr and Australian musician Nick Cave have never actually met. The description of the room is inspired by my working place (I added the cigarette smoke). However, the quotes are no mere fiction. The first one is ascribed to Niels Bohr and the other one I took from a recent Nick Cave song. This second quote can be read in two distinct ways that are interesting to reflect upon in the context of this introduction. To start with, it can be read as a rhetorical question or a cynical remark on people worrying about the future: Who cares? Well, nobody cares or should care about the future the question posed by Cave seems to indicate. It doesn't matter that much anyway. So stop racking your brains about it.

Well, actually loads of people seem to care about the future nowadays. For example, future-related discourse has become a common feature of our everyday life; so common that we hardly even notice it anymore. Right now, working on this introduction, I am looking at a sheet almanac on the wall opposite my desk with a logo and some kind of motto saying: ‘thinking the future’ (“Zukunft denken”). And this is just one example of

many. A brief look into different brochures, magazines or (academic) newsletters brings to the fore tons of similar examples: an Austrian housing corporation, for example, claims that it is 'building for your future'¹ ("Wir bauen für Ihre Zukunft"), the Austrian Economic Chambers' journal is called 'future industries'² ("Zukunftsbranchen") and the Austrian Academy of Sciences talks about setting the 'course for the future'³ ("Weichen für die Zukunft").

Apart from these diverse examples the future furthermore provides an important rhetoric and imaginative resource in political debates. This happened e.g. in the discussion about family assistance payments in which the Austrian minister of finance found himself labeled with the not very charming nickname 'Zukunftsräuber'⁴, which can be roughly translated into 'thief of the future'. Through this notion 'the future' of Austria and its citizens is substantialized and employed as a precious possession that can be taken by force. In a similar manner, in the 2012 US presidential campaign a Mitt Romney Super-Pac homepage was entitled with the slogan 'Restore Our Future'. In this slogan the future is something that is being destroyed but can be 'restored' again by certain actors with the ascribed ability to fix it in the present. Quite recently former presidential candidate Al Gore published his latest book on global change that is simply entitled 'The Future'⁵.

This more general political interest in the future also echoes in international science and research policy. The European Commissions' report on the European research area entitled 'inventing our future together'⁶ (2007), the current framework program for research and innovation 'Horizon 2020'⁷ or the World Commission on Environment and Development's report on sustainability named 'Our Common Future'⁸ (1987) are but some examples. In Austria there is a series of photographs depicting scientists that is

¹ ÖVW website. Accessed May 7, 2013. <http://www.oevw.at/projekte/status/ankundigung>

² Zukunftsbranchen. Accessed May 7, 2013. <http://www.zukunftsbranchen.at/>

³ OEAW press conference. Accessed May 7, 2013.

<http://www.oeaw.ac.at/deutsch/aktuell/fotogalerie/presse/weichen-fuer-die-zukunft.html>

⁴ Der Standard Online. Accessed November 16, 2010.

<http://derstandard.at/1289607987713/Kuerzungen-Faymann-und-Proell-wollen-doch-mit-Pensionisten-reden>

⁵ Al Gore website. Accessed May 16, 2013. <http://www.algore.com/>

⁶ 'Inventing our future together' report. Accessed January 1, 2013.
ec.europa.eu/research/era/pdf/web_era_greenpaper_en.pdf, 21.01.2013

⁷ Horizon 2020 website. Accessed May 3, 2013. http://ec.europa.eu/research/horizon2020/index_en.cfm

⁸ UN-Documents website. Accessed January 21, 2013. <http://www.un-documents.net/wced-ocf.htm>

called 'Austrian Futures'. According to the self-description that is part of these pictures one can see people with ideas that are labeled as "zukunftssträchtig"⁹.



What is especially interesting to me in these pictures is that the relevance of present research can apparently be - among other indicators - evaluated by referring to its potential relevance for some future, thus to its ability to articulate (reasonable) promises.

Such a focus on our capacity to make or be prepared for the future is not only visible in these various sorts of discourse. Apart from these contemporary examples there is also a broad body of utopian and dystopian storytelling¹⁰ and of course the innumerable amount of science fiction novels, television shows and movies. Such narrations about possible societies and technologies depicting multiple potential futures¹¹ are exemplars of an enduring preoccupation with the future that reaches back several centuries. Starting out in the 18th century the interest in science fiction reached its first peak at the

⁹ This term means something like 'promising', but carries along some associations that are very difficult to grasp, including ideas about animal pregnancy. It refers to a thing or a moment that is pregnant with possibilities for the future.

¹⁰ Not all of these stories – e.g. Thomas Morus' 'Utopia' – are set in the future.

¹¹ The use of the plural is supposed to indicate that the future is no longer understood as a single (temporal) entity that can be predicted, but as a multiplicity of possibilities.

turn of the 20th century (Atwood, 2011; Brehmer & Ruppelt, 2012; Kinsella, 2004) and is still present in contemporary science fiction movies and (graphic) novels. The British Library in London recently held an exhibition with the title 'Out of this World: Science Fiction but not as you know it'¹². Such fictional accounts of the future were and again are regarded as valuable contributions to the exploration of possible future developments. (Kirby, 2003; Miller & Bennett, 2008)

As we can see in these examples, there actually seem to be a lot of people who care about the future. In fact, there is some fascination with the 'temporal realm beyond the senses' (Adam & Groves, 2007), which pervades multiple facets of our everyday life. Our society's fascination with the future, however, is not completely new. Much to the contrary, there is a longstanding excitement with stories and knowledge about the future. Particular sorts of 'foreknowledge' were developed like e.g. prophecies or various forms of prediction (Adam & Groves, 2007). In this sense, the future has its own history meaning that ideas about what the future is and how we can achieve knowledge about it are historically contingent (Hölscher, 1999). But although an engagement with the future is not unique to contemporary societies scholars describe an increasing emphasis on 'the future' as an object for (re-)negotiating social, epistemic and moral orderings. This phenomenon has been debated as the emergence of 'anticipatory regimes' (Adams, Murphy, & Clarke, 2009) or as a 'breathless futurology' (Harrington, Rose, & Singh, 2006). Notions like these highlight a growing normative urge in contemporary societies to orient collective action towards an uncertain future to a degree where it seems no longer possible not to engage with the future.¹³

This increasing fascination or even obsession with the future is also visible in science and technology. As a result, engagements with 'the future' have been a focus of interest in Science and Technology Studies (STS) for quite some time and STS scholars have repeatedly highlighted the importance of paying attention to this topic. A central point is

¹² British Library. Accessed May 21, 2013.

<http://www.bl.uk/whatson/exhibitions/outof/outofthisworld.html>

¹³ A consequence of this focus on the future and the increasing desire to control and govern it is the need to produce knowledge about the future. Different accounts of the future increasingly become the basis for policy choices and in decision-making processes. It is thus not surprising that the production of anticipatory knowledge is supported in research funding schemes. To produce this kind of knowledge a broad range of different methods is applied: from more quantitatively based methods of risk assessment to more qualitative approaches like foresight processes or scenario workshops. These methods (among others) are used to produce knowledge about possible futures. What is produced in this way is not reliable and valid knowledge about 'the future'. Much rather, multiple futures are being generated, with everyone processing different options for making decisions and taking action.

that researchers engage in future making on a regular basis. It is as common to their day-to-day routines as e.g. doing experiments. Long before particular technologies or research areas are fully developed promises about possible benefits in the future are articulated. If researchers are successful in establishing expectations collectively, this might lead to the support necessary for realizing their technological and scientific projects (N. Brown & Michael, 2003). Thus promissory discourse is regarded as an important resource in researchers practices when it comes to gaining support for their ideas (Felt, 2007). In this sense, this strand of research addresses a peculiar relation between the collectively held assumptions about the future and how the future actually turns out.¹⁴ Apart from this strand of research that focuses on practices of researchers, attention has also been directed to collectively imagined futures on a broader level. The basic assumption is that there is a close relationship between collectively imagined futures of society and the kinds of science and technology needed to actualize these futures (Felt, forthcoming; Jasanoff & Kim, 2009). Collectively imagined futures, so the argument goes, contribute to stabilizing horizons of expectation as well as societal and scientific orderings. This means that imagining the future can't be understood as a practice in which individual minds fantasize about what might be (Fujimura, 2003). Much rather such engagements need to be regarded as collective practices with actual consequences in the present as they can become instrumental in the establishment and stabilization of research fields and scientific communities (Molyneux-Hodgson & Meyer, 2009).

The introductory quotes already point to tensions immanent to an occupation with the future and the use of anticipatory knowledge. While knowledge about the future is deemed necessary to 'steer' society, the problem of different kinds of uncertainty of predictions is simultaneously always present (Stirling, 2006). In spite of the inevitable uncertainty related to anticipatory knowledge, it is nonetheless a substantial resource in decision-making processes. Certainly most researchers will admit that this problem is well known and considered. However, researchers often find themselves in situations, in which they are well aware of the uncertainty of anticipatory knowledge and nonetheless

¹⁴ Robert Merton's work on what he calls 'self fulfilling prophecies' – although not concerned with science and technology - can be regarded as an early attempt to understand such relations. He shows how a particular definition of a situation and the expectation of a particular behavior in the future can contribute in making this situation become reality. He uses this concept to explore the societal reproduction of racial separation as not being a consequence of the intentions of individual actors.

share it with decision-makers or in which they know from the beginning that they are producing knowledge for decision-making processes.¹⁵

This tension between the need for and the necessary uncertainty of anticipatory knowledge are especially significant in sustainability research, which is at the core of this thesis. Sustainability research is especially concerned with the future as it focuses on working out solutions for contemporary problems that might have severe consequence for our future. These problems are often related to environmental issues like climate change or the scarcity of resources. So there is a particular concern about the future and together with that attempts to control or manage developments in order to actualize particular futures while preventing others. Additionally, in sustainability research this concern for the future and the related focus on anticipatory knowledge is combined with ideas about a need for an alternative kind of science. Contemporary problems are framed as becoming increasingly complex and therefore so-called ‘traditional’ ways of problem-solving no longer suffice. Traditional science, so the argument goes, lacks both the cognitive means as well as the necessary authority to produce such knowledge and technologies on its own. The solution to that is a ‘democratization’ of science (Nowotny, 2003), which basically refers to the inclusion of heterogeneous actors into knowledge production processes. This of course adds another layer of complexity that can be nicely captured in a different reading of the introductory quotes: *‘Who cares, who cares what the future brings?’* Nick Cave asks. Focusing on the *‘who’* of this quote, the attention is shifted to the actors who are supposed to care about the future. Who is supposed to participate in the construction of futures and related decision-making processes? Who needs to get a voice in articulating futures and who is at risk of being silenced? In this context, it is also worthwhile to think about the notion of *‘care’* that features so prominently in Cave’s question. What does it mean to care about the future? (Felt, Barben, et al., 2013)

Concerns like these especially affect researchers engaged in participatory settings where they are supposed to collaborate with non-academic actors in order to solve contemporary problems. In these crosscutting or in-between spaces of science, politics and different publics where assemblages of heterogeneous actors are supposed to

¹⁵ A tragic example for this tension is the recent conviction of seismologists as a consequence of their predictions concerning the earthquake probability in L’Aquila, Italy. See e.g. article in ‘Nature’. Accessed May 19, 2013. <http://www.nature.com/news/italian-court-finds-seismologists-guilty-of-manslaughter-1.11640>

collaborate, questions arise concerning how futures are being produced and which (or whose) futures are being left out.¹⁶ As I said, such debates are especially characteristic of sustainability research where futures are being produced in heterogeneous collaborations by a broad range of actors with different backgrounds. It is thus a site where participatory research settings and 'anticipatory regimes' (Adams et al., 2009) meet.

The idea of sustainable development has from the outset been closely related to debates about participatory ways of producing knowledge. The debate is – even if not exclusively – rooted in discussions about environmental problems and the unintended side-effects of science-based technological developments in our industrialized 'risk society' (Adam, 1998; Ulrich Beck, 1986). Environmental movements surrounding the nuclear energy catastrophes of Three Mile Island and Chernobyl and the related demise of scientific authority are considered as starting points or at least as closely related to these debates (Weingart, 1997, 1999). Notions like 'mode 2 science' (Gibbons et al., 1994; Nowotny, Scott, & Gibbons, 2001) or 'post-normal science' (Funtowicz & Ravetz, 1992) attempt to grasp such changes in knowledge production and question the kinds of knowledge we have at our disposal in facing situations of increasing complexity and uncertainty. These debates circle around how knowledge gets produced and made available or applicable for society. Whereas the concept of 'mode 2 knowledge production' most notably points out that scientific knowledge is increasingly produced according to extra-scientific rationales and is characterized by a social distribution of knowledge and more heterogeneous sites and principles of its production, the idea of 'post-normal science' – emanating from a background of quantitative risk assessment – emphasizes the need of extended forms of knowledge production in situations where "facts are uncertain, values in dispute, stakes high, and decisions urgent" (Funtowics & Ravetz, 1993, 744). It is interesting to note that in this conception knowledge production plays a crucial role for the future of science itself: "It has hitherto been a well-kept secret that scientific 'facts' can be of variable quality; and an informed awareness of this human face of science is a key to its enrichment for its future tasks" (Funtowics & Ravetz, 1993, 740).

National as well as international policy makers increasingly take up these academic 'diagnoses' of changes in the way knowledge is (and ought to be) produced. This is

¹⁶ In a recent talk at the 'Österreichischer Kongress für Soziologie 2013' in Linz Ulrike Felt described this issue as 'collateral futures'.

indicated by an ever-growing number of funding schemes and initiatives focusing on and even demanding interdisciplinary and transdisciplinary research methods. Examples are the 'Swedish Foundation for Strategic Environmental Research MISTRA'¹⁷ or the 'Swiss Priority Programme Environment' (see e.g. Pohl, 2005) and the Swiss 'td-net'¹⁸. As such, funding schemes and programs are often situated in the area of environmental or sustainability research they tend to especially focus on the 'future': the future development of global climate, the future availability of various resources and possible future threats. Already in their program outlines or mission statements national and international research programs refer to particular blends of utopian and dystopian futures to substantiate the need for particular ways of producing knowledge.¹⁹

Although issues of anticipatory knowledge and transdisciplinary research have been debated controversially in academia²⁰ – Nicole Nelson and her co-authors recently stated in an introduction to a special issue of 'Science and Public Policy' on the production of anticipatory knowledge and its use in different contexts: "The importance of knowledge-making about the future is difficult to overestimate" (Nelson, Geltzer, & Hilgartner, 2008: 546) – there is little empirical analysis on the research practices in which knowledge about the future is produced and circulated.²¹

The aim of my dissertation is thus to contribute to filling this gap and contribute to an empirically grounded understanding of what I will call 'futuring', i.e. the *construction, stabilization, rehearsing and contestation of futures* in transdisciplinary sustainability research in Austria. By using the verb form here I want to accentuate the practices of different actors engaged in making futures (more later). I will thereby address questions concerning the production of anticipatory knowledge and the simultaneous attempt to establish an alternative imaginary of science-society relations as a means for realizing particular futures.

¹⁷ MISTRA website. Accessed May 16, 2013. <http://mistra.org/en/mistra.html>

¹⁸ td-net website. Accessed May 16, 2013. <http://www.transdisciplinarity.ch/d/index.php>

¹⁹ Social-ecological Research website. Accessed January 21, 2013 <http://www.sozial-oekologische-forschung.org/>

²⁰ FORNE website. Accessed January 21, 2013 <http://www.forne.at/>

²¹ Efforts to discuss the issue of anticipatory knowledge from different perspectives are visible in meetings such as a convention recently held at the Center for Interdisciplinary Research at Bielefeld University: "Zukunftsexpertise. Zur Generierung, Legitimierung, Verwendung und Anerkennung von Zukunftswissen"

By doing so, I want to explicitly contribute to three different yet related debates: First, this thesis is an empirical contribution to debates about changing modes of knowledge production focusing on how the claims and demands of this debate manifest themselves in day to day research practices and on the kinds of tensions that arise. Second, I aim at providing some input to discussions about the production and circulation of anticipatory knowledge in the in-between spaces of science, politics and the public. Third, this thesis is an addition to the debate about the role of collectively shared imaginations about attainable futures in the stabilization of social order. I will thereby especially focus on ideas about attainable futures related to particular science-society relations i.e. the role of science in society.

Case & Material

This PhD-thesis is empirically grounded in a case study of the Austrian funding scheme proVISION²² and the research projects carried out within this framework. ProVISION was a funding scheme of the Austrian Ministry for Science and Research focusing on sustainability research and published the first of two calls in 2004. This case provides an empirical site to explore the transdisciplinary production and circulation of anticipatory knowledge in sustainability research as it explicitly aims to foster transdisciplinary research. In order to get funded the projects needed to include so-called 'extra-scientific actors' into knowledge production.

For my analysis I will draw on a variety of different data including transcripts from interviews and focus group discussions.²³ We talked to program managers as well as to project collaborators of projects funded within the proVISION framework. Additionally, my data set contains protocols of project-meetings and public events as well as project proposals, reports and publications. Next to these more project-related materials I will also draw on program documents and related policy documents such as e.g. sustainability strategies or research and innovation policy papers both on a national and an international level. This shall allow for taking into consideration the institutional and

²² Program website. Accessed January 21, 2013: <http://www.provision-research.at/>

²³ The data I refer to in this PhD-Thesis was gathered in course of the research project 'Transdisciplinarity as culture and practice', conducted at the Department of Science and Technology Studies at the University of Vienna and funded by the program proVISION. I worked in this project led by Ulrike Felt together with my colleagues Judith Igelsböck and Andrea Schikowitz. You can find more information on the project website (as accessed May 4, 2014): <http://sts.univie.ac.at/en/research/completed-projects/transdisciplinarity-as-culture-and-practice/>

discursive framing of the research practices as well as the retrospective narrative accounts of the actors involved.

Thesis-Outline

Changing Modes of Knowledge Production & Sustainability Research

In the opening chapter, I will review the literature on changing modes of knowledge production; its main concepts like ‘mode 2’, ‘post-normal’ science and the ‘triple helix’ as well as the development and context of the debate and the critique of these concepts. Thereby, I will especially focus on the concept of ‘transdisciplinarity’ and related debates concerned with more inclusive modes of knowledge production.

This literature is part of an ongoing debate about changes of knowledge production processes. So-called ‘traditional’ modes of knowledge production have been framed as deficient and not capable of solving some of the more complex contemporary societal problems and thus to reliably guide and give direction to the future development of society.

In this sense, these diagnoses pose serious questions concerning the role of science in society and the relation of science to other actors such as industries or the state. They not only address particular developments such as e.g. an increasing contextualization of (academic) knowledge production. Much rather, we need to pay attention to their prescriptive character and understand how they are at the same time diagnoses of contemporary developments and prescriptions of the future of science and the future of society. As Hackett and Rhoten put it, these ‘diagnoses’ of contemporary science society relations are also “visions of the future of science” (2009: 426).

Future(s) in STS

As the debate about new modes of knowledge production is closely entwined with ideas about attainable futures of society I will continue by elaborating on a theoretically grounded understanding of the notion ‘future’. Drawing on different strands of (mostly) STS literature concerned with ‘the future’ I will develop the conceptual foundation for how I understand the concepts of future and practices of future making, which I call ‘futuring’.

I will start the chapter with a brief elaboration on concepts of time followed by an overview of STS writing concerned with the future. I will organize this part around five

strands of debate: first, I will look at literature dealing with different ways of conceptualizing the future and of engaging with it (Adam & Groves, 2007). Second, there is a broad range of literature that deals with the dynamics of expectations and promises (N. Brown & Michael, 2003; Rappert, 1999). Literature from this strand of research argues that representations of the future need to be regarded as performative and thus explore the ways in which certain visions of a future influence research and vice versa (N. Brown, 2000; Lente & Rip, 1998). A third strand of literature is concerned with changes in contemporary science-society relations and asks how these changes are entangled with changing temporalities of doing research and ideas about what it means to be a researcher (Bister, Felt, Strassnig, & Wagner, 2008; Felt, 2009; Felt & Fochler, 2009; Garforth & Cervinková, 2009). Fourth, the issue of collective imagination has gained some relevance in recent debates in the field of science and technology studies (Felt, forthcoming; Hecht, 2001; Jasanoff, forthcoming; Jasanoff & Kim, 2009). The stabilization of collective imaginations of the future, so the argument goes, is closely entwined with technological innovation as well as with scientific and societal orderings. Finally, I will provide a brief historical account of social science endeavors of looking into the future (Andersson, Faas, & Keizer, 2012; Wendell Bell, 2001, 2003; W. Bell & Mau, 1970) and contemporary ideas of governing the future (Barben, Fisher, Selin, & Guston, 2007; A. Rip & Kulve, 2008).

Drawing together these different debates I will then focus on what can be gained by looking at the debate about changing modes of knowledge production through the lens of research on the role of collective imaginations of futures and by understanding ‘the future’ as an object for negotiating the re-ordering of science-society relations. The debate about changing modes of knowledge production in sustainability research provides a neat exemplar for processes in which imaginations of particular futures of society are deeply entwined with the emergence of new – in this case transdisciplinary - modes of knowledge production.

Approaching the Case

Building on the debates I will devote one chapter to describing the case for my research project and how I plan to approach it. This chapter will thus contain an elaboration of my conceptual framework and my research questions as well as a brief introduction to the funding scheme proVISION. Additionally, I will present the basic assumptions

guiding the research process, describe my material and reflect on the process of data gathering and analysis.

Empirical Observations – Futuring

The empirical part of my thesis consists of two main chapters. I will start out with exploring collectively held imaginations about a particular way of producing knowledge guiding Austrian sustainability research. In the second chapter I will focus on practices of futuring in which actors engaged in proVISION-funded projects make and unmake a broad variety of interrelated futures in the production of anticipatory knowledge.

(1) A Socio-scientific Imaginary in the Making

Following recent writing on imaginaries (Felt, forthcoming; Jasanoff & Kim, 2009; Pickersgill, 2011) I will argue that ideas about attainable futures of society are co-produced with imaginations about how science and society are supposed to collaborate in the production of knowledge and.

The aim of this chapter is to describe the assemblage and rehearsal of a particular socio-scientific imaginary guiding participatory sustainability research in Austria and to describe its particular aspects. I will thus start this chapter by tracing the historical process in which this imaginary was and still is being assembled and stabilized. This is followed by a description of the institutional set-up of Austrian sustainability research in which a particular imagination of knowledge production is already visible. After this, I will focus on central aspects of this imaginary like its particular conceptualization of the problems or challenges that need to be dealt with in sustainability research and the social, epistemic and moral re-orderings related to that. The last part of this chapter is devoted to the notion ‘Zukunftsfähigkeit’ (future-ability), a term that is widely used in German speaking sustainability policy. Telling a story about ‘Zukunftsfähigkeit’ nicely draws together ideas about the future and what is at stake for humankind. Concluding this chapter I will discuss the implications of attempts to establish such an alternative idea of science-society relations.

(2) Futuring and the Translation of Socio-scientific Imaginaries

To empirically explore the dynamic relations between broader socio-scientific imaginaries, the research program proVISION and the actors engaged in particular research projects that are funded by the program, I will then look at how researchers translate (Law, 2003) the research program’s requirements when they turn them into

‘their’ projects. This chapter focuses on their practices of futuring while at the same time asking how they are shaped by a particular socio-scientific imaginary and simultaneously re-shaping it through rehearsals and contestations.

This means exploring how researchers work with the funding scheme in their practices of looking for funding possibilities and adjusting their research interests according to particular requirements. Following that I will ask how researchers and their partners carve out particular problems in their transdisciplinary projects. In doing so I will address tensions that arise concerning the (temporal) scale of the problems to be dealt with, the different audiences as well as the knowledge needed for dealing with them. This will lead me to investigate the social and epistemic (re-)orderings taking place in the projects that become visible especially in the figure of the ‘Praxispartner’ and understandings of anticipatory knowledge. I will look at how researchers translate proVISION’s imaginary of producing knowledge to manage the future responsibly, i.e. to constantly monitor possible consequences of our actions to prevent environmental threats and to preserve (Austrian) landscapes. This means looking at how the researchers themselves understand anticipatory knowledge and their role as producers of this knowledge as well as their ideas concerning issues of ‘responsibility’. I will thus focus on questions about who is imagined to be responsible for the futures produced. These questions relate to concerns about the role of science and where responsibilities of science end in the narrations of the researchers and their non-scientific partners. When and for how long are researchers supposed to care for ‘social reality’ and what are the (material) traces they leave behind after projects end? Concluding this chapter I will come back to the notion of future-ability to show how questions concerning the stakes tend to become quite complex in projects in which a set of heterogeneous actors collaborate and need to negotiate different futures.

Conclusions

The conclusion of the thesis will bring together the different chapters and direct attention to some of the tensions in the attempt to assemble and stabilize an alternative vision of science-society relations against the background of quite well established and dominant collectively held ideas about scientific and societal orderings as well as in regard to practices of futuring and transdisciplinary sustainability research. I will ask how we can come to terms with the increasing normative urge to orient actions towards

the future in a society that seems to be confident that presents need to be managed through anticipatory knowledge, while at the same time the conviction gains momentum that science can no longer produce this knowledge on its own, while intentionally remaining locked-up in its ivory tower.

2. Changing Ways of Producing Knowledge

Contemporary societies are increasingly concerned with the future. This also holds true for science²⁴ and especially for sustainability research, which might be considered a somewhat trivial observation as the main goal of sustainability research is to examine past events and their consequences in the present in order to learn about potential effects of current actions. If we don't stop here, this observation directs our attention to important questions concerning the relationship between future-oriented action, politics and knowledge, i.e. the issue of envisioning a mode of knowledge production capable of generating a particular kind of (forward-looking) knowledge that can be used as a basis for decision-making. These questions are addressed in debates about changing modes of producing knowledge in which not only the reliability and validity of particular knowledge claims is at stake, but the very meaning of these notions is re-negotiated. In this sense both the ways in which knowledge shall be produced as well as issues of authority, legitimacy and responsibility of science are addressed simultaneously. Helga Nowotny in this sense argues that knowledge not only needs to be reliable, but additionally, is supposed to be 'socially robust' (Nowotny, 2003).

The last decades have witnessed an ongoing debate about such changes of knowledge production. So-called 'traditional' modes of knowledge production are framed as deficient and not capable of solving contemporary societal problems and thus to reliably guide and give direction to the future development of society. In this debate the role of science in society as well as the relation of science to other actors such as industries or the state are discussed. Three main arguments can be roughly distinguished: The concept of 'Mode 2' knowledge production most notably points out that scientific knowledge is increasingly produced according to extra-scientific rationales (Gibbons, 1994; Nowotny et al., 2001). Mode 2 knowledge production is characterized by a social distribution and more heterogeneous sites and principles of knowledge production. The idea of 'post-normal science' – emanating from a background of quantitative risk assessment - emphasizes the need for extended forms of knowledge production in situations where "facts are uncertain, values in dispute, stakes high, and decisions

²⁴ In the following I will use the term 'science' in the German meaning of 'Wissenschaft' referring to an overarching system that encompasses natural and engineering sciences as well as to the social sciences and the humanities. When I intend to address particular branches I will explicitly do so. Should I at times distinguish between science and research I will do so following Latour's (1998) distinction between a 'world of science' and a 'world of research'.

urgent” (Funtowicz & Ravetz, 1993b: 744). The authors mainly look at research that is somehow related to decision-making processes and thus situate knowledge production in a political context. The ‘triple helix’ can be regarded as a heuristic or an analytical tool for looking at changing relations between university, state and industry. The authors distinguish this model from ideas, where for example science and industry are all mainly defined by a superordinate state or where university, state and industry stand equally and autonomously next to each other (Etzkowitz & Leydesdorff, 1998).

The debates related to these notions share the claim that producing knowledge is increasingly transcending disciplinary and academic boundaries; they refer to the integration of actors not traditionally associated with knowledge production and decision making in this area. The knowledge produced this way is expected to be capable of dealing with contemporary problems. These contemporary problems are also framed as “grand challenges of our time” in the Lund Declaration, the final report of the EU conference ‘New Worlds — New Solutions’²⁵ that started the Swedish EU-presidency. Most recently these issues have become the object of a policy discourse that centers on the idea of ‘responsible research and innovation’²⁶ and more ‘careful’ (Felt, Barben, et al., 2013) approaches towards emergent technoscientific developments.

In this chapter I will review debates about changes in knowledge production and illustrate how this is an interesting issue from a Science and Technology Studies (STS) perspective. To do so it is necessary to understand the debate in its broader context. Therefore, I will trace some of its origins and review the major concepts and lines of argumentation. Building on that I will devote special attention to debates concerning transdisciplinarity, which is one of the key elements on the funding scheme proVISION. This concept has received some attention over the last decade in academia as well as in policy making and can be understood as an attempt to implement ideas about changing modes of knowledge production. Concluding this chapter I will argue that the changes diagnosed in these debates are interesting from an STS perspective as they not only diagnose but also simultaneously prescribe future relations of science and society.

²⁵ Conference Website. Accessed November 22, 2013.

<http://www.vr.se/inenglish/aboutus/policies/lunddeclaration/newworldsnewsolutions.4.227c330c123c73dc586800019506.html>

²⁶ Website of the European Commission. Accessed November 22, 2013.

<http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1401>

2.1. Origins & Models of Change

Authors contributing to the debate about changing modes of knowledge production often offer their own accounts of why such changes are necessary right now or how they came about exactly at this point in time. A central starting point in these debates is the increasing importance of environmental problems. These problems are related to issues concerning unintended side effects of science-based technological developments in our industrialized society and together with that the acknowledgement that technoscientific progress is inextricably entwined with the emergence of risks (Ulrich Beck, 1986; U. Beck, Adam, & Van Loon, 2000). Scholars writing about changing modes of knowledge production often focus on these risks and the nature of contemporary problems that are described as new and complex, thus having a defining quality for the times we live in. As a consequence, a need for new problem solving strategies is claimed (Funtowicz & Ravetz, 1993b; Sardar, 2010).

Current re-orderings in science-society relations, however, can also be analyzed from another perspective. The advent of environmental problems, so the argument goes, led to changes in the public perception of science and its relation to politics (Weingart, 2001). Through public controversies between various experts in the course of environmental debates the uncertainty of scientific knowledge as well as the relation of science and politics have become visible for a wider public. Writing about the Three Mile Island accident Weingart argues that both the use of scientific knowledge claims for legitimizing political goals and the role of scientific experts as part of political controversies were publicly displayed. This public display of the various liaisons of science and politics led to a decline in the authority of scientific knowledge. As a consequence, also the idea of science as an impartial actor became increasingly difficult to sustain. Science needed and still is in need of new ways of legitimating its knowledge claims.

Also concerned with the authority of science Nowotny et al. (2001) describe the oil crisis of the 1970ies and the demise of Communism as main drives for these changes and the rise of what they call 'the post-modern condition' (ibid.), i.e. the erosion of stable normative structures in science and society. They arrive at a similar conclusion:

"The rise of post-modernism, therefore, represents a crisis of both social legitimization and of methodological, epistemological and even normative authority" (ibid.: 9)

As a consequence of this crisis of scientific authority new players are able to enter the stage. A broad variety of quite heterogeneous epistemic actors such as e.g. think tanks, NGOs, citizen's initiatives or activist groups gains importance in the production and circulation of knowledge (Nowotny, Scott, & Gibbons, 2003). These actors increasingly produce their own knowledge and engage in debates formerly restricted to scientific actors.

This directs attention to another set of issues in regard to the relation of science and the so-called 'public'. (Irwin & Wynne, 1996; Wynne, 1992). The 1980ies witnessed an increasing interest in the public perception of science or the lack of it. The starting point of this interest was the thesis that insufficient knowledge about science led to a lack of interest and more dramatically to the rejection of science as well as technoscientific endeavors. The decreasing reputation of science thus was explained through a lack of education. This initial conception of the relation between 'science' and 'the public' and subsequent attempts to educate the public were criticized for being over-simplistic. Instead attention was directed to the multiple ways in which science and its 'publics' are co-constituted in participatory engagements (Felt, 2000; Irwin & Michael, 2003; Michael, 2009).

Now, how does this relate to the above-mentioned stories of origin focusing on the legitimacy and authority of science? The interesting thing here is that both debates circle around notions of 'trust' and 'distrust' when discussing science-society relations. Trust in scientific knowledge and institutions can no longer be taken for granted. Instead it appears to be fragile and in constant need of stabilization on a case-to case basis. One way of dealing with this is to 'open up' science. In his work on the relation between participatory technology assessment and the public understanding of science Durant argues that

“[f]aced with growing public distrust of science and scientists, the task must be, not to isolate and insulate science from the public, but rather to open it up to new forms of public engagement and public scrutiny. Such opening up must be not only local and regional but also national and international, for science is one of the least parochial of all human activities. (Durant, 1999: 318)

Framing the public understanding of science debate as an issue of trust relates to the diagnosis of a decreasing authority of science in society and the need to legitimize science in novel ways. One of the ideas for doing this is to 'contextualize' science

(Nowotny et al., 2001) i.e. to understand knowledge production as a practice of problem solving and to include various different actors into knowledge production processes.

When thinking about changes in science-society relations and issues related to the legitimacy of science it is important to also consider the changing role of universities that poses serious questions when it comes to the normative basis of science. With the development of mass universities academic research increasingly needs to find forms of income apart from public funding in order to cover their expenses. University research as a consequence focuses more and more on 'products' and operates according to market logic (Nowotny et al., 2003). Hellström and Jacob (2000) argue in this sense that universities need to legitimize their existence and increasingly describe their work in terms of *utility*²⁷:

"The entire debate about new forms of knowledge production (including this article) is backdropped by a tense political climate in the universities of Europe and North America. This tension is in part due to the fact that university research and education increasingly have to justify their right to exist in terms of immediate social and political utility." (ibid.: 71)

While there is concern that this changing role of universities might have problematic consequences for the way we understand science, e.g. scientists/universities increasingly thinking of their research in terms of patentable outcomes, Etzkowitz and Leydesdorff (1997) offer a more optimistic account of such engagements. They do not understand this exclusively as a problem of legitimization or *justification* on the side of universities. Rather, in their writing on the 'triple helix' model of university-industry-government relations, they diagnose a mutual interest of universities and industries to collaborate.

Summing up, the emergence of the debate about changing knowledge production needs to be understood as a complex assemblage of different issues: the increasing collective awareness that there are novel problems that call for new forms of solutions; a decrease in scientific authority and an increased need to legitimize scientific endeavors; and finally changes in the institutional organization of science. Over the last decades there has been a plethora of models and concepts of how to understand (and sometimes

²⁷ Please note: when referring to terms or phrases from quotes I have already used I will mark them by italicizing them.

achieve) different aspects of current developments in knowledge production²⁸. In what follows I will focus on three concepts related to the debate that have received attention in academic discussions as well as in national and international policy making: 'Mode 2' knowledge production (Gibbons et al., 1994), 'post-normal science' (Funtowicz & Ravetz, 1992) and the 'triple helix' model (Etzkowitz & Leydesdorff, 1998). These concepts are all tackling the issue of changes in knowledge production, they put emphasis on different aspects and thus raise different questions.

2.1.1. The importance of extra-scientific rationales and Mode 2

In 1994 Michael Gibbons, Camille Limoges, Helga Nowotny, Simon Schwartzman, Peter Scott and Martin Trow published a book called 'The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies' (Gibbons et al., 1994). Seven years later in 2001, three of those authors, Helga Nowotny, Peter Scott and Michael Gibbons published a follow up called 'Re-thinking Science: Knowledge and the Public in an Age of Uncertainty' (Nowotny et al., 2001), a book in which they did not only re-think science, but also the claims made in their previous book. In this book they responded to a set of criticism and further developed their analysis as the concept of Mode 2 science had been debated controversially in academia and, furthermore, had gained increasing influence in science policy since its initial introduction.

The concept of 'Mode 2' basically is used to describe the emergence of a new mode of producing knowledge that is different to previous ways of knowledge production, which the authors subsume under the notion 'Mode 1'. In early works the emergence of Mode 2 is broadly linked to societal transformations captured in concepts like 'knowledge society' or 'risk society' and in relation to these changes a "transition from Mode 1 to Mode 2" (Gibbons et al., 1994: 15) is claimed. In subsequent debates and publications the authors further develop this idea arguing that *transition* does not mean that Mode 2 is replacing previous forms of producing knowledge. Rather, Mode 2 needs to be understood as complementary to Mode 1 and its emergence a result of changes in the research environment. This change according to Nowotny, Scott and Gibbons lies in the "increasing desire to 'steer' priorities" (2003: 181) on different levels. This is visible in a growing commercialization of research, i.e. simultaneous processes of researchers looking for new funding possibilities as public funding is decreasing and a new

²⁸ For a good overview see Hessels and Lente (2008).

awareness for “the value of the ‘intellectual property’” (ibid.) of their work. Mode 1 science thereby is basically equated with a traditional idea of science commonly defined by particular (mostly experimental) methods, rules of access and exclusion as well as procedures of quality control:

“Mode I is meant to summarize in a single phrase the cognitive and social norms which must be followed in the production, legitimation and diffusion of knowledge of this kind. For many, Mode I is identical with what is meant by science. Its cognitive and social norms determine what shall count as significant problems, who shall be allowed to practice science and what constitutes good science.” (Gibbons, 1994: 56)

What becomes visible in this quote is that Mode 1 is equated with science in its broader sense of ‘Wissenschaft’ as a complex system of norms guiding the practices of particular actors *producing, legitimating and diffusing* knowledge. Central to the argument of a change in processes of knowledge production is the assumption of an increasing importance of extra-scientific rationales. The authors talk about a “context of application” in order to refer to “the environment in which scientific problems arise, methodologies are developed, outcomes are disseminated and users are defined” (2003: 186). Gibbons argues that in Mode-2 this context matters throughout the whole research process as

“Mode-2 knowledge production takes place within and between open and shifting boundaries. It consists of the re-configuration of knowledge and people, It is transgressively bounded because, in ways that still need to be spelled out in detail, a new kind of integration with the context is made possible” (Gibbons et al., 1994: 19)

In later work attention is directed away from the idea of ‘application’ and towards the broader term ‘contextualization’, which is perceived as a more open concept as it is not so much focused on products. The concept is further differentiated: what is called ‘weak contextualization’ can happen e.g. in the form of research priorities or R&D programs. ‘Strong contextualization’, in contrast, refers to more reflexive interactions between science and society. The emergence of environmental movements and their entanglement with science is one example for this form contextualization as it led to multiple interactions and a mutual re-shaping of both science and society. Additionally, the authors distinguish ‘middle range contextualization’ to describe particular spaces established for collaboration in which “local contingencies shape synergy and potential.” (Nowotny et al., 2003: 191). Their rationale for introducing this differentiation is to avoid a rash identification of Mode 2 knowledge with applied knowledge.

This focus on context is also a moral story. Science can no longer confine itself to defining and solving scientifically relevant problems respectively inner-scientific ‘puzzles’ (Kuhn, 1962). In contrast, attention is directed to the integration of extra-scientific rationales throughout the whole research process. Already the problems to be dealt with are supposed to be defined in a collective effort and in reference to contextual factors rather than solely according to inner-scientific rationales. In this sense, Mode 2 knowledge production is concerned with “problem solving” (Gibbons, 1994: 57) that focuses on achieving “practical goals” (ibid.). This broader focus on contextualization is regarded as a main difference to models often referred to under the label of ‘product development’ that basically describe attempts to develop applications on the basis of already existing knowledge.

As a consequence heterogeneous sets of actors are entering knowledge production processes and, additionally, the sites of knowledge production are becoming more diverse. Not only universities, but also non-university research institutes, governmental agencies, NGOs or think tanks are becoming possible sites of knowledge production. Knowledge production and expertise thus become ‘socially distributed’ (Nowotny et al., 2001). It is no longer sufficient that knowledge is valid and reliable. It needs to be ‘socially robust’ (Nowotny, 1999; Nowotny et al., 2001). In this sense, Nowotny highlights the necessity of a ‘democratisation of expertise’ (Nowotny, 2003), an acknowledgement of other forms of expertise that might be different from narrow conceptions of expert knowledge but nonetheless equally important. She argues that publics are better educated than ever before and therefore science should be attentive to the views of these publics. In doing so, she directs attention to questions concerning whose knowledge counts and on what grounds the expertise of different actors can be combined.²⁹

Closely related to these changes a new sense for the accountability of science is called for. Knowledge production is conceptualized as a process that does not stop after problems are solved but the actors involved are supposed to be accountable for what happens with the outcomes of the process. However, accountability does not start in the dissemination process. Much rather as Gibbons states

²⁹ For further debate on the notion of ‘expertise’ see e.g. Collins and Evans (2002) and the replies by Jasanoff (2003) and Wynne (2003)

“[s]ocial accountability permeates the whole knowledge production process. It is reflected not only in interpretation, and diffusion of results but in the definition of the problem and the setting of research priorities, as well.” (Gibbons, 1994: 62)

This idea of changes concerning the selection of priorities and concerns is quite similar to what is currently discussed as ‘responsible research and innovation’ in both European as well as national policy-making.³⁰ This notion refers to the observation of an ever-closer relation between science and society in knowledge production and to an acknowledgement of the consequences of scientific endeavors that goes beyond notions of individual responsibility. This also means that traditional concepts of quality control no longer suffice for assessing this mode of producing knowledge. Next to peer review as a model additional criteria for quality control need to be considered.

Transdisciplinarity, which is of special importance to my work, is another central characteristic of Mode-2 that is related to the integration of heterogeneous actors and to the opening up of problem definition. This term describes the idea that different disciplines are supposed to contribute to knowledge production and problem solving. But instead of merely working alongside each other disciplinary boundaries are supposed to be transcended. In close relation to the actual problem that needs to be solved particular “theoretical perspectives and practical methodologies” (Nowotny et al., 2003: 186) shall be mobilized. Therefore, frameworks for problem solving are established according to the actual problem at hand. This also changes the dissemination strategies as the potential ‘users’ of the knowledge produced are from the outset part of the process. Jerome Ravetz in this sense refers to Mode 2 as describing a “new social organization of science” focusing on “goal orientation” (1999: 648). As the term transdisciplinarity has triggered a lively debate of its own I will devote some more attention to it later in more detail.

The Mode 2 diagnosis has itself been the issue of several controversies. Among other things it has been accused of being not empirically grounded, theoretically underdeveloped and historically inaccurate. At the same time the notion has been quite successful in the realm of science policy. Especially the call for an integration of heterogeneous actors has been taken up in several funding schemes. Therefore, while

³⁰ One example is the EC Report ‘Options for Strengthening Responsible Research and Innovation’, accessed May 16, 2014: http://ec.europa.eu/research/science-society/document_library/pdf_06/options-for-strengthening_en.pdf

these critics all might have a point, this tension between skepticism within the academic debate and the fascination of science policy with this topic provides a fascinating starting point for empirical analysis.

2.1.2. The concern for extended peer groups and facts in post-normal science

A second notion that is central to the debate about changing modes of producing knowledge is that of 'post-normal science' (Funtowicz & Ravetz, 1992, 1993b). Silvio Funtowicz and Jerome Ravetz tell a story about the development of science as a continuing process of producing ever more detailed knowledge and removing uncertainties; a process in which scientists manage to gather authority and legitimacy for speaking truth from their secure places within institutions of knowledge. In contrast to authors working on the concept of Mode 2 knowledge production they thus take a slightly different perspective and ask for the kinds of knowledge we have at our disposal facing contemporary (environmental) problems. Thus, they start from the position of science itself instead of focusing on societal developments.

This privileged position of science, however, is increasingly difficult to maintain. Traditional problem solving strategies no longer suffice in the face of novel problems created by the success of science itself, or as Funtowicz and Ravetz put it "by the practice of normal, puzzle-solving science and technology" (1992: 268). The authors focus on issues of risk and articulate a critique of quantitative models of risk assessment. In doing so they are especially interested in cases in which science, politics and publics are closely entangled such as e.g. questions of nuclear waste disposal, controversies concerning environmental issues or the construction of dams. They argue that in such cases a model of a seemingly detached and value free calculation of risk is no longer capable of providing the knowledge-base for decision-making:

"In coping with these new problems, they [the scientists; T.V.] can find that their tools and techniques are stretched beyond the point where they can be effective of meaningful" (1992: 253)

What is necessary is "a new political epistemology for science" (ibid.: 252) as the role of science in society is changing. It "now encompasses the management of irreducible uncertainties in knowledge and in ethics, and the recognition of different legitimate perspectives and ways of knowing" (1993b: 754).

As this brief account of the story told by Funtowicz and Ravetz already shows that similar to work on Mode 2 a particular idea of problems is central to the argument. Waste management or dealing with environmental issues, they argue, pose new kinds of problems that call for different approaches towards problem solving or as they call it 'problem-solving strategies' (Funtowicz & Ravetz, 1993b). These new problems addressed by Funtowicz and Ravetz, however, differ considerably from the conception of problems that is guiding work concerned with Mode 2. Where the latter are interested in problems as collaboratively developed by scientists and extra scientific actors in varying contexts, Funtowicz and Ravetz focus on a different sort of problems. They address more abstract problems that are "facing our industrial civilization" (1992: 253). This is an idea of problems that bears more resemblance to the concept of 'challenges' that is currently discussed in European innovation policy³¹. And indeed Funtowicz and Ravetz also talk about the "great challenges of our age" (ibid.: 273) that call for new solving strategies:

"The problem situations that involve post-normal science are ones where, typically, facts are uncertain, values in dispute, stakes high, and decisions urgent" (ibid.: 253 et seq.)

In this meanwhile classic definition Funtowicz and Ravetz distinguish different kinds of science along the axes 'system uncertainties' and 'decision stakes'. The first describes the idea that science now is concerned with "the comprehension or management of an inherently complex reality" (1993b: 744) while the second category refers to "the various costs, benefits and value commitments" (ibid.). Alongside these categories they distinguish different sorts of knowledge production: from applied science, where both system uncertainties and decision stakes are low to professional consultancy and post-normal science, where both categories are highest.

All three types are clearly – and in contrast to work on Mode 2 more explicitly - distinguished from Kuhn's idea of normal science as elaborated, where a group of scientists works within an established paradigm according to particular methodologies in order to solve well-defined 'puzzles' (Kuhn, 1962). In contrast to what Funtowicz und

³¹ See e.g. the Lund Declaration addressing the 'grand challenges of our time': <http://www.vr.se/download/18.7dac901212646d84fd38000336/>, accessed November 10th, 2013. They EU Framework Programme for Research and Innovation 'Horizon 2020' in a similar manner talks about "societal challenges": http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020, accessed November 10th, 2013

Ravetz call “science of the textbooks” (1992: 253) problems are no longer a “well defined puzzle” (ibid.):

“Our innovation was to appreciate the possibility that in some important cases, either or both dimensions are extreme, so that the traditional methods are inadequate” (ibid.)

Funtowicz and Ravetz also talk about ways of dealing with these new problems that are similar to the ones provided within the Mode 2 debate. They argue that new actors are getting involved and, at the same time, ideas about what counts as accepted or legitimate knowledge in a given problem context are changing.

They talk about ‘extended peer communities’ that can consist of practitioners, activists of different sorts, publics and so on and describe this extension as a possible enrichment of scientific knowledge production. In this sense, these groups encompass all actors “with a desire to participate in the resolution of the issue” (Ravetz, 1999: 651). One example for such an extension is the case of AIDS where a heterogeneous set of actors is engaged in public debate based on different sorts of knowledge (Funtowicz & Ravetz, 1993b). This extension of the peer group is accompanied by calls for the appreciation of what they call ‘extended facts’ such as “anecdotes, informal surveys, and official information published by unofficial means” (ibid.: 753).

Funtowicz und Ravetz make clear that these new problem-solving strategies are not supposed to replace traditional science. Much to the contrary they argue that basic science still is necessary for producing knowledge. Only in particular situations and for solving particular challenges at the interface of science, politics and publics alternative strategies become necessary:

“However, the new challenges do not render traditional science irrelevant; the task is to choose the appropriate kinds of problem-solving strategies for each particular case.” (ibid.: 744).

They emphasize the importance of *choosing* the right strategies for particular situations. When talking about the interaction between different actors they describe the importance of dialogue and mutual respect (Ravetz, 1999) that supposedly “bridges the gap between scientific expertise and a concerned public” (Funtowicz & Ravetz, 1992: 254). In this sense they also argue for democratization of science and also of expertise and encourage public debate concerning “issues affecting our society” (ibid.).

It is in their opinion no longer necessary to adhere to abstract principles of truth. Rather, they are concerned with procedures for granting the quality of the knowledge and related problem solving strategies that are produced. Not only the products of science need to be a focus of quality assurance, but also its processes, persons and purposes (Funtowicz & Ravetz, 1993b). In this sense they argue that knowledge can be at the same time uncertain and of high quality.

Funtowicz and Ravetz thus start from a different point than authors writing about Mode 2. They emphasize different aspects concerning changing modes of knowledge production as their approach is from the outset more closely tied to environmental issues and the problems that arise as a consequence of those. At the core of their argument are questions concerning the kinds of knowledge that might prove most adequate for solving these problems. Still they arrive at similar conclusions when it comes to finding adequate 'problem solving strategies' for contemporary problems or 'challenges' when they call for social and epistemic diversification. They do not, however, provide any empirical analysis of the problem solving activities they envision and possible tensions that may arise. Additionally, they seem to be overly optimistic in assuming that there is a consensus about the particular problems that need to be solved.

2.1.3. The focus on institutional interdependencies and the triple helix model

Next to the debates outlined above the so-called 'triple helix' model developed in the late 1990ies by Henry Etzkowitz and Loet Leydesdorff (Etzkowitz & Leydesdorff, 1998) is a third notion that gained relevance in debates about changing modes of knowledge production. This notion is similar to the concepts of Mode 2 and post-normal science in many aspects yet adds another take on the issue of changes in knowledge production. Less concerned with diagnosis than the aforementioned concepts the triple helix can be understood as a heuristic for analyzing national innovation dynamics. Thereby, the emphasis is put especially on changing relations of university, industry and governmental agencies:

"We focus on the network overlay of communications and expectations that reshape the institutional arrangements among universities, industries, and governmental agencies."
(Etzkowitz & Leydesdorff, 2000: 109)

Etzkowitz and Leydesdorff start from the assumption that this ongoing reshaping is a consequence of changes due to the end of the cold war and a decrease in the military's importance in innovation dynamics (ibid.) on the one hand and the increasing

importance of knowledge within the so-called 'knowledge society' on the other. In this sense they argue that "university-industry-government network relations are key to knowledge-based economic development in a broad range of post laissez-faire capitalist and post-socialist societies" (Leydesdorff & Etzkowitz, 2001: 18). At first glance this argument about contextual and internal changes of knowledge production is similar to the description of the emergence of Mode 2. However, Etzkowitz and Leydesdorff are less concerned with knowledge production as such but instead focus on changing relations and reorganizations from an institutional perspective. Hellström and Jacob in this sense state that it "is focused on the organizational context of Mode 2 research" (2000: 76). As a consequence of this institutional approach there is no assumption about particular kinds of problems or challenges calling for new solutions as in the accounts I introduced before. Instead in their description of the triple helix Etzkowitz and Leydesdorff start acknowledging a changing role for universities (2001). As knowledge becomes a key resource in a globalized and competitive innovation network also the role of universities as one of the main producers and disseminators of knowledge and their relation to governments attempting to steer innovation are changing:

"What is emerging is a plethora of programmes, alliances and centres through which universities, governments and companies cooperate even as they compete" (1998: 207)

Universities are no longer concerned merely with science and research but additionally engage in a so-called 'third mission' (ibid.). This third mission basically refers to collaborations with industry and governmental agencies. In collaborations of this sort new institutions emerge taking part in knowledge production. Such 'hybrid organizations' (Etzkowitz & Leydesdorff, 2000) can take the form of e.g. "intermediary offices, spin-off firms, science parks" (Etzkowitz & Leydesdorff, 1998: 204) that change the technology transfer mechanisms. These practices are also associated with the idea of an 'entrepreneurial university' (Etzkowitz, Webster, Gebhardt, & Terra, 2000). The linear model of innovation – to which the authors also refer as the "ideology of basic research" (Etzkowitz & Leydesdorff, 1998: 205) – that assumes a progression from basic research to applications is no longer adequate for describing innovation dynamics and relations between institutions in knowledge production Funtowicz and Etzkowitz argue. According to them this model or ideology has in its attempt to grant the authority of science led to a weakening of the connections between university and industry. Instead they propose to think about these relations as a triple helix.

So why do they choose this biological metaphor? Etzkowitz and Leydesdorff quite openly acknowledge that this metaphor has its problems (2000: 112). Nonetheless, they use it in order to direct attention to processes of mutual shaping of the different 'helices' university, industry and government. Etzkowitz and Leydesdorff describe a reflexive "spiral model of innovation" (1998: 205) in which the different helices themselves are transformed, which in turn influences the other helices. In this way a "new overlay of institutional structures" (ibid.) is constantly emerging:

"What is considered as 'industry', what as 'market' cannot be taken for granted and should not be reified. Each 'system' is defined and can be redefined as the research project is designed." (Etzkowitz & Leydesdorff, 2000: 113)

Whereas writing on Mode 2 with its emphasis on the erosion of boundaries can be described as de-differentiationist the triple helix is understood as an exercise in 'neo-differentiation' (Shinn, 2002) as it especially focuses on the co-evolution of related yet distinct helices in a triple helix model. This model, however, is not to be understood as a new macro entity but rather as a heuristic to analyze innovation dynamics.

With this model Etzkowitz and Leydesdorff therefore provide a critique of the linear model of innovation and argue that Bush's idea of an 'endless frontier' in which science as a stable entity produces knowledge that leads to innovation needs to be replaced with the figure of "endless transition" (1998: 205). This model of innovation describes an ongoing interaction between the three strands of the helix in which they continually rearrange their relations as well as their own structures, or as they put it:

"continuous series of experiments on the relationship between science, industry and government in creating the conditions for future innovation" (ibid.)

Although Etzkowitz and Leydesdorff are mainly concerned with analyzing institutional arrangements at times they also refer to practices of knowledge production. They argue that e.g. interdisciplinary approaches to knowledge production are needed in such collaborations between different institutions. Additionally, they direct attentions to new disciplines like computer science, which they describe as the outcome of the "syntheses of practical and theoretical interests" (2000: 117). While they do not explicitly use the term such arguments resemble claims about transdisciplinarity raised by proponents of the Mode 2 diagnosis.

These changes, so the argument runs, also leads to a change in the normative structure of science as initially proposed by R. K. Merton (1942). Merton assumed that scientific endeavor is led amongst others by the idea of communalism, i.e. the sharing of ideas for the sake of the advancement of science. The emerging relations described by Etzkowitz and Leydesdorff instead lead to an increasing focus on the economic value of knowledge and thus to a capitalization. As a consequence, questions of ownership – manifest in discussions about patenting or intellectual property – gain importance. Scientific knowledge is no longer understood mainly as a common good but is increasingly framed as the property of entrepreneurial actors. This relates to debates about the freedom of science and to attempts to steer knowledge production that are captured in debates about a ‘strategic turn’ (Borup, Brown, Konrad, & Lente, 2006) and a move towards ‘strategic science’ (Arie Rip, 2000). In this way the debate thus not only addresses the social and epistemic organization of science, but additionally directs attention to a moral re-ordering that is going on.

2.2. Transdisciplinarity

A common element in the models of change I outlined above is the assumption that an integration of more heterogeneous actors in knowledge production processes is needed. In writing on post-normal science this is framed as ‘extended peer groups’ (Funtowicz & Ravetz, 1993b), while the triple helix model more generally refers to a mutual shaping of different institutional actors and collaboration with diverse actors as a new ‘third mission’ of universities (Etzkowitz & Leydesdorff, 1998). Authors related to Mode 2 writing argue that transdisciplinary knowledge production is closely related to the contextualization of science, i.e. extra-scientific rationales that become increasingly important and thus a central feature of the changes they describe. In ‘The New Production of Knowledge’ the notion is understood as

“the mobilization of a range of theoretical perspectives and practical methodologies to solve problems. But, unlike inter- or multi-disciplinarity, it is not necessarily derived from pre-existing disciplines, nor does it always contribute to the formation of new disciplines. The creative act lies just as much in the capacity to mobilize and manage these perspectives and methodologies, their ‘external’ orchestration, as in the development of new theories or conceptualisations, or the refinement of research methods, the ‘internal’ dynamics of scientific creativity.” (Nowotny et al., 2003: 186)

As this quote nicely shows the focus is put on *solving problems*. In this process disciplinary boundaries are allegedly *transcended*. Thus something new is emerging that does not correspond to any *pre-existing discipline*. Gibbons and his colleagues also direct attention to the particularity of knowledge stemming from a

“context of application with its own distinct theoretical structures, research methods and modes of practice but which may not be locatable on the prevailing disciplinary map” (Gibbons et al., 1994: 168)

In this line of argument Nowotny states that the knowledge produced in such settings is ‘transgressive’ and therefore “does not respect institutional boundaries” (Nowotny, 2007).

Transdisciplinarity is not only the object of – one might say – mode 1 scientific ‘ivory tower’ debate within scientific discourses. Far from it the term has become consequential as there are now research programs across Europe with the explicit agenda to foster transdisciplinary research. Examples are the ‘International Center for Transdisciplinary Research’ (CIRET)³² the ‘Swedish Foundation for Strategic Environmental Research’ (MISTRA)³³ or the ‘Swiss Priority Programme Environment’ (see e.g. Pohl, 2005) and the Swiss ‘td-net’³⁴. Among those programs is also the Austrian funding scheme proVISION³⁵, a funding scheme in the area of sustainability research with the explicit agenda to foster transdisciplinary research.

So far I have focused and briefly described how transdisciplinarity is used in work related to Mode 2, post-normal science and the triple helix. The use of the term transdisciplinarity, however, reaches back beyond current debates about changing modes of knowledge production and refers to a discussion about different forms of collaborations between and beyond disciplines such as interdisciplinarity or multidisciplinarity. And although the term is used in many different variations that are – to say the least – not always completely consistent with each other I will now give an overview of the main understandings of the term and its characteristics.

While there are a lot of different understandings of the term (Balsiger, 2004) most authors agree that the broad idea of transdisciplinarity present in the debate about new

³² CIRET website. Accessed November 17, 2013. http://ciret-transdisciplinarity.org/index_en.php

³³ MISTRA website. Accessed May 16, 2013. <http://mistra.org/en/mistra.html>

³⁴ td-net website. Accessed May 16, 2013. <http://www.transdisciplinarity.ch/d/index.php>

³⁵ proVISION website. Accessed November 17, 2013. <http://www.provision-research.at/>

modes of knowledge production goes back to Erich Jantsch and Jean Piaget (Klein, 2004; Nicolescu, 2008). In a talk at a conference on interdisciplinarity held in 1972³⁶ Jantsch used the notion to describe the idea of a general coordination of innovation and education that goes beyond disciplines in terms of shared assumptions and epistemologies. Piaget, slightly deviating from Jantsch's conception, described transdisciplinarity as follows:

"Finally, we hope to see succeeding to the stage of interdisciplinary relations a superior stage, which should be "transdisciplinary", i.e. which will not be limited to recognize the interactions and or reciprocities between the specialized researches, but which will locate these links inside a total system without stable boundaries between the disciplines" (Piaget, 1972 as cited in Nicolescu 2010: 20)

This definition is similar to Jantsch's understanding as it still assumes the development of *links inside a total system*. However, it differs as Piaget is not so much interested in coordination but instead emphasizes the difference to interdisciplinarity that lies in the erosion of 'stable boundaries' and thus goes beyond the idea of a coordination of pre-fixed entities. This definition also echoes in the idea of 'methodical transdisciplinarity' (Mittelstrass, 2011) proposed by Jürgen Mittelstrass who claims to be the first who used the term transdisciplinarity in "the context of the philosophy of science" (ibid.: 329):

"Within the boundaries of transdisciplinary developments, the individual disciplines do not remain what they were, at least, they change their methodical and theoretical perspectives." (ibid.: 337)

He argues that this 'methodical transdisciplinarity' as a way of collaboratively solving actual problems needs to be understood as a "principle of *research and science*" (ibid.: 335; emph. orig.) rather than as a "*theoretical principle* that changes our textbooks" (ibid.; emph. orig.). This means that there is no new discipline that transgresses common boundaries and manifests itself in particular theories, methods or methodologies. Instead transdisciplinarity as a research principal "guides the perception of problems, and their solutions" (ibid.: 332).

³⁶ The conference was called 'Interdisciplinarity- Teaching and Research Problems in Universities', held in Nice, France in 1972 and organized by the Organization for Economic Co-operation and Development (OECD) together with the French Ministry of National Education and University of Nice (Nicolescu, 2010). In the decades following this initial definitions attempts to institutionalize transdisciplinarity took place as e.g. in CIRET that was established in 1987. Together with this tendency towards an increasing institutionalization several 'charters' and 'manifestos' were published (Nicolescu, 2002; Nicolescu & Morin, 1994) (Nicolescu 2010, 2002, 1994).

As I already indicated the concept of transdisciplinarity is generally used as a distinction from interdisciplinarity. The main difference between those two terms consists precisely in the understanding of the role of disciplines:

“Interdisciplinarity generally refers to the appropriate combination of knowledge from many different specialities – especially as a means to shed new light on an actual problem” (Brewer, 1999: 328)

Whereas interdisciplinarity assumes a stability of disciplines and the collaboration on grounds of discipline derived expertise and knowledge – as the above quote nicely shows –, transdisciplinarity postulates the disintegration of boundaries and the development of something different. In transdisciplinary research these problems, so the argument goes, lead to a transgression and an erosion of disciplinary boundaries. The two concepts have in common an idea of *actual problems* that need to be solved. These problems are described as fundamentally different to those treated in traditional scientific research as they are emerging in the so-called ‘Lebenswelt’ (Mittelstraß, 2005) and thus are ‘real-world problems’ (Zierhofer & Burger, 2007). Mostly these real-world problems are related to broader issues of sustainability, health or energy supply (Mittelstrass, 2011). In this sense, transdisciplinarity is described as ‘problem-oriented research’ (Zierhofer & Burger, 2007). It is argued that these real world problems do not fit into a disciplinary ordering of academic research. The segmentation of disciplines is criticized as the “outcome of a methodological reduction of reality” (Després, Brais, & Avellan, 2004: 475). This in turn bears the danger of disciplinary boundaries becoming cognitive limits (Mittelstrass, 2011), which makes necessary a call for interdisciplinarity and, in addition or as a succession or supplement of that, a call for transdisciplinary research. As Mittelstrass rightly remarks, such ideas of problems calling for a particular kind of science or problem-solving strategy rehearse ideas of a “unity of nature” (ibid.: 333). I would add that together with this idea of a *unity*, there is also the idea of nature ‘out there’ being stabilized. This bears the danger of falling back to a positivistic account of reality and of underestimating or failing to acknowledge the performative features of scientific conduct (Law, 2009).

This framing of problems as real-world problems (sometimes) leads to the claim that integration of heterogeneous actors is necessary and a ‘(co)creation of knowledge’ (Regeer & Bunders, 2003) a crucial element to their solution. Debates about transdisciplinarity thus often tackle issues concerning an integration of different kinds

of actors. The assumption is that these actors are carriers of different kinds of knowledge framed sometimes as a particular sort of local knowledge (Regeer & Bunders, 2003) necessary to the solution of a problem or as some kind of specialist knowledge (Després et al., 2004) held by particular actors.

These ideas of integration often come along with a focus on questions concerning how to achieve this integration. Narrations about 'dialog' (Nicolescu, 2010), finding a 'common language' (Després et al., 2004; Klein, 2004) or 'bridges' (Klein, 2004) are quite common in this regard. The idea is that some sort of genuine form of communication needs to be established in order to achieve integration of different realms of society.

Other authors arguing like that take a slightly different direction and invoke Habermas' idea of a 'communicative rationality' as an alternative for the more established idea of a cognitive scientific rationality (Després et al., 2004). The goal thereby is to achieve *intersubjectivity* among collaborators:

"Activating intersubjectivity is not only a question of bringing people together and coordinating their verbalizations. It involves a difficult mediation process and a ceaseless effort of mutual understanding between different stakeholders for learning and acting."
(ibid.: 477)

In this sense researchers engaged in transdisciplinary working contexts presumably need a particular set of competences like "multi-perspective thinking and the ability to work with multiple forms of knowledge and information" (Klein, 2004: 522) or particular "rhetorical and hermeneutical skills needed to deal with the public" (ibid.: 520). However, at the same time a lack of transdisciplinary education and - as a consequence - a lack of capable researchers is diagnosed and thus specialized programs are requested.

Summing up, forty years after the term was introduced the debate is still alive and well. Scholarly work concerned with transdisciplinarity thereby focuses on different areas. There are contributions dealing with transdisciplinary methods (Jäger et al., 2008; Pohl & Hirsch Hadorn, 2006) and methodology (Mittelstrass, 2011; Nicolescu, 2010) as well as more encyclopedic oriented work (Pohl & Hirsch Hadorn, 2008). Additionally, there is work aimed at developing a specific epistemology for transdisciplinarity (Max-Neef, 2005; Regeer & Bunders, 2003) and papers that deal especially with issues concerning the evaluation of transdisciplinary research (Defila & Di Giulio, 1999; Pregernig, 2007). Furthermore, there are reports of experiences with transdisciplinary approaches in

different areas as e.g. environmental and sustainability research (Pohl, 2005), or ecology (Rentz, 2004), but also social and health related issues (Reitinger, 2008), or e.g. in relation to collaboration of arts and sciences (Scott, 2006) or urban studies (Després et al., 2004; Ramadier, 2004). Additionally, there is also a strand of literature concerning experiences with the education of transdisciplinary researchers (Muhar & Enengel, 2010).

But while there is a lot of work concerned with transdisciplinarity there is still surprisingly little work that systematically explores the actual practices of researchers engaged in transdisciplinary projects (Bister et al., 2008; Felt, Igelsböck, Schikowitz, & Völker, 2012). One of the aims of my PhD-thesis is actually to contribute to filling this gap. I will come back to this later.

2.3. Debating Limitations

The concepts I outlined above invoked a vivid and at times quite normative and emotional debate³⁷. Criticism often focuses on the **claim of the newness** of the developments described in these accounts of changes in knowledge production. Especially the Mode 2 thesis is criticized for merely repeating things that have been said before. In this sense Peter Weingart asks whether Mode 2 should be regarded as ‘old wine in new bottles’ (1997). He argues that the things discussed in relation to Mode 2 were also already present in writing concerning ‘finalized science’ by Böhme, Daele, and Krohn (1973) some 25 years earlier (Weingart, 1997). The question Weingart is interested in concerns the “turnaround in the way these ideas are received” (ibid.: 592), i.e. why they were ignored back then while policy makers nowadays frequently refer to concepts such as Mode 2.

Additionally, critics address the **lack of empirical evidence** as problematic. Again, especially Mode 2 and post-normal science writing is targeted by this sort of criticism. The evidence, so it is argued, is taken from a “very narrow sector of research” (ibid.: 600). The debate on changing modes on knowledge production merely focuses on “areas of knowledge which are policy relevant” (ibid.: 603). The arguments thus can hardly be extended to “all other areas of science” (ibid.: 600). Although this is an accurate point, Hellström and Jacob (2000) rightfully point out that this restriction to particular areas of

³⁷ A neat exemplar for this sort of the debate is the critique articulated by Weingart (Weingart, 1997) and the riposte by Hellström and Jacob (Hellström & Jacob, 2000).

knowledge production does not make the overall argument any less valid. They argue that

“a traditional reductionist understanding of knowledge production creeps into Weingart’s (1997) argument as he disputes whether Mode 2 really leads to any ‘fundamental change in epistemology’. What constitutes a ‘fundamental change’, and even if this could be defined, a fundamental change in what one may ask? What is the name of this epistemology that obviously demands the generalizability of ideas to ‘science as a whole’ for their validity to be accepted, and at the same time is so homogeneously constructed that it can be reformed in a fundamental way?” (ibid.: 72)

Terry Shinn utters similar criticism and especially directs attention to the need for more historical analysis instead of just assuming that the changes described are just a phenomenon of our time. Whereas he argues that Mode 2 as well as the Triple Helix model are interested in what he calls “transversality” (2002: 611), by which he means the crossing of diverse boundaries, both accounts fail to historically analyze transversality. A historical analysis would have to pose questions concerning former relations between science and other (institutional) actors.

In another variation of this point critics address a **misconception in the understanding of the historical development** of science. Especially Mode 2 is accused of portraying a past that never happened. Mode 2, so the argument goes, actually was the general model of knowledge production and the university only gained importance later in history. With the increasing importance of universities the idea of a detached and value free science producing knowledge independent from society was established. Etzkowitz and Leydesdorff in this sense argue that Mode 1 is a *construct* that was supposed to ensure the autonomy of science:

“Mode 1 is a construct, built upon that base [science as detached from society; T.V.] in order to justify autonomy for science especially in an earlier era when it was still a fragile institution and needed all the help it could get.” (Etzkowitz & Leydesdorff, 2000: 116)

Thus the Mode 2 version of the history of science is accused of turning around history. This argument of course relates to a point often made concerning the newness of the developments that are described.

Together with concerns regarding the empirical base for the various diagnoses emphasis is also put on **weak theoretical underpinning**:

“It is a failing that this startling claim is not girded by discussion of how ‘differentiations’ have operated in the past, how and why they have allegedly eroded, and what their putative demise implies for sociological theory” (Shinn, 2002: 611)

While the Mode 2 thesis is criticized for being “anti-differentiationist” (ibid.: 604) without grounding this claim in sociological theory, the triple helix model is generally described as more theoretically ambitious and elaborated, as it references different versions of systems theory and related to that a theory of differentiation. Still, concerns are expressed that the “theoretical message [...] is not intelligible to many in the audience” (ibid.: 606). Shinn argues that within the context of a theory of differentiation it seems difficult to assume a macro entity like the triple helix and at the same time assume differentiation between its different parts. Additionally, the triple helix model is accused of not clearly differentiating between different models of change as the authors talk about evolution and at times about revolutions (ibid.: 609).

Another common critique refers to the importance of **transdisciplinarity** that is part of work related to Mode 2 and post-normal science. The diagnosis of “disciplines gradually losing their function as social organization and cognitive frame of orientation” (Weingart, 1997: 596 et seq.) is criticized for being exaggerated. It has been stated before and if accurate then only for a limited area of knowledge production. In addition to that it is argued that it is not clear what is understood as ‘discipline’ and how this term is defined. In this sense, Hellström and Jacob note that “the relation between disciplinary and transdisciplinary research is still a grey area” (2000: 72). This relates to criticism concerning a lack of theoretical considerations.

These descriptions of Mode 2, post-normal science and (although to a lesser extent) triple helix as being not empirically grounded and lacking theoretical consideration often lead critics to an assessment of these concepts of being **mainly normative** or prescriptive. Shinn in this sense states that the diagnoses mainly consist of “prefabricated indications about where science has putatively come from and where it is allegedly going” (Shinn, 2002: 603), that it is “tinged with political commitment” (ibid.: 604) and that it is not clear what the “intellectual project” (ibid.) is. In this sense, the debate is depicted as a “performative discourse” (ibid.) and especially Mode 2 is compared to “political manifestos” (ibid.: 610). Weingart describes it as biased and following its own agenda, an expression of particular beliefs and a “romanticized appeal

to the higher rationality of lay knowledge” (1997: 611) and the “product of our wishful thinking” (ibid.).

A more general critique addresses the issue of ‘**commercialisation of research**’ (Nowotny et al., 2003), i.e. the increasing tendency to commodify research in literature dealing with changing modes of knowledge production and new (third) missions of university (M. Jacob, 2009). Commodification thereby is understood as the production of packaged knowledge for particular users. Such practices are accused of promoting an understanding of knowledge as a product. In this sense the discourse about a changing mission of science and university can be understood as a “steering mechanism” (ibid.: 392), because it grants that applicable, relevant knowledge is produced. This conceptualization of science, Jacob argues on the basis of a Marxist idea of commodity, assumes that science merely works in terms of use and exchange value and neglects the gift dimension of science. This dimension for example is visible in mentoring or teaching. Jacob identifies two dangers in understanding science in terms of commodification. First, it questions the impartiality of science and second, there are possible restrictions to scientist’s right to use the knowledge produced for e.g. further research or more generally making it public.

A similar contention – issued more directly towards Mode 2 - is brought forward by Shinn who argues that the Mode 2 thesis supports a “**neo-corporatist** vision of the world” (Shinn, 2002: 608). This *vision* consists of downplaying the distinctions of different spheres of society. This, so the argument goes, can be seen as a pre-condition for the possibility of authoritative steering of science. A variation of argument is not only directed to Mode 2 but also more directly towards transdisciplinarity when it is described as a way of governing science (Maasen & Lieven, 2006). In this view, the participation of extra-scientific actors, understood as “members of the generalized citizenry” (ibid.: 408), in knowledge production functions as a control mechanism for science. In this sense, transdisciplinarity is described as a “mode of responsible [sic] self government” (ibid.) and thus a “political technology” (ibid.).

These lines of critique bring up important issues and it would of course be fascinating to delve deeper into these discussions. The debate itself is quite influential as policy makers increasingly refer to the concepts discussed and funding resources are made available for different variations of transdisciplinary research and other participatory

activities. Instead of directly engaging in this debate, however, I want direct attention to a particular aspect: the prescriptive dimensions of the different arguments and notions.

2.4. Discussion: On the Pre-scriptiveness of Diagnoses

The debate I have outlined above is fascinating as it addresses a broad variety of questions concerning science-society relations on methodological, epistemological and ethical levels. However, I do not intend to directly engage in these discussions. Instead I'd like to look at this debate from a STS perspective and focus on its relation to research practices. From such a perspective especially the prescriptive character of these diagnoses seems to be interesting. They are as much descriptions of present developments as they are - as Hackett and Rhoten have rightly observed - "visions of the future of science" (ibid.: 426) that "may become real in their consequences" (ibid.)³⁸. These diagnoses thus can be described as a "performative discourse" (Godin, 1998: 480). Concluding this chapter I now want to focus on the various ideas about futures of science and society that are part and parcel of these diagnoses.

Broadly speaking the debates I outlined above deal with futures in two ways: first and quite intuitively these debates are interested in future-oriented issues such as environmental threats, future demographic and economic developments and in innovation dynamics. Thus there is an emphasis in the actual production or manufacturing of forward-looking knowledge. Especially Funtowicz and Ravetz write about forward-looking knowledge. Concretely they criticize methods of risk assessment for not being fit to deal with contemporary problems. Whereas "[c]omputer models are the most widely used method for producing statements about the future based on data of the past and present" (Funtowicz & Ravetz, 1993b: 741), the results produced are necessarily uncertain as "what comes out at the end of a program is not necessarily a scientific prediction; and it may not even be a particularly good policy forecast" (ibid.: 742 et seq.). Therefore more "appropriate kinds of problem-solving strategies for each particular case" (ibid.: 744) are needed. The interesting thing here is the kind of knowledge that is supposed to be necessary for dealing with contemporary problems. Thus, while traditional modes of producing knowledge are criticized the need for knowledge about the future such as *predictions* or *forecasts* is not questioned, but rather enforced. Facing new kinds of problems and an increasing importance of collaborations

³⁸ On diagnoses in the social sciences see e.g. Bogner (2012) und Osrecki (2011)

of heterogeneous actors in decision-making contexts gives rise to calls for producing knowledge about the consequences of these actions.

There is also a second and more fundamental way in which futures become important in these accounts. They implicitly and sometimes also very explicitly develop visions of futures of science and research together with futures of society. Funtowicz and Ravetz in their work on post-normal science provide a dystopian outlook for society. The challenges faced by contemporary societies pose a severe threat to the survival of civilization:

“In post-normal science, when global environmental issues are involved, the stakes can become the survival of civilization as we know it or even of life on the planet.”
(Funtowicz & Ravetz, 1992: 260)

The *survival* of humankind therefore is closely related to new forms of knowledge production. The need for a new kind of science is underpinned by global “threats” (Funtowicz & Ravetz, 1993b: 742) and feeling responsible for “future generations, other species, and the planetary environment as a whole” (ibid.: 751). Potential futures of society and humankind are in this way complemented with visions of a potential future science:

“It has hitherto been a well-kept secret that scientific ‘facts’ can be of variable quality; and an informed awareness of this human face of science is a key to its enrichment for its future tasks” (Funtowicz & Ravetz, 1993b)

What we see in this quote is the implicit idea that science ought to be changed in order to be able to deal with its *future tasks*. A potential future of society – or the threat of an absence of any future - is in this way linked to an assumed need for change in knowledge production. The present of knowledge production is thereby directly linked to these tasks. What is needed now is establishing a science *enriched* through being aware of its *human face*. This is also visible in more explicit calls for a new kind of science:

“there is a need for a new, more pluralistic strategy of inquiry where the power embodied in quality assurance is more equitably shared among those with a legitimate concern for the consequences of scientific and professional work” (Funtowicz & Ravetz, 1993a as cited in Weingart 1997)

Here the vision of the future of knowledge production is fleshed out a little. Funtowicz and Ravetz call for a *more pluralistic strategy*. This pluralism shall be related to the notion *concern*. This quote can thus be understood as a call for changing rules of

integration in a future science. Also, Mode 2 writing and work on transdisciplinarity argues in a similar way. Especially transdisciplinarity, as Balsiger notes in a paper on Mode-2, is “considered to be the key issue for all future research which deals with problems that are not circumscribed in any existing disciplinary field” (2004: 407). Also, main proponents of the Mode 2 thesis describe their project as a “debate about the future of knowledge production” (Nowotny et al., 2003: 180).

From an institutional perspective the future of universities is a topic often discussed in accounts of changing modes of knowledge production. Gibbons and his colleagues state that “[i]n a Mode-2 society, the future university will need to be more of a synergetic institution” (1994: 91) and develop a vision for a “Mode-2 university” (ibid.: 93). In a similar manner Etzkowitz and Leydesdorff envision universities that are supposed to engage in collaborations with industry and economy (2000). In their view this is necessary for maintaining science’s legitimation as “a contribution to culture” (ibid.: 117) and thus its entitlement to resources:

“The future legitimation for scientific research which will keep funding at a high level is that it is the basis of economic growth” (Etzkowitz & Leydesdorff, 1998: 206)

Thus we can see how collectively shared and interrelated ideas of the future are central to the debate about changing modes of knowledge production and the re-organization of science. The future of our planet as a whole relates to future knowledge production practices, the assessment of their quality and potential future institutional boundaries of universities. In this sense imaginations of futures of society and futures of science are closely entwined in accounts of changing modes of knowledge production. The debates on changing modes of knowledge production (and consequentially the research programs they inspire) can be regarded as a site in which the future relations of science and society are negotiated. In this sense, they are no mere ‘diagnoses’ but also prescribe attainable futures for science and society. This means that through the debate about changing modes of knowledge production our collective imaginations of science-society relations are re-shaped.

Within the debate about new modes of knowledge production, however, there seems to be the tendency to simply disqualify such a future-orientation. This becomes visible e.g. when Shinn states that Mode 2 “offers a number of prefabricated indications about where science has putatively come from and where it is allegedly going.” (Shinn, 2002: 603). Well, it does. But I think it might be worthwhile not to stop at this statement or

assessment, but to focus on collectively shared imaginations of science and society and on questions about how they are produced and stabilized and how they relate to knowledge production practices of actors engaged in transdisciplinary sustainability research. In a next step it is thus necessary to develop a conceptual framework to analytically grasp this two-fold future-orientation of the debates about new modes of knowledge production and its dynamics.

3. Future(s) in Debates on Science and Technology

So what to make of the observation that the debate about changing modes of knowledge production does not merely diagnose changes in the way knowledge is produced, but also prescribes particular societal futures as well as specific science-society relations? How do visions of the future relate to orderings in the present? How can such temporal dynamics be understood? Those are intriguing and important questions that have not been tackled in depth and in an empirically rich manner in debates about changing modes of knowledge production so far. To do so I will now develop the conceptual basis through exploring different sets of more or less related literatures that deal with ‘the future’ in technoscience.

For being able to deal with futures it will in a first step be important to elaborate a general understanding of what it actually is that we call ‘time’. Based on that I will be able to focus in more detail on the future and turn to different strands of literature dealing with (technoscientific) futures in order to understand how collectively imagined futures become relevant for practices in the present. Using the plural I indicate an understanding of futures as multiple in contrast to a single future that can be (quantitatively) predicted. Such multiple futures relate, they overlap and at times contest each other. Also, they are necessarily uncertain and cannot be known. I will use the plural unless a particular theoretical conception requires use of the singular. In the conclusion of this chapter I will then draw these different strands of debate together and argue that a deeper engagement with futures that are collectively produced and stabilized is necessary for understanding current developments and debates concerning knowledge production.

3.1. Time and Temporality

American writer and Nobel Prize laureate William Faulkner in ‘The Sound and the Fury’ lets his character Quentin state that “clocks slay time [...] time is dead as long as it is being clicked off by little wheels; only when the clock stops does time come to life.” (Faulkner, 1956) In this quote he distinguishes between ‘dead’ time and time that ‘comes to life’. The first one is associated with clocks and the mechanical processes, whereas the second appears to be merely the absence of clocks. This distinction is still widely prevalent in everyday understandings of time. Reviewing social science accounts

of time and temporality³⁹ I argue that time is neither simply dead nor alive, but is a multi-faceted phenomenon that is historically and socially contingent, made in interactions, while at the same time appearing as an 'objective reality' structuring and coordinating our lives. Over the last century scholars have elaborated on the numerous ways in which time is made part of every aspect of our daily lives. Clocks, calendars, opening hours and deadlines structure our daily routines, while e.g. imagined life or career trajectories organize our more long-term ideas of what we want to or feel obliged to accomplish in a certain amount of time. Working time as distinguished from recreational time as are (recurring) sacred times from profane times, and from a psychological perspective time can be experienced as going by slowly or moving very fast. These are just a few ways in which time comes to life in social practices.

While time has been an issue in the social science from its beginning - already Emile Durkheim observed that categories such as time and space were closely related to forms of social organization (Durkheim & Schmidts, 1984) - it was Pitrim Sorokin and Robert Merton who first offered a systematic analysis of time early in the last century. In their now classic paper 'Social Time: A Methodological and Functional Analysis' (Sorokin & Merton, 1937) they focus on how 'social time' is ordering social life. Against the background of an understanding of time as out there and independent of human actions they argue that it is necessary to think about different conceptions of time and introduce 'social time' as a concept to analyze the qualitative features of time:

"social time, in contrast to the time of astronomy, is qualitative and not purely quantitative; that these qualities derive from the beliefs and customs common to the group and that they serve further to reveal the rhythms, pulsations, and beats of the societies in which they are found." (Sorokin & Merton, 1937: 623)

Two elements are interesting in this quote. First, Sorokin and Merton understand social time as *deriving* from the *societies* in which they are embedded. What they call 'time systems' (Sorokin & Merton, 1937: 627) are thus closely related to particular socio-historical configurations. This is visible e.g. in the different beginnings of the year in different societies or in the fact that systems of time reckoning vary depending on

³⁹ I will not provide a systematic overview of literature dealing with time as this is not in the scope of this thesis and has been done already by colleagues better fit for such a task. For good overviews on conceptualizations of time in the social sciences see e.g. Adam (1994) or Bergmann (1992), for a philosophical account see e.g. Sandbothe (1998). For attempts to relate time and social theory see Nowotny (1992), Nassehi (1993) and more recently Rosa (2005).

whether you look at agricultural societies or societies based on hunting. Second, time is not only closely entwined with particular collectives; moreover it is a way of *revealing* or analyzing the social organization of collectives. Different groups follow different rhythms. There are different times for doing particular things such as wedding, going on holiday, doing repair works, cutting hair and so on. In this sense, they thus understand time as closely entwined with societal orderings. This leads Sorokin and Merton to further argue that the need for what is commonly referred to as time is historically related to the growing amount of mobility and interactions between different groups and thus a need for *co-ordination*:

“Thus, the social function of time reckoning and designation as a necessary means of co-ordinating social activity was the very stimulus to astronomical time systems, the introduction of which was made imperative by the inadequacy of local systems with the spread of contact and organized interaction and the resulting lack of uniformity in the rhythms of social activities. Astronomical time, as a "time esperanto," is a social emergent.” (Sorokin & Merton, 1937: 628)

It is thus the *social function of time reckoning* for coordinating different groups that led to the introduction of astronomical time. Following this line of research other authors adopted the argument of time as a means of coordinating social life. However, they went one step further and criticized the differentiation between astronomical and social time for still assuming that time is a pre-fixed entity that precedes and is independent of the practices of societal actors. In his essay on time Norbert Elias states that it is not enough to differentiate different times and then define ‘social time’ as the object of study for sociology (cf. Elias, 1988: XV). In contrast to such distinctions he assumes that time is both simultaneously ‘natural’ and ‘social’ or ‘objective’ and ‘subjective’ (cf. Elias, 1988: 94). Against the background of this rejection of a distinction between social and natural time Elias states that clocks (as well as other instruments for time reckoning) are not instruments for measuring a somehow independent time. Time itself, he argues, is an instrument for orientation and regulation. In this understanding it is neither a property of the human mind, nor is it something independent of human action. Talking about ‘Zeitbestimmen’ he argues that what is commonly understood as time are practices of putting in relation respectively ‘synthesizing’ different events. This can be movements of mechanical watch hands and the perceived movement of the sun. Concepts of time are in this account then closely related to a society’s knowledge about recurring events as e.g. planetary movements and the development of technical devices for time measurement

such as calendars or clocks. Time itself is in this sense understood as an instrument closely related to particular socio-historic configurations. Elias thus goes beyond Sorokin and Merton as he emphasizes the social nature of time reckoning understanding such practices as situated in particular socio-historic contexts and, more importantly, directs attention to the close relation of time reckoning and the knowledge available to the members of certain collectives. This shift of focus brings to the fore questions about what kind of knowledge is used for time reckoning and which actors hold this knowledge. Is it e.g. priests that hold the knowledge about the right time for sowing or is it a group of scientists who hold the authority to state that now is the time to urgently take particular measures in order to save our environment? Related to knowledge in this way, all time becomes necessarily 'social'. There might well be processes of change and becoming, but once we speak of time this always refers to particular social practices of synthesizing events. Time thus becomes a means of interpreting reality and is based on collectively held knowledge by a particular society at a particular moment in time. It is in this sense that Luhmann highlights the importance of time as a means of orientation and regards time as "the interpretation of reality with regard to the difference between past and future" (Luhmann, 1976: 135). If time is a way of *interpreting* reality then it follows that it is also contingent. Therefore the question what time is becomes an empirical question. Bruno Latour differentiates time from this act of interpreting and proposes to "call the interpretation of this passage [of time; T.V.] temporality, in order to distinguish it carefully from time" (Latour, 1993: 68).

Akin to such conceptions of time social science scholars from different disciplines build on the methodological implications of an understanding of time as a means of coordination and explore the temporal patterning of social life using time as an entry point for understanding social order. In his work on schedules and calendars Zerubavel e.g. is interested in "*the sociotemporal order*, which regulates the lives of social entities" (Zerubavel, 1985: XII; *emph.orig.*). He distinguishes different dimensions such as the sequential structure and the duration of events that tell us about their order and how long they last. The temporal location and the rate of recurrence of events are concerned with when and how often something is taking place. Stability of social order he argues is closely related to the "temporal rigidification of social situations, activities, and events" (Zerubavel, 1985). Social order can thus be understood through a "temporal anchoring of normalcy" (Zerubavel, 1985: 20), i.e. shared understandings of what is and ought to

happening at what time, how often, for how long and so on. Referring to Garfinkel he describes them as the 'ground' for experience. Collective temporal institutions as schedules and calendars are thus also regarded as important means for establishing group identities. Especially in his more recent work he additionally elaborates on 'sociomental topographies of the past' as means for building collective identities (Zerubavel, 2012)⁴⁰.

Using a similar metaphorical language British sociologist Barbara Adam talks about 'timescapes', i.e. the multilayered and interrelated temporal features of living. Adam considers time to be "the invisible 'other'" (1998: 9) and central to understanding societal ordering processes:

"This entails concern with approaches to time and the multiple intersections of the times of culture and the socio-physical environment." (Adam, 1998: 9)

Adam is thus not interested in erecting or deconstructing dichotomies of some sort. Much rather she is interested especially in the intersections of different dimensions of timescapes, such as different rhythms, timings and tempos. She emphasizes questions regarding how particular ways of living are mutually constitutive with certain temporal orientations. It is thus a very dynamic conception of time that stresses the "temporal features of living" (Adam 1998: 10) and is attentive to processes of constant emergence and change:

"And yet, simultaneous with the transcendence of dualisms we are forced to recognise important distinctions between cultural time(s) and the temporalities of nature while appreciating their mutual interpenetration and influence." (Adam, 1998: 13)

As the quote above nicely shows, in her „attempt to bring the complexity of time(s) to the forefront of attention" (Adam, 1998: 10), Adam focuses on practices and their related temporalities. Herein also lies a main difference to other work on time such as e.g. Zerubavel's writing, which is Adam's sensitivity concerning the dynamic relations of different timescapes as well as their dimensions. She is explicitly interested in possible tensions and conflicts related to what she calls 'industrial time' characterized by ideas of "linear causality on the one hand and reversibility on the other, as well as abstraction, rationalisation and objectivity." (Adam, 1998: 8)

⁴⁰ Also referring to spatial metaphors American historian Robert Levine in a comparative culturalistic approach describes a 'geography of time' (Levine, 1997)

Similar to the way Adam talks about ‘industrial times’ Latour argues that contemporary understandings of time are closely related to the rise of science. He argues that the ‘modern’ idea of scientific conduct with its related concepts of enlightenment and discovery are co-constitutive with certain temporalities. The idea that something is ‘out there’ and is suddenly ‘discovered’ assumes the existence of a fixed temporal realm where entities wait to be discovered:

“In order to explain what becomes a great mystery, you are going to have to construct an image of time that is adapted to this miraculous emergence of new things that have always already been there, and to human fabrications that no human has ever made.”
(Latour, 1993: 70)

Building on the argument that time is not a general frame of reference for the succession of ‘revolutionary miracles’ he suggests turning this conception around and regarding time not as “a general framework, but a provisional result of the connection among entities.” And thus “[i]t is the sorting that makes the times, not the times that make the sorting” (Latour, 1993: 76; *emph. orig.*)

Such an understanding of times as produced in practices of *sorting* a range of different elements, however, directs attention also to a set of related issues. As already indicated in Adam’s sensitivity towards possibly conflicting timescapes, studying time and temporality also means being attentive to questions of power. Writing about the emergence of simultaneity Helga Nowotny argues that the ability to allocate and distribute time resources is closely related to questions of power (Nowotny, 1989, 1995). ‘Zeitsouveränität’ as the ability to decide about how to use time and ‘Zeitzwang’ as the power to dispose of the time resources of others and with these the dichotomy of ‘Eigenzeit/Fremdzeit’ are central concepts in Nowotny’s thinking about time and power. In a similar manner Felt talks about the ‘tempor(e)alities of epistemic living spaces’⁴¹ to especially highlight the temporal aspects of science and research (systems). In this sense, time is always connected to particular modes of sovereignty. This touches on questions about who defines sequences of things to be done as well as their duration or rhythms. On a broader level, this also entails ideas about progress and innovation and who is up to date or lagging behind and thus about centers and peripheries. Stories about

⁴¹ E.g. in a talk at the 2013 congress of the Österreichische Gesellschaft für Soziologie (ÖGS) 2013 in Linz entitled: “Über turbulente Zeiten und Tempor(e)alitäten kontemporärer Wissenschaft”

‘innovation leaders’ and ‘closing gaps’ in policy discourse are nice exemplars for such ideas.

Questions concerning ‘making times’ and its implicated power relations also direct attention to the association of temporality and technology. As STS scholars have convincingly argued time is not only itself a technology for orientation and coordination, it is also inextricably entwined with technological innovation: it is cesium atomic clocks and the related precision of time reckoning, it is laboratories for timekeeping and the related establishment of universal time over the last century. But it is also new means of transport and communication that are linked to changing temporalities of daily life (Nowotny, 1989). We are able to travel faster and communication around the world virtually happens in real time. This points to the materiality of time that is also beautifully shown in science historian Peter Galison’s work on the worldwide standardization of time (Galison, 2000, 2004; see also Zerubavel, 1982). Galison presents this process as a story about both Einstein’s work on a theory of time and the technopolitical negotiations surrounding the establishment of a worldwide system of time reckoning, a net of wires, rails and politics and argues that they cannot be understood separately. This is a reminder that time is not only made by human actors in interactions but is also always material and nonhuman. What is understood as time is as much a negotiation of human actors and their practices as it is dependent on the material world of technologies and artifacts.

Summing up, what can be learned from these authors is that time is simultaneously produced or made in social practices, a symbolic order and a way of making sense of the world. But time is more than that. It is not only symbolic, but also material. It is a corporeality of emergent bodies experiencing time in different ways. But then again time is not only the subjective experiences of actors but simultaneously what we call time is a seemingly objective reality coordinating and structuring our daily lives. Furthermore time is itself political and additionally contingent on political orderings and material technological developments and contexts. This is what scholars have referred to as the multifaceted aspects of time.

What does all this mean for our understanding of the future? How does this help us understand contemporary concerns about the future articulated throughout different areas of society? A ‘breathless futurology’ (Harrington et al., 2006) is diagnosed and ‘anticipatory regimes’ (Adams et al., 2009) are described that make it increasingly

difficult not to take into account the 'not yet' (Adam & Groves, 2007). This is especially true when it comes to sustainability and sustainability research.

3.2. Grasping the 'Temporal Realm Beyond the Senses'⁴²

What follows from the conception of time as constantly (re-)produced in heterogeneous assemblages of actors and their practices is that also what is commonly termed 'the future' needs to be thought of as a material and symbolic temporal abstraction produced through social practices.

3.2.1. Future theorized

When we assume that the future is not a stable temporal entity to which we will automatically proceed as time passes by, but instead think of it as constantly produced through practices it follows that what we regard as the future is socially and historically contingent. Different societies have different ideas about the future that are constantly changing. This does not only concern the content of ideas about the future like the houses in which we will be living the cars we will be driving⁴³ or the political systems we will be living in⁴⁴. Much rather, also ideas about what the future is and accordingly how we can and should position ourselves towards this temporal abstraction are subject to historical change. The important point here is that particular conceptions of the future are related to a certain way of social ordering: "The relation of past and future will not have the same form in every society" (Luhmann, 1976: 136) as Luhmann puts it. Now how are conceptions of the future different from each other and how can changes in such conceptions be understood? When and why do our understandings of the future change?

The future in its current understanding as a spatio-temporal entity that follows after the present and is open to our shaping is relatively young as historians concerned with different conceptions of the future argue (Hölscher, 1999; Koselleck, 1979). According to Hölscher the idea of the future as a single coherent timeframe is a product of the 17th

⁴² This is a phrase used by Barbara Adam and Chris Groves in their book 'Future Matters' (Adam & Groves, 2007)

⁴³ A nice piece of literature concerned with such content of the future is the edited volume of Arthur Brehmer published in the beginning of the 20th century (Brehmer & Ruppelt, 2012).

⁴⁴ This is usually a topic in utopian or dystopian literature such as e.g. Thomas Morus' Utopa, Orson Well's 1984 or Aldous Huxley's 'Brave New World' to name just the most famous ones. Nowadays there exists also a broad canon of science fiction movies concerned with such issues. For a nice overview of the genre see Atwood (2011) or the volume 'Out of this world: Science Fiction but not as you know it' by Mike Ashley. This book accompanied a British Library exhibition on science fiction.

and 18th centuries. In line with Elias' concept of time he argues that the ability to project oneself into a future is not an anthropological a-priory but a historically and socially contingent mode of thinking (Hölscher, 1999: 10). The emergence of this conception is closely related to societal upheavals linked with the French Revolution, the rise of industrial capitalism and an increasing secularization. Additionally, this change in the conception of the future is tied to the emergence of a bourgeois society and related to this the idea of technological and social progress (Luhmann, 1976). Whereas previous conceptions picture the future as already existent – still visible in ideas about fate or destiny – the future as we now understand it has a different ontological status compared to the past and the present: it is an open future that can be shaped. Whereas the past and the present are real and to different degrees existing, the future is understood as non-existent. There is a gap between the present and the future. This gap is bridged by our decisions in the present through which the future can be shaped.

As a consequence of this changing conception of the future the issue of anticipatory knowledge gains importance. If it is our decisions and actions that shape the future it seems important to gather knowledge about the potential consequences of our actions. Of course this knowledge necessarily remains uncertain. In this line of argument Anthony Giddens states that one of the defining characteristics of what he calls modernity is a 'colonisation of the future', by which he refers to "the creation of territories of future possibilities, reclaimed by counterfactual interference" (Giddens, 1991: 242). Talking about *counterfactual interference* Giddens highlights the problem that we necessarily make decisions about our future on the basis of uncertain knowledge claims:

"While the future is recognised to be intrinsically unknowable, and as it is increasingly severed from the past, that future becomes a new terrain – a territory of counterfactual possibility." (Giddens, 1991: 111)

Crucial to this argument is also that social life is increasingly oriented towards the future and depends less on tradition. And to the degree individual or collective actors rely on knowledge claims about the future they become more self-reflexive. This turn is central to Giddens as the 'colonisation of the future' is an important aspect in what he calls 'reflexive modernisation'.

Nowotny (1985, 1989) takes a different stance and argues that we seem to be loosing the future as a temporal area disposable to our dreams and ideas. According to Nowotny

the future in contemporary societies is no longer understood as open. Much more she sees the present as 'expanding'. She argues that there is no more trust in modern ideas of (technological) progress. As a consequence also the conviction that present problems will be automatically solved through scientific progress and future technological innovations thus becomes increasingly difficult to sustain. There is an interesting tension in this argumentation. Although Nowotny describes a loss of the future, we do experience that on a discursive level the future is more present than ever. Now what can we make of this apparent contradiction? I want to argue that Nowotny directs attention to the fact that the future does not actually really disappear. Instead it appears in a new form, it becomes an object of (political) negotiations in the present. It emerges as a political space of action, an object through which orderings in the present are negotiated. The future is something that needs to be constantly kept in mind in our decisions and practices. It is exactly this obsession with the future, its pervasiveness that Adams et al. (2009) have in mind when they talk about 'anticipatory regimes'.

This directly leads to another element in debates related to conceptualizations of the future that recently gained relevance. The emergence of the future as an object of political debate poses severe questions concerning the decisions we should or should not make and the ethical foundations for these decisions. So while Giddens spots an "evaporation of morality" (Giddens, 1991: 145) and states that "[m]orality is extrinsic so far as the colonization of the future is concerned" (ibid.) and Luhmann articulates the hypothesis that "increasing system differentiation correlates with increasing dissociation of past and future" (Luhmann, 1976: 136), which will lead to a situation "that a more distant past and a more distant future become irrelevant" (ibid.), more recent work concerned with the future explicitly directs attention to the ethical issues at stake. This is often combined with a call for a 'careful' approach towards the future (Adam & Groves, 2007; Felt, Barben, et al., 2013). One exemplar for this strand of literature is the work of Adam and Groves who combine conceptualizations of the future with issues of knowledge and ethics. They relate different approaches towards the future, different ways in which the future is 'known', to particular conceptualizations of the future: "knowledge practices, and the implicit assumptions about the future that underlie them, linking diverse practices to one another" (Adam & Groves, 2007: 121). Whereas in ancient cultures pre-existing futures were 'told' in oracles and prophecies, the unknown future has also been 'tamed' through burial rituals and religion in general.

Adam and Groves describe more recent approaches of dealing with the future as e.g. the emergence of insurances as a consequence of a geographically expanding market, the hazards of sea trade and related to that the developments of risk as a temporal concept as ‘trading’:

“the merchant’s activity is based on assumptions of which time is the very foundation – storage in anticipation of famine, purchase for resale when the time is ripe, as determined by knowledge of economic conjunctions and the constants of the market in commodities and money – knowledge that implies the existence of an information network and the employment of couriers” (Adam & Groves, 2007: 9)

Trade thus is not only related to material goods or services of some kind. Rather, it is futures that are traded: promises and expectations in regard of goods. The future in this understanding is ‘transformed’; no longer embedded but emptied of any content it can be used according to particular needs:

“future emptied of content, and divorced from context, a future that can be calculated anywhere, at any time and exploited for any circumstance” (Adam & Groves, 2007: 10)

This approach depicts the future as something to be calculated, exchanged, traded and discounted. Adams and Groves relate this conception to an “industrial way of life” (Adam & Groves, 2007:77). While they freely admit that this emptying of the future was an important pre-condition for the process of industrialization, they take up a normative position and call for a ‘re-embedding’ of the future. The future shall be re-embedded and be treated *responsibly*:

“responsibility for the future requires that we are able to take the standpoint of the future present and have the capacity to move knowledgeably between the two approaches” (Adam & Groves, 2007: 200)

In this quote Adam and Groves direct attention to what they call the perspective of a ‘future present’, the actual futures that are lived by actors. They contrast this perspective with ‘present futures’, our current representations of what the future might be and call for consideration of the former perspective in our practices. Other authors take a similar position to Adam and Groves and critically reflect especially on technoscientific futures. Recently the European Science Foundation published a so-called ‘Science Policy Briefing’ in which the authors refer to diagnosis of an “increasing attention given to anticipating, transforming and/or controlling societal futures through science and technology” (Felt, Barben, et al., 2013: 16) and call for “more collective

forms of imagining” (Felt, Barben, et al., 2013: 17). Such novel forms of collectively orienting towards the future shall allow for a broadening of perspectives and thus enable societies to engage with futures responsibly. Questions about whose futures are negotiated and who should take part in such negotiations are put forward.

In these calls for consideration of ethical aspects in our occupation with the future an interesting shift becomes visible. While early work tends to focus on semantic issues, i.e. how future is thought of in relation to socio-historical changes, we can see a different accentuation in current treatments of the future. The work I briefly described above builds on a conception of the future that especially emphasizes its material features and points out a process of constant *emergence*,

“the latent yet material dimension of that which already exists, and which is always at work, creating patterns for near and unimaginably distant futures. [...] When it is lived, once it becomes incorporated in bodies and in the social meanings by which humans project and organize their lives, it may emerge as beneficial or harmful.” (Adam & Groves, 2007: 139)

In this account the ontological difference between the present and the future is bridged through the materiality of our actions. The material present becomes effective for the future. Although the future might be latent now, it becomes a material reality once it is *lived* by corporeal humans. Future here is a material and embodied reality, i.e. the “latent flows of potential which, under specific conditions, congeal into organized physical structures with lived futures, such as organisms” (Adam & Groves, 2007: 132).

This emphasis on the material dimensions in conceptualizing the future is also the basis for the work of scholars who especially focus on the situatedness of practices of imagining. While earlier work pointed out that understandings of the future and its relation to the present are co-constitutive with particular socio-historical settings this argument goes one step further and focuses on the particular spatiality of futures. Now what does that mean? Looking at processes of ‘future-making’, Suchman, Danyi, and Watts (2008) e.g. explore how futures are imagined differently at different sites. They focus on the “comprising practices oriented to projections of transformative change” (Suchman et al., 2008) and also talk about ‘situated futures’ (Suchman et al., 2008; Watts, 2008). This means that the concrete futures imagined are always grounded in their material spatiality, the future is “particular to the places where it is made” (Watts, 2008). To substantiate this claim Laura Watts studies British telecommunication systems.

Although mostly focusing on the content of future making she gives a beautifully articulated account of her understanding of future in a recent paper on her work, which she describes as ‘future archeology’:

“Like the past, the future is not entirely unknown. The future is not magically always materialising, nor unimagined on the temporal horizon. Like the past, the future is made of stuff, of materials, landscapes, and people. Durability and heritage are as much a matter of the future, as a matter of the past. Things endure from past into future. It takes ongoing, unceasing work to conserve, to make things for the world to come. The future is hard work. It has to be made. It has conditions of possibility, as Foucault might say. Those possibilities for the future are woven by us, and we are woven in to them. The future does not happen to us, we are part of it, make it, are responsible for it. Although who we are, and where we are, makes a difference, of course. So informing or writing strategy documents, designing exhibits, creating fashionable trends, compiling timetables, ordering a book online, voting or not, all these effect what the future may be - for us and for others.” (Watts, 2009)

In this quote Watts highlights the processuality of time. She opposes the idea of the future as something distinct from the present, always already out there and suddenly ‘materializing’. On the contrary, she argues that the idea of distinct temporal spheres is misleading. Instead, she focuses on the material traces of the future in the present. In this account also actors are no longer passively waiting till the future *happens to them*. Much rather Watts is interested in how actors make the future and thus how they become responsible for it.

What is important in all these different debates is that our conceptualizations of the future are socially as well as historically contingent. More recently the future has emerged as an object of political action. As such it is closely entwined with the ways in which we know it, be it through prophecies, quantitative risk assessments, or participatory deliberation. The future together with the present is constantly made and unmade in anticipatory practices. This also becomes consequential on a material level, which is especially important in thinking about sustainability (research).

3.2.2. Dynamics of promise and expectation

While the literature I referred to above mainly concentrates on the conception of future as a temporal abstraction, there is also a body of literature that is more concerned with the content of particular representations. Focusing on notions like ‘expectation’,

'promise' or 'hype' these debates are interested in how such representations relate to (mainly) techno-scientific innovation. Initially tackled by authors such as Arie Rip or Harro van Lente in the late 1990ies (Lente & Rip, 1998; Arie Rip, 2000) in the course of the so-called 'sociology of expectations' or 'critical innovation studies' (Suchman et al., 2008) the issue of future-orientation or imagination has received quite some attention recently.

Proponents of the sociology of expectations brought forward three main arguments: first, rhetoric that builds on certain representations of the future needs to be analyzed concerning their performative properties (Lente & Rip, 1998); second, these imaginations need themselves be regarded as situated or embedded, socially as well as temporally (N. Brown & Michael, 2003); and third, attention is directed to the anticipated trajectories of expectations and promises in order to explain their success or failure (Geels & Smit, 2000b).

Expectations and performativity

Expectations are basically understood as "real-time representations of future technological situations and capabilities" (Borup et al., 2006: 286). One of the main concerns within the sociology of expectations is the performativity of expectations or promissory rhetoric. Inspired by Merton's notion of 'self fulfilling prophecies' (1948) several authors highlight the performativity of envisioned futures. They ask how through the employment of particular imaginations and the articulation of what is called 'expectation statements' (Lente & Rip, 1998a) networks are established, actors are mutually positioned and agendas are set. Taking into account this performative function these authors ask how a better understanding of the production of particular futures might be used for gaining insights into innovation processes and techno-scientific change.

A general dynamic of promise and expectation is described in which (exaggerated) expectation statements are uttered by proponents of an emerging technology or technoscientific field such as for example gene therapy (Hedgecoe & Martin, 2003; Horst, 2007), Nano technology (Selin, 2006), or membrane technology (Lente & Rip, 1998). In their study on membrane technology Harro van Lente and Arie Rip lay out a general dynamic of expectations. They describe how membrane technology was first created as a rhetorical entity, a 'rhetorical space' that was established by introducing this "umbrella

term” (Lente & Rip, 1998: 225) and related expectations. The term led to a unification of formerly dispersed research and technological developments. Actors were positioned, particular spokespersons respectively “promise champions” (ibid.: 231) as well as their audiences emerged and created a “social reality” (ibid.: 234), whereas “[t]he backbone of this world is provided by shared expectations about the proclaimed field of membrane technology” (ibid.: 244).

Once these expectation statements are collectively accepted, so they more general argument runs, they become promises and in further consequence turn into requirements. In this way they are able to create “communities of promise” (N. Brown, 2003: 5) as well as ‘protected spaces’ (Lente & Rip, 1998a) in which innovations can be further developed. This basically means that new technologies receive funding based on the expectations they were able to rise among certain stakeholders. This is also described as a ‘prospective structure’ (Lente & Rip, 1998a) the mutual shaping of structures for research and the (promissory) work done by researchers. From an Actor-Network perspective ‘future’ as ‘promissory statements’ therefore serves as a means of translation, through which allies can be enrolled (cf. Michel Callon, 1986; Lente & Rip, 1998). On a broader level e.g. Vannevar Bush’s idea of science as the ‘Endless Frontier’ has been described as a “macro-protected space” (Arie Rip, 2000: 32), a sort of shared imagination or social contract between science and society with particular expectations that tacitly govern the conduct of science. In this sense futures are described as performative (Michael, 2000), they are constitutive for certain socio-material realities.

Looking at the role of expectations in clinical research several scholars have investigated such future orientation in relation to the concept of ‘hope’ (N. Brown, 2006) and described them as ‘regimes of hope and truth’ (Moreira & Palladino, 2005) or as a ‘political economy of hope’ (DelVecchio Good, 2007 cited in Brown 2006) These works deal with the complex temporal relation between hopes and unknowns and their relations to economic interests and potential future markets. Brown e.g. argues that there has been a shift from relying on evidence and facts to what he calls “meta-abstractions of hope, expectations and the future” (ibid.: 7). Glossing Charis Thompson he states that such investment in hopes can be regarded as a “promissory capital” (ibid.: 8). What is conceptually interesting in this account is his emphasis on the ‘affectual’ dimension of expectation and on its ‘intercorporeality’ (Waldby, 2002 cited in Brown 2006). Futures become performative because they are “futures with an emotional

resonance” (ibid.: 9) and “affectivity is seen to mediate future oriented actions in the present” (ibid.). We position ourselves towards representations of futures we want to become true or that we are scared of:

“People considering cord blood banking are often represented – and to a certain extent represent themselves - as emotionally vulnerable to persuasion at a time of high anxiety and insecurity about the immediate experience of childbirth itself, and also their responsibilities to the future of their new child.” (ibid.)

The term ‘intercorporeality’ refers to the bodily relations in practices related to stem cells as

“depositing stem cells involves a highly material and yet symbolic stake in the future potential of an investment to protect families from disease, and cord blood banks have been anxious to stress this in their marketing” (ibid.)

Thus, expectations and promises as forms of representations of the future are co-constitutive with the establishment of networks and agendas in technoscientific innovations. At the same time they create moral re-orderings and have bodily realities that need to be taken into account.

The socio-spatial variability of expectations

Other important insights relate to the social and temporal variability of expectations. That means, for example, looking at different grades of involvement in technoscientific processes and the different expectations that go along with it. Elaborating on the idea of a general dynamic of promise and expectation it is argued that expectations always need to be regarded as situated or embedded, temporally as well as socio-spatially. From this perspective it is not sufficient to postulate a general dynamic of expectations, processes of future-making need to be regarded as connected to factors such as the trajectories of innovation or the degree of involvement of certain actors in processes of knowledge production. The temporal patterning of promises and expectations has been observed, for example, in empirical studies of “cycles of hype and disappointment” (N. Brown, 2006, 4) . Looking at so-called ‘hypes’ Brown describes a pattern in which promises are vastly exaggerated in the early phases of a technological development often followed by disappointment in later stages:

“it often seems to be the case that hype tends to entirely overestimate the near or medium term potential of a field whilst completely misunderstanding longer term value altogether” (N. Brown, 2003)

Brown and Michael use the differentiation between ‘retrospecting prospects’ as “the recollection of past futures” (N. Brown & Michael, 2003: 3) and ‘prospecting retrospects’, i.e. “how these prospects are deployed in the real-time now to construct futures” (ibid.) to account for the temporal patterning of expectations. They focus on how actors use past futures to assess particular innovations in the present.

In a similar manner expectations are also socio-spatially contingent. They change in relation to “different actor’s proximity to the actual scientific work” (N. Brown & Michael, 2003), whereas actors close to scientific work as well as those with little proximity tend to focus on the uncertainties, while those in between these positions (potential users) are likely to be less concerned with such uncertainties. This picture, however, becomes more complicated when taking into account the spaces and audiences in which expectation statements are uttered. They change when moving from the lab bench into newspaper articles or national television, becoming less uncertain and conflicting the farther the move away from the lab (N. Brown, 2003).

It is therefore crucial to take into account the temporal and socio-spatial situatedness of expectations and to explore how futures and the use of futures is influenced by the specific situation of action. As Brown puts it, “orientation to the future and the past is always embedded in a specific scene or temporal location” (N. Brown, 2006: 4).

Futures gone wrong

When dealing with the temporal development of expectations the question also arises, what happens to those futures that never came true?⁴⁵ Geels and Smit (2000a) explore characteristics of such ‘failed futures’ and describe reasons for the failure of futures. They argue that particular expectations often are closely related to and ‘biased’ by broader cultural expectations. Additionally, they criticize a missing sensitivity for sudden developments that can cause shifts in expectations. Furthermore, new technologies are often expected to simply replace older ones while empirical examples

⁴⁵ For a nice overview of expected technologies that were never realize see the very entertaining blog ‘Paleo Future’: <http://paleofuture.gizmodo.com/>, accessed October 25th, 2013 or Benford (2010). Also Bruno Latour’s classic text ‘Aramis, or, the Love of Technology’ is a nice example for the failure of a highly promising and anticipated technology (Latour, 1996).

such as the idea of the so-called 'paperless office' show that co-existence of technologies is much more common. Furthermore, they point to assumptions about the stability of the "pool of existing social practices" and about conceptualizations of social activities that are too functionalistic. Finally, Geels and Smit argue that new technologies are often too optimistic concerning the gains and advantages and the speed of their "societal embedding" (Geels & Smit, 2000a: 879).

Works like this highlight the common underestimation of the interdependence of science and technology and the problems of applying a techno-deterministic view. Geels and Smit thus argue that more sophisticated models of what they term 'promise-requirement cycles' need to be taken into account in order to avoid the pitfalls of "too simplistic conceptualisations of technological development and its impact on society" (Geels & Smit, 2000a: 822).

Summing up, work that is commonly subsumed under the label 'sociology of expectations' argues that futures in the form of expectations, promises, or hypes are performative in that they are able to create protected spaces for the development of particular technologies or technoscientific fields. Furthermore, it is stated that expectations need to be regarded as temporally, spatially and socially contingent and dynamic. Scholars related to this field of research caution against too optimistic expectations and related techno-deterministic conceptions of the relation between science and society. As a consequence, they call for a modest approach towards promissory discourses. In this sense Richard Dutton (2011) argues that it is necessary to be aware of the entwinement of promise and pessimism in future rhetoric. It is therefore not enough to look at promises as the only forward-looking statements but to additionally mind the pessimistic rhetoric of avoidance to better understand the dynamics and performativity of expectation statements. Furthermore, futures can create a "moral space" (N. Brown, 2006: 9) in which "communities of promise" (N. Brown, 2003: 5) emerge and stabilize. Thus, the affective dimensions of expectations need to be taken into account. So while the work I discussed in the chapter before is mainly concerned with the future on a broader level, i.e. how we position ourselves towards the future, this strand of literature directs attention to the actual practices in which particular futures are made and unmade.

This focus on the practices in which futures are negotiated is especially important for the case of transdisciplinary sustainability research. Additionally, the socio-spatial

variability of expectations needs to be kept in mind for this case of transdisciplinary sustainability research: which futures matter in which arenas for whom? How do imaginations differ e.g. between different actors in the field of transdisciplinary sustainability research (scientists and researchers, extra-scientific actors, policy makers, various audiences and so on) in relation to their social as well as temporal proximity to processes of knowledge production. How are they emotionally laden? Additionally, in the context of the debate about new modes of knowledge production, this raises the question of how these developments are related to similar concepts (such as different concepts of e.g. interdisciplinarity or participation), and how the impact of transdisciplinarity may be misjudged.

3.2.3. Promises and tempor(e)alities in research practice

Another strand of literature focuses on the 'economy of promise' (Felt, 2007) from a more actor-centered perspective and asks how researchers are 'making time' in their daily practices. Work in this branch of research often starts from the observation that within contemporary practices of knowledge production procedures of accounting and evaluation become increasingly important. Additionally, science and research today is to a large degree conducted within a framework of temporary restricted projects (Torka, 2006). What is crucial here is that goals and potential future applications and outcomes need to be determined ever earlier in the research process. Thus, futures of research already play an important role from the outset of research projects in the allocation of funds. Felt and Fochler (2009) argue that futures in this sense can be regarded as a main resource in research practice. This means that researchers need to engage in an 'economy of promise' (N. Brown, 2003), triggered by the use of future as a resource in a 'knowledge economy of expectations' within 'communities of promise'. This process is described as a 'strategic turn' (Borup et al., 2006; Arie Rip, 2007), which is indicated by the increasing importance of research and innovation policies and related to that changes in funding structures (Arie Rip, 2000).

Recent work tends to additionally focus on the ethical dimension of scientific engagement with the future in the form of promises about future successes and breakthroughs (N. Brown, 2000). In addition, to gain a better understanding of the

dynamics of future making processes it is considered to be important that representations of futures are used in a responsible way⁴⁶.

Changing tempor(e)alities of research

This increasing future orientation is also entwined with temporalities in scientific practices (N. Brown & Michael, 2003; Felt, 2009). Contemporary science is increasingly organized according to new public management regimes with their focus on projects, work packages and accountability (Power, 1997). Emphasis is put on both excellent research and applications while at the same time scientific conduct is increasingly measured in terms of publications and success in the sense of acquiring project funding. These changes, so it is argued, also become visible as tensions and dilemmas that lead changing practices of researchers who adjust their self-perception as researchers and accordingly their working practices to the changing environment. Felt and Fochler (2009) refer to this process as ‘tacit government’ of science.

These recent developments concerning the temporal organization of research practices also become visible in the way researchers’ experience of time is changing. Different authors direct attention to such changing temporalities and describe a loss of ‘timeless time’ at the expense of what is called ‘scheduled time’ (Ylijoki & Mäntylä, 2003). Scheduled time is understood as time that is for working “according to externally imposed and controlled timetables, such as project deadlines, lecturing hours and administrative meetings” (ibid.: 60) and distinguished from timeless time that is free from external pressures and mainly used for “reading, writing, thinking and having intellectual discussions in peace and quiet” (ibid.: 62). In this line of argument other authors describe researchers’ experiences of a decrease in what they refer to as “time to think” (Garforth & Cervinková, 2009: 171). The main argument is that researchers who are increasingly obliged to handle a set of different tasks like acquiring resources for research, teaching or managing administration. As a consequence they experience a lack of time that is not ‘scheduled’ beforehand but freely at their disposal. They need to actively negotiate their different tasks in order to gain what – according to a traditional idea of science – can be described as main activities of scientific conduct. They even feel

⁴⁶ An indicator for the growing concern with such an economy of promise can be seen in the activities of the Centre for Society and the Life Sciences (CSG) such as a workshop held in September 2013 in Brussels called ‘Responsible Promise Management. Responsible Promise Management as a Key Component of Responsible Research and Innovation in the Life Sciences’: <http://www.society-lifesciences.nl/1/?L=1>, accessed October 22nd, 2013.

forced to 'steal time', which mainly makes visible a perceived loss of autonomy on the side of the researchers when it comes to the temporal organization of their research practices (Ylijoki & Mäntylä, 2003). In highlighting such tensions authors engaged in this strand of literature of course address the issue of power relations when it comes to 'Zeitsouveränität' (Nowotny, 1989)

Work concerned with the temporalities of research also deals with issues related to the more long-time oriented perspective of normative career trajectories. Such imaginations of ideal careers structure working practices as they prescribe how much time one should spend e.g. for writing a doctoral thesis, at which age one should have written a certain number of articles and so on. Time and the collection of 'academic capital' are thus closely related (Garforth & Cervinková, 2009). These imaginations also stand in sharp contrast to actual careers in academia that tend to be increasingly organized as an array of short-term contracts. Ylijoki and Mäntylä (2003) point out that this kind of contract makes it difficult for individual researchers to commit to particular institutions and even to academia in general. In this sense, the increase of such "contracted time" (ibid.: 65) might also have negative repercussions for scientific institutions.

These debates highlight tensions that arise from a changing organization of research and its evaluation. They also direct attention to difficulties of managing different tasks in a given timeframe, which is of special importance in transdisciplinary sustainability research, as – additionally to meanwhile standard-pressures of the research system – heterogeneous assemblages of actors from different fields need to be coordinated.

Furthermore, work concerned with the temporalities of day-to-day research practices additionally focus on broader ideas about temporal relations. It is thus a reminder to consider how researchers in their day-to-day practices of knowledge production refer to temporal narratives and collective imaginations. As Felt puts it: "Powerful stories of past, present and future also circulate within smaller scale and face-to-face setting – in departments and laboratories, institutes and research groups. Such stories can be deeply inscribed in the identities and performances of researchers' academic selves, even before they arrive in specific working contexts" (Felt, 2009: 171).

3.2.4. Future(s) imagined

While the debates I introduced above circle around notions like promise and expectations there is another strand of literature dealing with the mutual shaping of

technoscientific futures and collective identities focusing on the notions 'imagination' and 'imagining'. Whereas commonly associated with acts of individuals' minds imagination, thereby is understood as "distinct from fantasy" (Fujimura, 2003: 192). Much rather the emphasis is put on an exploration of practices of collective imagination. Thereby, it is asked how collective imaginations are stabilized and contested, which (kind of) actors are involved and how such imaginations are put to use in governing the present. In this subchapter I focus on two aspects of literature on collective imagination that are important for my thesis: work concerned with the relation of collective imagination and collective identities and literature dealing with collective imagination in science fiction and its relation to anticipatory practices.

Futures & collective identities

Imaginations of future developments in STS related writing is first of all understood as an organized field of social practices instead of being the products of single individuals' minds. Imagining, furthermore, is not something scientists engage in occasionally in times of contemplation. Much to the contrary, we need to understand "both imagining and laboratory experimentation as practices in which scientists are regularly engaged" (Fujimura, 2003: 176). What Joan Fujimura in her study about Japanese genome scientist calls 'technoscientific imagining' is thus "serious work done by serious people" (ibid.: 192) with potentially serious consequences. Fujimura argues that in fact scientists were able to accumulate financial and cultural capital through establishing and stabilizing particular imaginations about the future of their research field and thus gain support for their goals. In her work she raises important points about collective imagining. Scientists are producers of futures in (at least) two senses: first, they produce knowledge and innovation and second, they simultaneously always produce ideas about futures of particular fields like genome science or systems biology. Furthermore, she highlights that such imaginings might be related to other discourses prevalent in a given society at a specific time. Additionally, she directs attention to the historical situatedness of imaginings, "their present contexts" (Fujimura, 2003: 193) . Thus, she understands collective imagining as a set of practices that is socially, culturally and historically situated. Other authors point to the importance of pictorial materials or visualizations in the stabilization of particular imaginations (Jasanoff, 2001). Brigitte Nerlich argues in a study about images of so-called 'nanobots' – fictional tiny machines that are able to perform particular tasks inside the human body - that these images are central to "the

creation of meanings” (Nerlich, 2008: 290) that become part of emergent technologies like this. But collective imaginations are not only performative in that they are able to set agendas, position actors and win support. They are additionally constitutive for collectives and thus effective in societal ordering processes (Hecht, 2001; Jasanoff & Kim, 2009). As Jasanoff and Kim put it: “the capacity to imagine futures is a crucial constitutive element in social and political life” (Jasanoff & Kim, 2009: 122).

Ideas like the one expressed in this quote elaborate on the assumption that it is not only institutional and material aspects that stabilize communities. Additionally, so the argument goes, imaginative resources need to be considered. One of the main sources for this line of study is Benedict Anderson’s concept of ‘imagined communities’ (Anderson, 1991). He describes nation states to a certain extent as imagined “through political and cultural practices” (Hecht, 2001: 255). This means that the coherence and stability of a nation state depend among other things on collectively shared ideas about what a nation is and stands for. These collective ideas, however, need constant negotiation, stabilization and rehearsal (Felt, forthcoming).

One site in which such stabilization is going on and that has been the object for much STS interest is the co-production of social order and technological systems via collective imagining. This means the manifestation of collectively shared ideas about good society in the material reality of technological systems such as nuclear reactors and their regulation. This includes collective remembering of the past as well as shared envisionings of attainable futures. In this sense, Gabrielle Hecht argues in a study on the development of nuclear energy systems in France after World War II that ideas about national identity were crucial in the choice of a particular reactor type. In doing, so she argues that national identity is always closely related to ideas about past, present and future:

“Discussions of national identity typically refer back to the past. But ultimately, national-identity discourse is not about the past per se or even about the present. It is about the future. National-identity discourse constructs a bridge between a mythologized past and a coveted future. Nations and their supposedly essential characteristics are imagined through a telos, in which the future appears as the inevitable fulfillment of a historically legitimated destiny.” (Hecht, 2001: 255)

It is ‘coveted’ futures that are imperative in structuring politics. They are an essential part of what Hecht calls ‘technopolitical regimes’, which she uses as a conceptual

“shorthand for the institutions, the people who run them, their guiding myths and ideologies, the artifacts they produce, and the technopolitics they pursue” (Hecht, 2001: 258). Telling a story about how different institutional actors competed over the development of different reactor types she shows how ideas about the future of France and a particular imagination of what it means to be French are mutually constitutive.

In a similar manner Sheila Jasanoff and Sang-Hyun Kim explore the regulation of nuclear energy in a comparative study of the USA and South Korea (Jasanoff & Kim, 2009). In doing so they analyze different ‘sociotechnical imaginaries’⁴⁷ and state that exploring the differing ideas about ‘attainable futures’ (ibid.) helps understanding the contingencies in state-level decisions on the support of technological and scientific projects. Looking at imaginaries as “collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects” (ibid.: 120), they share Hecht’s interest in national identity but are more interested in the level of national politics than in institutional differences. Through an analysis of imaginaries the co-production of attainable future ways of living and attainable social orderings and technoscientific futures becomes tangible:

„we introduced the concept of sociotechnical imaginaries, using it to show how different imaginations of social life and order are co-produced along with the goals, priorities, benefits and risks of science and technology“ (ibid.: 141)

What can be gained by looking at this strand of literature concerned with collective imagination is a sensitivity for processes in which entities such as nation states or other (epistemic) collectives are co-constituted with trajectories of technoscientific developments. However, the issue of collectively imagining futures is far from being a recent phenomenon that is restricted to the genre of scientific writing.

Collective imagination and science fiction

When talking about collective imaginations concerning science and technology naturally science fiction comes to mind. Thus I want to devote some attention to a growing body of STS writing concerned with science fiction.

⁴⁷ This concept will be a guiding conceptual tool in my analysis of collectively shared imaginations of Austrian sustainability research within the funding program proVISION. I will therefore devote more space and attention to it in the respecting chapter.

Initially the cognitive capacity of science fiction writing was foregrounded. The genre was seen as a way of exploring the future and generating hypothesis concerning particular developments (Seitz, 2010). Over time, however, scientific literature lost its interpretational sovereignty concerning the future of scientific forecasting and prediction.

Authors interested in issues of science fiction traditionally explore questions about the relation of the mutual dependence of scientific innovations and science fiction writing. Science fiction is often understood as the expression of collectively shared ideas about science and technology (Dennis, forthcoming). Hannah Arendt described science fiction as a “vehicle of mass sentiments and mass desires” (1958: 2). In this sense the future in science fiction is always concerned with the present. It is “a dramatic device for exploring the present” (Bensaude-Vincent, 2006: 352).

In addition to this understanding, science fiction is also understood as a way of establishing particular technologies as feasible and attainable before their actual realization in the ‘non-fictional’ world (Nerlich, 2008; Thurs, 2007). Writing about what he calls ‘diegetic prototypes’ David Kirby focuses on the role of science fiction movies in this regard:

“The key to cinematic diegetic prototypes is that they allow scientists and film-makers to visualize specific methods and technologies within the social realm of the fictional world. Film-makers and/or scientists can use the narrative and visual framework of cinema to contextualize and model potential futures for their particular technology whether it be medical, computer or space-based.” (Kirby, 2010: 66)

The main characteristic of science fiction is that potential technologies are not merely presented as technologies, but already embedded in a particular world, an imagined future. It is described as “an ideal vehicle for establishing a technology’s necessity, its viability and its benevolence within society” (ibid.). Science fiction does not only show what could work, but why it might be beneficial to aspire certain technologies, “why the public should *want* it to work” (ibid.; *emph. orig.*). Going beyond an understanding of science fiction as somehow prophetic, Kirby thus directs attention to the fact that science fiction (movies) are able to sort of pave the way for emerging technologies.

Thus an ‘interactive science model’ is preferred over a ‘scientific literacy model’ meaning that science fiction is part of “rhetoric and representational techniques of persuasion” (Kirby, 2003: 258) in scientific controversies. It is not about teaching

scientific facts about potential future developments, but rather about establishing and stabilizing collective imaginations. Kirby thus suggests that science fiction needs to be regarded as an arena amongst others in which scientific controversies are staged. Thus, it is not surprising that scientists increasingly act as science consultants for film productions (ibid.). This resonates with Jasanoff and Kim's observation that media along with "popular culture, and visual materials also play critically important roles in the articulation of sociotechnical imaginaries." (Jasanoff & Kim, 2009: 122)

Other authors in this sense suggest that science fiction can be useful resource for education on different levels. Berne and Schummer argue that science fiction is especially useful for teaching engineering students:

"Through science fiction, engineering students are given opportunities to move beyond ideas of present material reality into the domains of the imagined future, where they can work with moral questions of our future with nanotechnology in creative and active ways." (Berne & Schummer, 2005)

Through using science fiction texts, so the argument goes, ethical dimensions of science can be made more easily tangible for science students. In a similar manner Miller and Bennet argue that what they call "*socio-literary techniques* inspired by science fiction" (Miller & Bennett, 2008: 598; *emph. orig.*), i.e. the ability to imagine futures creatively, already need to be integrated into educational programs on a broader level. They have in mind not merely engineers but envision some sort of science fiction education for a broader public. This shall allow for publics to engage more actively in public debates concerning emerging technologies. Thus, decisions concerning our collective futures can to be taken in more deliberate and in participatory formats. Thus, they call for the development of

"new tools that can help the public engage vitally with scientific and technological futures, which increasingly are caught up not only in the physical transformation of matter but the biological transformation of life." (ibid.: 605)

Thus, they argue that it is necessary to adopt techniques from science fiction writing to avoid too simplistic and narrow accounts of the future in attempts to govern technological developments.

3.2.5. Governing futures⁴⁸

As indicated in the last quote on science fiction and as I have shown at the beginning of the chapter the future is understood as a 'temporal realm' (Adam & Groves, 2007) open to be 'colonised' (Giddens, 1991). This means it is open to human activity and is therefore also a field of political action (e.g. Schaper-Rinkel, 2005). It is thus not surprising that attempts to gain control over technoscientific developments and thus to 'rationalise' (Rappert, 1999) or 'govern' (Stirling, 2006) the future constitute a major concern in current research on technoscientific innovation as well as in innovation policy. Recently visible e.g. in policy discourses about 'responsible research and innovation'⁴⁹ such an interest in governing mechanisms builds on a longstanding tradition.

In the middle of the last century attempts to provide knowledge about possible futures for governing purposes were grouped under terms as e.g. 'Futurologie' (Flechtheim, 1971) or 'futures studies' (Wendell Bell, 2003; Polak & Boulding, 1973). Wendell Bell states that actors engaged in futures studies "aim to invent, evaluate, and propose possible and probable futures, helping people to explore their alternatives, to decide what future they want, and to design effective action to achieve it" (Wendell Bell, 1996: 45). This quote nicely shows the aim to govern possible futures. However, Bell is also eager to emphasize the ethical orientation of futures studies, which he considers a main reason for its initial success (ibid.: 46).

Whereas 'Futurologie' and futures studies are concerned with the identification and assessment of potential developments, more broadly there is also a lively debate concerning more concrete ways of governing techno-science.

Early attempts commonly referred to as technology assessment asked for the potential impacts of novel technologies. In the USA technology assessment was institutionally established in 1972 in the 'Office of Technology Assessment' (OTA), which was closed down in 1995. In Europe institutions concerned with technology assessment are pooled within the network of 'European Parliamentary Technology Assessment' (EPTA).

⁴⁸ I borrowed the heading from a conference with this title that was held in 2011 in Vienna: 'Governing Futures' conference website. Accessed May 14, 2014.

<http://sts.univie.ac.at/events/governing-futures-conference/>

⁴⁹ 'Innovation Union' Website. Accessed November 25, 2013. http://ec.europa.eu/research/innovation-union/index_en.cfm; and 'Science in Society portal'. Accessed November 25, 2013.

<http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1401>

Technology assessment is often criticized for assuming a deterministic relationship between technology and society and for not taking the reflexive relations between those two spheres with respect to their mutual constitution into account. In addition to this conceptual criticism procedural aspects of technology assessment have also been debated. Social science, so the argument runs, enters the scene mainly after a technology has been developed and is allowed to contribute mainly to questions about its consequences for society. Furthermore, early conceptions of technology assessment have been described as an elitist enterprise as mainly so-called experts were allowed to express opinion and concern. As a consequence, alternative approaches such as e.g. participatory technology assessment or programs addressing the ethical, legal and social implications respectively aspects of emerging technologies were proposed (Fisher, 2005). Depending whether you are in the USA or in Europe such programs are then referred to as ELSI or ELSA. These approaches are more reflexive in regard to the relation of science and society. Fisher in this sense argues “that every technological choice is potentially an ethical and political act” (2005: 327) and thus boundaries tend to be blurry.

Although these approaches are regarded as an improvement ELSI or ELSA initiatives - although now being part of the innovation process - are criticized for being displaced to the end of research and development projects and for their often weak connections. There are approaches towards the governing of emerging technologies that aim to respond to these deficiencies as e.g. ‘constructive technology assessment’ (A. Rip & Kulve, 2008) or ‘real-time technology assessment’:

“The necessary and logical next step to ELSI is integrating social science and policy research with natural science and engineering investigations from the outset — what we call here ‘real-time technology assessment’ (Guston & Sarewitz, 2002: 94)

The central notion in the quote above is *integration*. The basic idea is that this kind of integration of technology assessment can be achieved through interdisciplinarity and in a collaborative effort of natural scientists, engineers and social scientists. In a similar manner Rip and his colleagues emphasize the need for participation and engagement:

“CTA [constructive technology assessment; T.V.] can be seen as a new design practice (which includes tools) in which impacts are anticipated, users and other impacted communities are involved from the start and in an interactive way, and which contains an element of societal learning.” (Schot & Rip, 1997)

Users and impacted communities are supposed to participate in such processes right from the beginning in an *interactive* way. This framing signifies a move away from an elitist conception of governing emerging technologies towards more participatory model; a move that has been described as a ‘participatory turn’ in science-society relations (Felt & Fochler, 2010). What is furthermore interesting in this quote is the focus on *anticipation*. Another recent approach of steering technoscientific innovations highlighting the notion of anticipation is proposed by Barben et al. (2007). Anticipation can be understood as “not just a reaction, but a way of actively orienting oneself temporally” (Adams et al., 2009: 247), whereas governance indicates “a move away from a top-down government approach” (Barben, 2010). Anticipatory governance is thus understood as an alternative to approaches that focus on prediction and certainty and supposed to highlight an “awareness of the co-production of sociotechnical knowledge and the importance of richly imagining sociotechnical alternatives that might inspire its use” (Barben et al., 2007)

In addition to these debates about the best way of governing emerging technologies I have briefly sketched out above, there are more fundamental critiques questioning the basic assumptions on which the idea of planning the future is built. In his paper on the UK Foresight program as an attempt “to shape the future” Rappert criticizes the underlying ‘traditional’ model of rational decision making processes. In such models different stages are often distinguished. Building on that the capacity of analysis to improve political decision-making through feedback cycles is stressed:

“a stage of formation, in which the objectives are established; a stage of implementation, by which these objectives are translated into actions; and a stage of evaluation, where practice will be monitored and information is fed back systematically into a new cycle, starting with the reformulation of objectives” (Rappert, 1999)

Rappert questions this model as an adequate way of describing (future-related) decision-making processes as it idealizes and thus overestimates the capacity of rational analysis to steer decision-making. In doing so he especially highlights the contradiction between uncertainty, ignorance and rational planning. As Hartmann and Vogel state such critique has a longstanding tradition and is closely connected to broader debates concerning the applicability of scientific knowledge claims (Hartmann & Vogel, 2010).

From an STS perspective such attempts of steering technoscientific developments can be regarded as particular articulations of futures through which societal orderings are

stabilized (Lente, 2012). Such steering exercises always are performative and mutually constitutive with the particular situation or event in which they are embedded. This means they are constitutive for the very entities they are supposed to integrate such as e.g. particular technologies, science, society or certain publics. Looking especially at engagement exercises Felt and Fochler (2010) in this sense direct attention to ‘machineries for making publics’ and explore how such engagement exercises “frame or pre-scribe particular kinds of roles and identities for the participating publics in relation to ‘the public at large’.” (ibid.: 220) However, they do not stop here and furthermore ask how the participating actors actively ‘appropriate’ the roles prescribed for them.

Against the background of these debates, interesting empirical questions can also be posed for the case of transdisciplinary sustainability research: how are such ‘articulations of futures’ produced and applied in decision-making processes? How are, at the same time, different actors such as experts, publics and extra-scientific actors as well as their relation to each other constituted? And finally, how are boundaries between science and society and related epistemologies (re-)negotiated in such processes? (Felt, Fochler, & Strassnig, 2011)

3.3. Discussion – How to Conceptualize Futures

I will start by describing my understanding of futures ex-negativo. What do I not mean? Using this term I do not refer to a fixed temporal entity or period that is somehow pre-existing and independent of human agency, towards which we are collectively moving on an irreversible ‘arrow of time’. This idea refers to so-called ‘clock time’ or - going back to the introductory quote - what Faulkner refers to as ‘dead time’. As I have shown in this chapter there is more to it. Thus, in contrast to this linear conception I refer to literature from the social sciences and especially STS and understand the future as historically contingent (Hölscher, 1999; Koselleck, 1979) and inextricably entwined with both particular societal orderings (Elias, 1988; Giddens, 1991; Latour, 1993; Luhmann, 1976) and ways of knowing the future (Adam & Groves, 2007). Through such knowledge practices “substantive representations of the future” (Michael, 2000: 22) are produced and re-produced in socio-material practices of heterogeneous assemblages of actors in the present (Adam, 1994; Michael, 2000; Watts, 2008). As Adam has put it, they are “constantly created and recreated in a present” (Adam, 1994: 24) or as Michael states, “the present is the locus (which we can never leave) in which are drawn together substantive representations of particular sorts of ‘sociotechnical’ past and future” (Michael, 2000: 22). Hence there is no single (quantitatively) predictable future but various potential futures in any given situation.

This doesn’t mean however that futures are arbitrary. Futures are situated in socio-political, historical and spatial situations, or as Suchman and Watts put it, they are the “effect of imaginative, rhetorical and material practices [...] enacted always at specific moments, and in situ.” (Suchman et al., 2008) This indicated materiality of futures has also another level that needs to be kept in mind. Futures are present in the materiality of corporeal being, i.e. in developments that are already under way, Adam and Groves direct attention to such “latent futures hidden in networks of processual interdependencies that they set in motion” (Adam & Groves, 2007: 121)

Furthermore, I have shown that representations of the future are also contingent in regard to their social situatedness, i.e. who is involved in making them and to whom they are presented. Brown and Michael argue that expectations about the future development of biomedical technologies and the awareness of uncertainties in scientific knowledge vary in regard to factors such as the degree of involvement in the actual research process (N. Brown, 2003; N. Brown & Michael, 2003).

The futures that are produced are also consequential; they have performative effects in the present. The futures we collectively imagine are closely entwined with the ways in which we choose to act in a present. Shared expectations about future developments are used for enrolling allies in the establishment of emerging technologies and technoscientific fields such as membrane-technology (Lente & Rip, 1998) or Nanotechnology (Selin, 2007). Furthermore, collectively shared imaginations are on a more general level stabilizing social order and constitutive for (collective) identities (Fujimura, 2003; Hecht, 2001; Jasanoff & Kim, 2009). This means that the future also is an object for political action, for negotiation and contestation; a messy 'thing' (Latour, 2005; Rheinberger, 1997) through which social, moral and epistemic orderings are negotiated.

Now what can we take from these debates when it comes to changing modes of knowledge production? A central point in work concerned with conceptualizations of the future is that our understanding of what the future actually is, is socio-historically contingent. It was a special moment in history that brought about the emergence of a future that is open and shapeable by our decisions in the present. Therefore, it is necessary to ask how our understanding of the future is changing over time. Transdisciplinary sustainability research provides a neat example to explore current understandings of and positionings towards the future. Against the background of these debates it is important to explore the practices in which futures are made and unmade in attempts to solve contemporary problems related to sustainability and to ask for the collectives that are stabilized in these practices as well as the tensions that arise when different collectively imagined futures are competing with each other. In a nutshell, I am interested in 'looking at' futures instead of 'looking into the future' (N. Brown, Rappert, & Webster, 2000). This means directing attention to "how the future as a temporal abstraction is constructed and managed, by whom and under what conditions" (N. Brown et al., 2000: 4). The aim of my work is thus to analyze how through practices of 'futuring' in transdisciplinary sustainability research social as well as scientific orderings are (re)negotiated.

4. Research Interest, Questions, Approach & Material

In the last chapter I argued that I aim at analyzing practices of futuring in transdisciplinary sustainability research. Now what do I mean by the term ‘futuring’ and how do I intend to go about the empirical analysis?

4.1. Focusing on Imaginaries and Practices of Futuring

Analyzing transdisciplinary sustainability research I am interested in two interrelated issues: on the one hand I will explore the construction and (attempted) stabilization of what Jasanoff and Kim call ‘imaginaries’ (Jasanoff & Kim, 2009), i.e. how **collectively shared envisionings** of science and its relation to society are assembled and stabilized. This means exploring how scientific and societal orderings are (re-)negotiated in attempts to shape our future in particular ways. In order to understand this process of assembling a particular imaginary I focus on what I propose to call practices of **futuring**. I use this notion to address socio-material practices of making and unmaking futures at heterogeneous sites such as policy making, writing research proposals and reports or in doing research and producing anticipatory knowledge. It is done by heterogeneous assemblages of (non-)human actors. The notion thus directs attention to the multiple different futures and their related epistemologies as well as to shared imaginations of (collective) identities that are constantly (re-)produced in situated, material practices; how they overlap, interact and contest each other. Such practices need to be distinguished from a narrow focus on the production of particular futures like e.g. the future of biotechnology or the automotive industry. Imaginaries provide the imaginative framework for futuring practices, which in turn contribute to their re-shaping and/or stabilization.

By practices I refer to *“detectable and somewhat ordered sets of material-semiotic relations”* (Law, 2011: 157; *emph. orig.*). This understanding of practices directs attention to the activities of actors who by assembling particular relations in different patterns enact certain orderings and realities. This means that situated local activities of actors cannot be explained through a somehow pre-existing order (or as one might also call it: structure). Instead, the empirical and analytical focus is directed to the orderings going on in practices of reflexive actors. Order then is understood as the outcome of practices rather than its cause. This emphasis on particular practices brings with it a sensitivity for the multiplicity of different activities in which heterogeneous actors open

up rooms of possibility while closing down others. These practices and orderings are – when it comes to transdisciplinary sustainability research – always related to the attempt of finding solutions to particular problems and attempts of actualizing imagined futures.

Above I hinted at a particular relation between practices of futuring and collectively held imaginations of desirable and less desirable futures of science and society. I assume that **socio-scientific imaginaries** enable particular practices by rendering them preferable to others. At the same time imaginaries are themselves dynamic and are constituted through these practices of futuring. This means such imaginaries are historically as well as socially contingent. It is therefore important to understand how they are being constantly re-assembled through futuring practices in transdisciplinary sustainability research.

Focusing on futuring I aim to explore the mutual constitution of collective imaginations about attainable futures of society and particular ways of producing knowledge - and related to that ideas about “knowledge-making about the future” (Nelson et al., 2008: 546) – as well as the simultaneous ordering work that is done on social, epistemic and moral levels; through looking at futuring practices I want to explore how futures are at the same time produced and used in transdisciplinary sustainability research practices and how actors engaged in these practices draw on a socio-scientific imaginary in the making that is rehearsed and stabilized, but also re-shaped through these uses.

Thus, while the debate on new modes of knowledge production focuses mainly on how to produce knowledge and debates about the future often tend to focus either on quite abstract musings about what the future is or on very explicit technoscientific innovations, I aim to bring these two debates together, to empirically explore the re-ordering of science-society relations in an era of a constantly increasing normative demand to engage with the future. This demand is especially intense in debates about which kind of knowledge is needed for finding solutions to contemporary (environmental) problems and actualizing particular attainable futures.

The overall question of my thesis therefore refers to practices of futuring. Additionally, I distinguish three different levels of analysis: first, I am interested in the collective imaginations of attainable futures of society that are to be achieved through transdisciplinary sustainability research. On a second level this leads to exploring collective imaginations about particular ways of knowledge production and thus

changing science-society relations. A third level of analysis deals with the practices of knowledge production in researchers' day-to-day practices. Here I am especially interested in practices of producing anticipatory knowledge and the translation of shared envisionings of science-society relations, i.e. the mobilization, rehearsal, stabilization and contestation of imaginative resources.

Considering these different dimensions of exploring imagined futures of scientific and societal orderings the analysis focuses on the following overarching research question:

- **What practices of futuring can we observe in transdisciplinary sustainability research?**

This broad research question encompasses a set of three interrelated sub-questions:

- **How are desirable futures of society imagined in such practices?**
- **How do they relate to scientific (re-)orderings and how are new modes of knowledge production expected to contribute to their actualization?**
- **How are imagined futures of science and society articulated in practices of producing anticipatory knowledge? In which ways are they re-shaped in such practices?**

4.2. Approaching the Questions

How do I intend to go about tackling these research questions and explore practices of futuring in transdisciplinary sustainability research (in Austria)? To start with, methodologically my thesis is situated within a tradition of qualitative research. This branch of research has a long history and has been shaped by a broad spectrum of internal and external debates between contesting assumptions about reality and the most adequate ways of ‘accessing’ and ‘representing’ it.⁵⁰ As a consequence, there is a great variety of different more or less compatible positions. For the purpose of this thesis, however, it will suffice to clarify the key assumptions that guide my empirical work.

Silverman rightfully highlights that the choice of a research approach and particular methods need to be appropriate to the questions that shall be explored. Such choices “inevitably reflect a commitment (explicit or implicit) to a particular model of how the world works” (2009: 10). In order to make my commitments explicit and to clarify the basic premises of my approach I will briefly outline the main assumptions that guide my analysis:

(1) Basically qualitative research is interested in **sense-making** practices of **reflexive knowledgeable actors** (Denzin & Lincoln, 2005; Silverman, 2009). In this tradition, I focus on the meanings and the practices through which they are ascribed to objects, events, situations and persons. Focusing on such practices, as Clarke puts it “furthers interpretive, constructivist, and, I would add, relativist/perspectival understandings,” (2005: xxiii)

(2) I understand sense making as an **interactive practice** in which actors in their encounters constantly negotiate meaning. From STS writing and recent writing on grounded theory I adopt a sensitivity for the **situatedness and materiality** of such interactions (Clarke, 2005; D. Haraway, 1988). I consider the materiality of practices an essential part of meaning making as “[n]onhuman actants structurally condition the interactions within the situation through their specific material properties and requirements and through our engagements with them.” (Clarke, 2005: 63)

⁵⁰ For overviews of these different positions and debates see e.g. the introduction to Denzin and Lincoln (2005), or Gubrium and Holstein (1998); Hirschauer (2001); Hirschauer and Amann (1997)

(3) Such interactive practices necessarily do take place somewhere and that somewhere needs to be taken into account. In this sense I draw on Clarke's version of a grounded theory that especially focuses on the '**situation**': "Our analytic focus needs to go beyond 'the knowing' subject' and be fully on the situation of inquiry broadly conceived, including the turn to discourse." (Clarke, 2005: xxviii)

(4) Against this background I conceive of social order as the outcome of continuous situated, embodied and material practices of '**ordering**' (Law, 1994), i.e. the collective making of realities or (social) worlds (Clarke, 2005). At the same time it is important to be aware that such orderings are simultaneously shaped by and shaping practices of actors.

(5) This focus on practices of sense-making in turn means that instead of aiming at universal explanations qualitative studies are interested in what Merton has called 'middle range theories' (R. Merton et al., 1949), or what Glaser and Strauss initially called 'grounded theory' (1967). Middle range theory in the context of STS means to "not address the whole of science and technology, but to focus on limited themes and topics." (Geels, 2007: 635) In this sense my work is guided by '**sensitizing concepts**' rather than by definite theoretical systems. The idea of sensitizing concepts goes back to Blumer (1954) who, out of a discontent with the relation of sociological theory and empirical research, asks researchers to "reduce drastically their preoccupation with the literature of social theory and instead get in touch with the empirical social world" (ibid.: 4). Despite its positivist undertones his call can be read as an invitation to work creatively with theoretical concepts. Sensitizing concepts are means for getting a "general sense of reference and guidance approaching empirical instances" (ibid.: 7), they "suggest directions along which to look" (ibid.). They need to be constantly refined in empirical work in order not to become a "vague stereotype" (ibid.: 9). Blumer therefore stresses the reciprocal relation of sensitizing concepts and empirical findings: "If varied empirical instances are chosen for study, and if that study is careful, probing and imaginative, with an ever alert eye on whether, or how far, the concept fits, full means are provided for the progressive refinement of sensitizing concepts." (ibid.) This becomes consequential for the outline of this thesis: instead of providing a definite theoretical framework I will instead introduce each of my empirical chapters by elaborating on a set of sensitizing concepts that iteratively support the analysis.

(6) To produce such accounts of situated practices – in my case futuring practices in transdisciplinary sustainability research in Austria - I will rely on a **case study approach** taking the program as well as the different projects as my case(s). Case study approaches are broadly speaking interested in different social worlds or collectives and their particular interactive practices of meaning making (Clarke, 2005).

(7) Thereby, I will apply a range of different methods inscribing into what Hine calls **“multi-sited imaginary of research”** (Hine, 2007: 656). This is also compatible with grounded theory approaches. Clarke understands multi-sited research as interested in “multiple kinds of data from a particular situation of inquiry, including discourses” (Clarke, 2005: 165). This can lead to “both a broad and deeply empirically grounded understanding of the phenomenon of interest.” (ibid.) In applying such a multi-sited methodology it is important to be aware that in attempts of describing and understanding different sites researchers do not merely represent a given reality, but are constitutive of those realities. (Law, 2004, 2009)

(8) This leads to a final key assumption that is especially important for my analysis: it is the idea that doing research is **not about ‘representing’** a given world. Much rather, the work of researchers also takes part in bringing about particular enactments of reality. Besides this performativity in our own writing about a case, this additionally means that our actions in the field, as well as the knowledge produced, are likely to become consequential for the field. As a consequence, research needs to be regarded as an engagement or an intervention rather than as a representation. (e.g. Denzin & Lincoln, 2005) This also highlights the necessity of being reflexive about which realities are brought about through the research design and methods one chooses and also about which realities might be left out.

4.3. Case, Material & Methods

My **case** for exploring the questions outlined above is the **Austrian funding scheme proVISION** of the Austrian Federal Ministry of Science and Research and a sample of projects funded by this program⁵¹. ProVISION was established in 2003 and published two calls for projects in 2004 and 2007. This funding scheme provides a fitting case study as one of its main aims is fostering transdisciplinary research in the area of sustainability research. This program thus allows for observation of an attempt of realizing the claims made in course of debates about changing modes of knowledge production. The call for transdisciplinary methods is combined with the thematic focus on sustainability research, which in turn means a focus on anticipatory practices. In this sense transdisciplinary sustainability research is a neat exemplar for both contemporary debates about changing modes of knowledge production and what might be described as a “breathless futurology” (Harrington et al., 2006: 3) on different yet entwined levels: it combines (and even causally relates) imaginations of attainable futures of society with particular ideas of science-society relations and a call for the production of knowledge about the future for governance in the present.

My sample consists of six projects from the first call of the funding scheme and six projects from the second. One of the projects from the second call was not a research project in a traditional sense, but had the aim to establish a doctoral school on transdisciplinary sustainability research at an Austrian university. The main difference between the two sets of projects is that the projects from the first call were already finished at the time of data gathering whereas the others were yet to be finished.

A set of different methods was used for gathering data including semi-structured interviews, focus group discussions, ethnographic observations of project meetings and public events and document analysis of different program and project documents. The process of data gathering roughly took place in the time period from fall 2009 to spring 2013.

⁵¹ I wrote this thesis in the course of my employment at the Department of Science and Technology Studies at the University of Vienna as a project collaborator in the project “Transdisciplinarity as Culture and Practice” led by Univ.-Prof. Dr. Ulrike Felt. This means that the data I use were gathered in a collaborative effort by my colleagues Ulrike Felt, Judith Igelsböck, Andrea Schikowitz and myself. For this reason I use the plural when I talk about data gathering.

Type of Material	Quantity	Explanatory Notes
Semi-structured interviews	39	38 interviews with actors related to 12 different projects, 1 program official
Focus-group discussions	2	1 focus group with members of a doctoral school, another one with actors related to other projects
Meeting observations	12	12 meetings (including closing events and one press conference) of 4 different projects
Program-related documents	-	Program documents & website, related sustainability strategies, project related documents

Table 1: Overview of materials used in the analysis

4.3.1. Semi-structured interviews

The core material I use for my analysis consists of a set of **semi-structured interviews** and interview transcripts. We conducted one interview with a program official and 38 interviews with actors working in different projects funded by proVISION. This set of interviews brings together quite heterogeneous actors at different points in their careers and with different institutional and temporal relations to the proVISION-funded projects. Ten of these interviews were conducted with actors whose projects were funded in the first call. This means that the projects had already ended by the time of the interview. 28 more interviews were held with actors whose projects were still running or in the phase of being finished when the interviews took place. Eight interviewees were part of a doctoral school (six PhD candidates and two organizers/supervisors of the doctoral school). All of the interviews were recorded and transcribed. We also provided informed consent forms that served us as a means to inform our interviewees about the aims and purposes of the interviews and how we are going to handle the data gathered. Everyone was offered the opportunity to either refuse to be taped or to end the interview right away or at any moment during the interviews without a need for explanation.

We prepared an interview guideline on the basis of our analytical interests. This guideline, however, was not treated as a fixed questionnaire or as an attempt to standardize the interviews in order to make them comparable. Instead, we used the

guideline as a means of orientation during the interviews. The chronology or sequential order of the interviews was open and depended on the actual interviewee and the course of the respective conversation. This also holds for the topics we discussed. While we tried to talk about the issues that were of interest to us, our interviewees were also given the opportunity to bring up new issues. This in turn means that the interview guideline constantly evolved throughout the project. During the phase of data gathering the guideline was slightly adapted several times either to improve it based on our past experiences or in order to adapt it to differing interview situations.

Most of the interviews were conducted by teams of two project members. This could be either two of the three pre-doc team members (in changing teams) in the project or a team consisting of the project leader and one of the pre-docs. A small proportion of the interviews were held either by teams of three or a single project member. In two cases, it also happened that interviews were conducted with more than one interlocutor. In these interviews, we suddenly found ourselves in a grey area somewhere between an interview and a group discussion.

One of the central issues in conducting interviews concerns the question of how to present oneself and how interviewers are perceived by their interlocutors. (Gunasekara, 2007; Silverman, 2006) This proved especially challenging in our project on transdisciplinary sustainability research, as our interviewees often were not quite sure what to make of our study and sometimes took us for evaluators. As a consequence, some of the interviewees were reluctant to grant us access to project meetings or other project partners for further interviews. It thus took some effort to explain the interest of our analysis and establish a trustful relationship. Additionally, it is notable that the relation between interviewers and interviewees varied considerably throughout the different interviews. Whereas most of the interviews were conducted with senior researchers who regarded us as juniors (but fellow researchers), the relations to other early stage researchers were entirely different. In these interviews we (i.e. the pre-doc team members) were perceived as peers. Establishing trust was not such an issue in these interviews and our interviewees would often rhetorically address shared experiences. In interviews with extra-scientific actors we were regarded as members of the scientific community writ large.

As this brief description shows, interviews provide a highly interactional research setting. In this sense, they need to be understood as a collaborative production of

meaning. Interviewees are thus not regarded as mere vessels of opinions and experiences, but rather as active and knowledgeable actors capable of constantly reflecting their own utterances and actions and who also “continuously monitor who they are in relation to the person questioning them.” (Holstein & Gubrium, 1997: 122) They are the ‘editors’ (Gubrium & Holstein, 1998) of the stories they tell us, they decide what is worth talking about and what can be left out. At the same time the interviewees draw on particular cultural patterns of narration and collectively available resources. And the particular situation of a research interview about a research funding scheme on transdisciplinarity additionally influences what can allegedly be said and how.

This means that interviews cannot or should not be simply reduced to a direct access point of a person’s opinions. In my analysis I am thus not interested in the ‘truth’ of the accounts of experiences or events offered by my interview partners. I don’t aim to “get inside someone’s head” (Byrne, 2012: 2009). Instead, I think of interviews as a **narrative practice**. Gubrium and Holstein define narrative practice as “the activities of storytelling, the resources used to tell stories, and the auspices under which stories are told.” (1998: 164) In such practices our interlocutors present stories about transdisciplinary sustainability research and about science-society relations to us, the interviewers. The focus of the analysis – instead of looking for truthful accounts of things that happened – lies on the kind of stories that interviewees deem appropriate in a given context. Stories about science and knowledge production that can be told to a member of the scientific community. Interviews can thus also be conceptualized as instances of ‘ordering’ (Law, 1994) the world through telling “little stories” (Law, 2003: 8)

Hence in the context of this thesis the interviews with researchers and their extra-scientific partners about their experiences in the projects provide material for exploring how they are making sense of transdisciplinary sustainability research in retrospect. In analyzing this data I am equally interested in the ‘whats’ and ‘hows’ of their stories (cf. Silverman, 2006); what they were saying about their experiences and how they did it. For the case of my thesis the focus especially lies on narrations about attainable and sustainable futures, changing science-society relations and the role of anticipatory knowledge in shaping the future.

4.3.2. Focus group discussions

In addition to the interviews we conducted two **focus group discussions**. One of these discussions was held with early stage researchers that were part of a doctoral school on transdisciplinary sustainability research. For the second one we invited researchers that were part of different proVISION-funded projects whom we had interviewed or at least met and talked to before. For both of the focus group discussions we prepared guidelines. For the second one – which was held at the end of the project – we additionally provided a power point presentation with some of our findings. Presenting our findings this way was intended to stir the debate. Especially the second focus group was a way of engaging with our field of research and discussing our findings. Both discussions were moderated by the project leader. They took place at the Department of Science and Technology Studies and were also recorded and transcribed.

The idea of focus groups is to initiate debate between the participants. Focus group discussions are used in contemporary social science to explore the interactive constitution of meaning among members of a particular group. As in interviews the premise is that stories, opinions and subjectivities are not pre-fixed and stable, but are rather negotiated interactively. Focus group discussions are a means for highlighting especially this processuality of meaning making. In such discussions not only opinions are negotiated, but simultaneously subject positionings and the object of discussion itself. However, the actors engaging in a focus group discussion are also part of particular collectives and thus the process of interactive meaning making is not completely unstructured; opinions do not emerge out of nowhere. Instead, particular discursive formations characteristic for these collectives become visible through the kind of opinions or stories that are deemed acceptable. (Flick, von Kardorff, & Steinke, 2004) In this sense, Giddens understands focus groups as a way of accessing what he calls the ‘practical consciousness’ (ibid.: 373) i.e. “all the things which actors know tacitly about how to ‘go on’ in the context of social life without being able to give them direct discursive expression.” (Giddens, 1984: xxiii)

I use transcripts of focus groups discussions to explore how researchers negotiate imaginations about science society relations, forward-looking knowledge as well as their own positionings, relations and responsibilities. Focus groups are a fitting method for exploring such questions as they make visible the discussion processes in which particular arguments and positionings are accepted by a group of discussants, while

others are contested. My main interest thus lies in the stability of particular (alternative) imaginations about knowledge production.

4.3.3. Meeting observations

In addition to this interview material I also draw on **observation protocols** from project meetings and public events. My colleagues and I were allowed to participate in eight meetings of 3 different projects from the second proVISION call. In these meetings we were able to observe negotiations about different issues concerning e.g. the methods used, further actions and dissemination strategies. We also attended public closing events of three projects and one press conference. These events mostly consisted of presentations of the project results and discussions.

In the project meetings as well as at the public events we were passive participants for the most part. At one of the closing events we presented findings of our project after being approached in this regard by the project leader. In the beginning we either were introduced by our contact persons (mostly the project leaders) as ‘the science studies scholars’ or ‘social scientists’, or we were given the opportunity to briefly introduce ourselves as well as the aim of our project. During breaks we usually engaged in informal talk with the meeting participants. We took notes during the meetings separately, which we discussed and put together afterwards. In this way we produced one accumulated protocol for each meeting or public event we attended. In those meeting we were sometimes offered additional material like power point presentations.

Ethnographic approaches in the study of science became prominent through a series of laboratory ethnographies in the late 70ies and early 80ies of the last century (Knorr-Cetina, 1981; Latour & Woolgar, 1986). The idea of such laboratory studies was to go beyond an idea of science as searching for absolute truths guided by a set of values characteristic for the scientific endeavor. As a contrast, laboratory ethnographers were interested in the practices in which scientific knowledge is ‘fabricated’ (Knorr-Cetina, 1984) and in the ways such knowledge is stabilized and travels (Latour, 1987; Latour & Woolgar, 1986). Since then ethnography has been core to various studies in the field of STS. One of the main arguments for conducting ethnographic research is the assumed ‘naturalness’ of the data. Ethnographies, so the argument goes, do not have to rely on ‘artificial’ set-ups as do, for example, interviews or group discussions, where researchers assemble interviewees in situations that are not natural to them. In contrast, by going to laboratories these actors can be observed in their ‘natural habitat’. Several authors (e.g.

Silverman, 2006) have argued that this distinction between natural and artificial kinds of data is not a very productive one. Ethnographic data is not to be understood as more 'natural' as it is also mediated by the researchers.⁵² It is more productive to assume that through ethnographic approaches different kinds of data is created; data that enables a focus on the day-to-day practices of actors. In this sense Annemarie Mol (2002), for example, speaks of ethnography as 'praxiography'.

Including ethnographic observations into our research design on a pragmatic level gave us the opportunity to meet a broad range of different actors engaged in the proVISION funded projects in person instead of just being informed about them through the accounts of our limited set of interviewees.

Furthermore, we were able to include a "direct observation of the actual site of scientific work" (Knorr-Cetina, 1983: 117) into our materials. In this way, we were able to observe situated practices of members of 'epistemic' cultures, their knowledges and ways of producing them (Knorr Cetina, 1999). Concretely this means, for example, that in my analysis – in addition to interviewees' retrospective accounts of e.g. negotiations about modeling parameters – I can also draw on our observations of these negotiations. In these negotiations actors' constructions of particular 'objective' realities become visible: the opinions and imaginations that are shared, knowledge that can be regarded as taken for granted facts as well as the performance of particular subjectivities and relations of actors. In this way ethnographic data are similar to data gathered through focus groups. The difference is that in focus groups it was us who provided the 'focus' for the negotiations whereas in our observations of meeting we had a less active role in this regard. So although this kind of data is not necessarily more 'natural' it certainly can be regarded as less 'directed' or 'steered'. Still our role as participants in these meetings needs to be considered in the analysis.

Additionally, I understand ethnographic observations a means of following the "movements of people, concepts and artifacts" (Hine, 2007: 660). Especially when looking at different sites - we were able to observe members of different projects in different sites such as meetings or public events - this allows for comparisons between

⁵² These issues have been discussed in the debate about the 'crisis of representation'. (cf. Hirschauer, 2001) In this debate the active role of the ethnographer as author of ethnographic texts was highlighted. Up to that point researchers were understood as a mere witnesses of events.

different sites and thus directs attention to transformations, tensions and even “clashes” (ibid.).

In my analysis I will use the observation protocols to focus on practices of negotiating different issues in the production and use of anticipatory knowledge in participatory settings. Scientific as well as extra-scientific actors attended the meetings we were able to observe; therefore they provide a neat site for exploring such negotiations. Additionally, in these meetings imaginations about the relation of science and society and particular responsibilities and competences of different actors can be observed. The observations of public events provide a possibility to analyze the public performances of participation and the knowledge produced.

However, these are only two of the many sites in which practices of knowledge production might be observed. Due to the fact that the projects from the first call were already finished at the time of our study and more extended participatory observations in the ongoing projects were not possible, my analysis has to remain restricted to these materials.

4.3.4. Document analysis

In addition to the data discussed so far I will also draw on a set of **documents** related to the funding scheme proVISION and to the different projects. On a program level I will analyze different documents such as the two calls for projects, the program’s principles as well as its website. Supplementary policy documents will be part of my materials as far as they are mentioned within the core set of proVISION documents. This includes documents from precursor programs and from various other national as well as transnational research or sustainability policy documents. These documents provide insights into the collectively shared imaginations about which kind of knowledge is needed for achieving particular attainable futures. As researchers in their accounts need to refer to these documents they can be regarded as sort of a background for the stories researchers tell in the interviews (Gubrium & Holstein, 1998: 173). Especially in the second empirical chapter of this thesis I will focus on the projects collaborators’ various translations of the imaginations present in these documents.

On a project level I will look at project proposals as far as they are available. In contrast to the retrospective accounts in the interviews proposals are another form of discourse. They entail promissory narrations about what is going to be done and achieved.

Additionally, I will also include various reports and publications into my material to explore how imaginations of changing science-society relations and ideas about the production and use of anticipatory knowledge are presented to different audiences.

Analyzing documents in this way means exploring **narrative (and visual) discourses** about knowledge production and science-society relations. In this way, I can enrich my empirical work with an analysis that goes beyond the concept of a knowing subject and focuses on the discursive formations that provide a frame for the stories of the various actors engaged in proVISION. Looking at the discourse in various proVISION documents I will ask how different elements such as science and society are framed, how they are related to each other as well as to issues such as knowledge production, responsibility, risks and sustainability.

Analyzing documents and discourses, however, does not only mean looking on framings of discursive elements. It simultaneously means exploring power relations. Especially when it comes to knowledge production and ideas about science-society relations in sustainability research discourses can be productive in rehearsing and stabilizing power relations together with particular social, epistemic and moral orderings.

As with the other materials and methods it is also key to keep in mind that narrative and visual discourses are always material, situated and mediated; they are produced in different ways by different actors for different audiences. In doing so, they rehearse and enact different realities (Law, 2009).

4.3.5. Writing a thesis

As a closing remark to this section I want to note that of course **writing this thesis** also needs to be understood as a part of my analysis.⁵³ Transdisciplinary sustainability research is a messy field that consists of multiple sites and actors. The story of the chosen case therefore is far from being a single linear story. However, writing a thesis makes necessary a somewhat linear style of writing and developing an argument. The linearity you will encounter in the following chapters is thus far from being a mere 'representation'. Much rather, it needs to be understood as imposed on to a great degree by choices of the author. The process of putting together a thesis therefore can't be regarded as merely writing down observations. Instead, this text is the result of a complex process of assembling different bits and pieces into a (hopefully) somewhat

⁵³ For a more general account on writing see e.g. Becker and Richards (2007); Hirschauer (2001)

coherent story of my own. In this sense - although led by the wish to be truthful to both the interviewees who granted us access to their work and shared with us their views, experiences and time as well as to the various other (nonhuman) sources I used for my analysis - writing a thesis still needs to be regarded as part of the analysis.

It can be understood as a 'montage' where "several different images are juxtaposed to or superimposed on one another to create a picture." (Denzin & Lincoln, 2005: 4). Quite similar to this idea borrowed from cinematography writing down or analyzing materials gathered in multi-sited research settings means drawing together different materials and thereby creating a unique picture in which the author presents as much as the object of study. As Denzin et al put it: "There is no one 'correct' telling of this event. Each telling, like light hitting a crystal, reflects a different perspective on this incident." (ibid.: 6)

In this sense, this case study about futuring practices in transdisciplinary sustainability research tries to explore a situated version of transdisciplinary sustainability research, as it is visible within the framework of the funding scheme proVISION. I accessed this case through a particular set of methods and thus write about it based on this particular situated approach of my own. Nonetheless, I am confident that the empirical analysis of the following chapters will direct attention to issues and tensions that are at the same time characteristic for this particular case and situation, but can also be compared to similar research contexts beyond this particular funding scheme and the projects funded by it.

5. A Socio-scientific Imaginary in the Making: Preserving and Preventing

Exploring the collectively held visions of science-society relations that are assembled and stabilized in futuring practices in transdisciplinary sustainability research is one of the central aims of this thesis. Such imaginaries tend to be “institutionally stabilized” (Jasanoff, forthcoming: 6). Thus, I will use the funding scheme proVISION as a starting point for delving into ideas of desirable futures in transdisciplinary sustainability research in Austria.

The institutional organization of science, i.e. science policy and research funding or, more broadly speaking, different modes of steering and governing science, have been core issues in science studies from its very beginning. More recently scholars engaged in science policy analysis describe a shift from basic research funding – often associated with Vannevar Bush’s famous conception of research and innovation as ‘The Endless Frontier’ – to what has been described as ‘strategic research’ or as efforts in ‘steering research priorities’ (Owen & Goldberg, 2010; Arie Rip, 1990, 2007). Diagnoses about such changes often come along with debates about the autonomy and freedom of science and how it might be ‘distorted’⁵⁴ by policy interferences. What is common ground in these debates, however, is that there is a “mutual interplay between institutional and epistemological factors in knowledge production” (Hellström & Jacob, 2000: 74). Attempts to understand day-to-day practices in which knowledge is manufactured thus need to pay attention to the institutional setting in which they are embedded. Exploring the institutional conditions of sustainability research in Austria I will especially focus on imaginative resources that are mobilized in the conceptualization of proVISION. This focus is based on the assumption that, in order to understand how institutional conditions of research funding relate to day-to-day practices of researchers, it is necessary to focus on collective imaginations as an incremental part of research funding schemes. Recent writing in STS highlights the importance of imaginative resources or the myths at play when analyzing institutional settings like in the governance of emerging technologies or in the emergence of new research fields (Fujimura, 2003; Hecht, 2001; Jasanoff & Kim, 2009). This means going beyond an understanding of

⁵⁴ The issue of ‘distortion’ of science is often debated in relation to concerns about the involvement of the military in science funding (see e.g. Barth, 2003)

funding schemes as ‘merely’ an institutional arrangement for distributing money to researchers. They have to be conceptualized as sites in which broader collective ideas about science-society relations are assembled and stabilized. In the case of transdisciplinary sustainability research this involves ideas about the kind of contemporary challenges that need to be solved and the kinds of science and research that are needed to solve these challenges in order to reach particular “desirable futures” (Jasanoff, forthcoming: 6).

Thinking about the role of imagining as a social practice and collectively held visions of the future as cultural resources has gained relevance in social science over the last decades. Imagining is no longer equaled with mere fantasy and therefore no longer confined to acts of individual minds. Instead collective ideas about who we are and where we ought to go are regarded as constitutive in stabilizing social order (Anderson, 1991; Appadurai, 2006/1990; Jasanoff, 2001). Directing attention to the imaginative resources that are at play in the organization of research and technological innovation Fujimura (2003) talks about imaginaries of scientists engaged in the field of genomics and highlights the importance of imagining as part of their daily work:

“I treat both imagining and laboratory experimentation as practices in which scientists are regularly engaged.” (Fujimura, 2003: 176)

Fujimura regards *imagining* as a practice that is central to the activities of researchers. It is equally important as *laboratory experimentation* in her analysis of scientist’s practices. She therefore examines the “social practices of imagining” (Fujimura, 2003: 176) of scientists, thus looking for collective imaginations on an actor level and how particular actors attempt to establish their ideas on a broader level.

Other authors tend to situate imaginations on an institutional or on a policy level. In her study about the development of nuclear energy in France Gabrielle Hecht (2001) points out that not only the personal, institutional and material elements need to be considered to understand the development of a technology. Also, the ideologies prevalent in a particular institutional setting provide an important aspect of what she calls “technopolitical regimes” (Hecht, 2001: 257). These regimes comprise:

“the institutions, the people who run them, their guiding myths and ideologies, the artifacts they produce, and the technopolitics they pursue” (Hecht, 2001: 258)

Similar to Fujimura, Hecht also directs attention to ideas about the futures present in such imaginations. However, whereas, Fujimura is interested in how scientists produce and try to stabilize ideas about the future, Hecht focuses more on the ideas about the future of France as some sort of collective that is part of different regimes. While both tell fascinating stories about collectively shared visions of the future and how they relate to emerging technoscientific fields and particular technologies, their empirical cases differ considerably from mine and so, consequently, do their approaches. Fujimura is interested in practices of single genome scientists and their attempts to establish a particular imaginary. In this sense, her work might be compared to the interest in so-called 'promise champions' in the sociology of expectations (Lente & Rip, 1998). While Fujimura follows a person-centered approach Hecht accentuates her analysis of technopolitical regimes towards an institutional level (while of course being mindful of the fact that institutions are made up of people, artifacts and ideologies) and explores controversies between two different energy agencies and their visions of the technological future of France.

For the analysis of collectively shared visions of desirable futures and particular relations of science and society in transdisciplinary sustainability research within the proVISION framework I will use a concept developed by Sheila Jasanoff and Sang-Hyun Kim (2009). Focusing on research funding and especially on the contingencies in state support of science and technology they comparatively analyze nuclear energy policies in the USA and in South Korea and propose to look at what they call "sociotechnical imaginaries" (Jasanoff & Kim, 2009: 120). Jasanoff and Kim describe how different ideas of attainable futures of a nation state are simultaneously shaping technological trajectories and ideas about nationhood. They "introduce the concept of sociotechnical imaginaries, using it to show how different imaginations of social life and order are co-produced along with the goals, priorities, benefits and risks of science and technology" (ibid.: 141). With this sensitizing concept the authors aim at explaining contingencies in policy actions and in state support of science and technology. They relate this concept to the idea of technoscientific imaginaries and point out that the development of technologies cannot be sufficiently explained by the inherent characteristics of a particular technology or through social practices of producing technoscientific knowledge and its materializations. Put differently, technological development is contingent and the fact that particular possibilities are actualized at the expense of

others needs explanation. What is important is the close entanglement between ideas about technological development and about attainable social order, ideas about what is good and desirable in the social world:

“In that sense, technoscientific imaginaries are simultaneously also “social imaginaries,” encoding collective visions of the good society.” (Jasanoff & Kim, 2009: 123)

This emphasis on *visions of the good society* directs attention to practices, in which futures are constantly produced, rehearsed and contested together with particular technologies. Put shortly sociotechnical imaginaries are

“collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology.” (Jasanoff, forthcoming: 6)

In this quote she again directs attention to *visions of desirable futures*. In order for these visions to be regarded as imaginaries they need to be held collectively. Furthermore, she ascribes a stabilizing capacity to institutions and stresses the need of the public performance of imaginaries. In paying attention to desirable futures Jasanoff's concept is also sensitive to the normative dimensions tackled in technoscientific developments, i.e. the implicit assumptions of “how life ought, and ought not, to be lived” (ibid.).

In their conceptual work Jasanoff and Kim frequently direct attention to both science and technology as important elements in stabilizing social order. They write about “the fulfillment of nation-specific scientific and/or technological projects” (ibid.: 120) or ask for the reasons of the state for supporting “science and technology” (ibid.: 120). It is interesting to note that, while Jasanoff and Kim talk about technoscientific and social imaginaries, in their own concept the notion ‘scientific’ suddenly disappears. I think this corresponds to the empirical part of their initial paper on sociotechnical imaginaries, in which they mainly focus on technological issues. In their case studies they examine national differences in the governance of nuclear power guided by imaginaries centered around the idea of either ‘the atom for peace’ or ‘the atom for development’. In describing their cases Jasanoff and Kim focus on regulatory practices in which nuclear energy and ideas about attainable social orders (and with it ideas of the nation state) are being co-produced. In doing so, they interestingly direct attention mainly to governments and their publics; controversies between different publics or between scientists producing technologies are not in the scope of this paper. This focus on

regulatory agencies and laypersons might be a result of the empirical focus on the legal system that seems to especially foreground state/public controversies in the empirical work of the authors.

Now why do I think that the notion of imaginaries is a suitable sensitizing concept for exploring research funding in Austrian sustainability research? To explain this I need to strike out a little. So, whereas nuclear energy regulation provides a convincing empirical case for exploring the role of sociotechnical imaginaries in stabilizing social order, while at the same time being shaped by ideas about social order and social collectives such as nation states (see also e.g. Felt, 2012; Hecht, 2001), the case I am interested in is slightly different. I will use ‘imaginaries’ as a sensitizing concept for studying the co-production of science-society relations and attainable futures of society in transdisciplinary sustainability research in the context funding scheme proVISION. This funding scheme however does not center on the development of particular technologies for reaching attainable futures. In the case of sustainability research attainable futures of society are shaped together with ideas about how to organize knowledge production and particularly relations between science and society. The issue at stake is the knowledge needed for dealing with contemporary (environmental) challenges in order to actualize particular futures. The relation between knowledge and (political) action is thus at the core of my empirical case. Knowledge in this sense can be understood as providing possibilities to act⁵⁵. Therefore, I will slightly re-accentuate that notion and look at **‘socio-scientific imaginaries’**⁵⁶.

Looking at the empirical cases Jasanoff and Kim explore it becomes apparent that they are mainly interested in controversies about the application and regulation of a technology and less so in the assumed need for scientific knowledge to address specific

⁵⁵ Analyzing the funding scheme proVISION I will draw on Stehr (2003) who defines knowledge as the capacity to act or to put something in motion. This understanding of knowledge leads to questions about how knowledge is being produced, distributed and applied. If we do not buy into the linear model of innovation (Godin, 2006) that claims a somehow mechanical movement of scientific knowledge to its application, the interesting question becomes how it is that knowledge becomes able to put something in motion. In this line of argument Grundmann and Stehr (2011) distinguish between different ways in which knowledge becomes influential: through technological artifacts or through political devices.

⁵⁶ I am aware that drawing a clear-cut distinction between scientific knowledge and technology is hardly a meaningful endeavor. STS writing has a long history of examining technoscientific issues and thus pointing to the relations of science and technology (Haraway, 1997; Ihde & Selinger, 2003; Law, 2002; Michael, 2006). So, to preempt any misunderstandings I do not aim to establish a distinction between knowledge and technology. Much rather, in re-accentuating the notion, I want to adapt it to an empirical case in which solutions to particular problems are explicitly articulated in relation to changing ideas about knowledge and its production.

problem areas. Therefore, I think that the different empirical case I am looking at also calls for a shift in the accentuation of the conceptual tools used to analyze it. Looking at practices in which imaginations of attainable societal futures are co-produced with particular knowledge orders will emphasize different questions than exploring technological trajectories; questions about knowledge, actors that are imagined as knowledgeable and those who decide about the validity of knowledge claims, about moments and methods of distribution and so on.

Focusing on socio-scientific imaginaries enables me to go beyond telling a story ‘merely’ about an Austrian funding scheme. Given the complexities of research funding and sustainability research this would already be a promising story to tell. However, I regard the funding scheme proVISION as a case in which a particular imaginary becomes manifest. Understanding this funding scheme like that means that it is but one instance in which broader imaginaries about changing science-society relations can be observed. Looking at the funding scheme proVISION with the conceptual tool ‘socio-scientific imaginaries’ enables me to focus on a set of interrelated issues:

To start with, it enables me to go beyond and complement institutional analysis of research funding and additionally **address the broader imaginations** about science-society relations and attainable futures that are guiding the set-up of this particular research-funding program. How should attainable futures of society be imagined and how are these imaginations related to particular modes of knowledge production respectively science-society relations?

Furthermore, I will address the **dynamic** features of imaginaries. For doing so I will refer to Felt’s model of how imaginaries are assembled and publicly rehearsed in order to become stable imaginative resources. She describes this as “a gradual, long-term, bottom-up formation, always in need of rehearsal and (re)stabilization” (Felt, forthcoming: 24). Assemblage and rehearsal are thus the central elements in the stabilization of imaginaries. Once they are stabilized imaginaries gain a certain degree of mobility. This process is never complete, therefore Felt focuses on “the work needed to construct this kind of sociotechnical imaginary, to nourish and keep it alive as well as to naturalize it.” (ibid.: 4) Felt nicely shows how Austria’s sociotechnical imaginary of ‘keeping Austria free’ of certain technologies was nourished by a broader political post-war imaginary, which can be transferred from a debate about nuclear energy to discussions about genetically modified food and beyond. Adapting this general model of

the stabilization of imaginaries I also need to keep in mind the differences between the case of nuclear energy and transdisciplinary sustainability research. While Felt describes a relatively stable imaginary that can be used in different technology-related debates, the funding scheme proVISION needs to be understood rather as case in which we can observe a **socio-scientific imaginary ‘in the making’**. Although being in the making this imaginary builds on a pre-existing imaginary of Austria as an especially ‘green’ characterized by its natural environment. This funding scheme is an attempt to stabilize particular scientific and societal orderings that are presented as an alternative to common ideas about technological solutions visible in discourses about technological innovation. This imaginary, however, is far from being widely established and stabilized. Much rather, it is a fragile and messy assemblage of imagined futures and ideas about how science and society ought to work together in order to find solutions for contemporary problems. This also means looking at imaginaries from a historical perspective and asking how this particular imaginary is being assembled and stabilized as well as looking for alternative socio-scientific imaginaries and how these different imaginaries might relate to each other. How are particular imaginaries being assembled, rehearsed and (maybe) stabilized (at the expense of others) over time?

Finally, as Jasanoff remarks, imaginaries are “group achievements” (Jasanoff, forthcoming: 36). Hence this conceptual tool brings into focus questions about the **collectives** that are related to a particular imaginary. This means looking at both the actors engaged in assembling, stabilizing, rehearsing and also contesting such collective imaginations of attainable futures and the collectives that are co-constitutive with it. Who is supposed to be guided by particular imaginaries and who attempts to produce and stabilize them?

I agree with Jasanoff and Kim when they talk about the importance of carefully defining one’s tools and distinguishing them from similar concepts. This is important in order to be able to get a good grasp of the case to be explored. Jasanoff and Kim distinguish imaginaries from ‘policy agendas’, ‘master narratives’, ‘media packages’ or ‘belief systems’. Imaginaries, they argue, are “less issue-specific, less goal-directed, less politically accountable, and less instrumental” than policy agendas (2009: 123). Imaginaries are also distinct from master narratives in their orientation towards the future. Furthermore, they are not as focused on public spaces of communication as media packages. And unless belief systems, imaginaries need to be regarded as multiple

and contending each other. There are two more conceptual tools often used in telling stories about collective imaginations and sociotechnical development, which need to be differentiated from the notion of ‘imaginaries’ as proposed by Jasanoff and Kim.

To start with, the concept as I intend to use it differs from ‘expectation’ as it is used in work related to the sociology of expectations as discussed above. At a first glance talking about expectations also addresses more or less collective ideas about futures that might become performative in the present through setting agendas or being instrumental in the allocation of resources. Nonetheless, there are significant differences. While expectations center on particular technologies of technoscientific fields and are promoted mostly by small sets of actors - mostly actors engaged in the particular technoscientific field that is at stake - imaginaries operate on a different level. As Jasanoff and Kim put it, the need to be situated

“in the understudied regions between imagination and action, between discourse and decision, and between inchoate public opinion and instrumental state policy” (Jasanoff & Kim, 2009: 123)

Additionally, imaginaries need to be distinguished from research that is concerned with different sorts of regimes be they technopolitical (Hecht, 2001) or knowledge regimes (Felt, Igelsböck, Schikowitz, & Völker, 2013). The regime metaphor, quite similar to the imaginaries concept addresses the entanglements between epistemological, institutional, social and ideological dimensions. The important difference, in my view, is that the imaginary concept additionally directs attention to the “futuristic” (Jasanoff & Kim, 2009: 123) aspects of collective imaginations of knowledge production. It is exactly this emphasis on the mutual constitution of collective ideas about attainable futures and scientific as well as societal orderings, which fits well with my overall interest in futuring practices in transdisciplinary sustainability research. Futuristic in their understanding means that imaginaries are about ideas of attainable or desirable future social orders. They are imaginations about possible directions of developments; about what might be and simultaneously what ought to be. They are imagined futures and normative prescriptions at the same time. Dennis argues that imaginaries are additionally about ‘monsters’ by which he refers to “the problematic and disturbing issues that challenge and threaten the performance and reaffirmation of desired social orders.” (Dennis, forthcoming: 5)

Jasanoff and Kim address ideas about the future of the USA and of North Korea on a quite abstract level. The USA in their view collectively imagines itself as containing the destructive powers of nuclear energy while South Korea relates nuclear energy mainly to national autonomy. How futures are being constructed within these imaginations is not in the scope of Jasanoff and Kim's analysis. So if we assume that ideas about attainable futures of society and social as well as scientific orderings are co-produced it might be worthwhile to pay closer attention to what 'future' actually means. Especially since sustainability discourse is very explicitly concerned with futures a more fine-grained analysis of how the future is mobilized and what 'the future' actually is seems necessary. As Adam and Grove (Adam & Groves, 2007) argue, the ways in which we think about the future collectively is closely related to our actions in the present.

Looking at 'socio-scientific imaginaries' thus directs my attention to the co-production of ideas about "preferred ways of living and social order" (Felt, forthcoming: 3) and about particular ways of doing science and producing knowledge. In this way the concept sensitizes me to the issue of new relations between society and science and producing knowledge responsibly that lie at the core of debates about new modes of knowledge production. The aim of this chapter is to study attempts of assembling and stabilizing a **'socio-scientific imaginary of preserving and preventing'**.

But how can imaginaries be identified especially in a case where they are not yet stabilized? What am I looking at? To start with the imaginary becomes visible in the official documents related to proVISION. Jasanoff argues that policy documents "can be mined for insights into the framing of desirable futures (or, as Dennis argues, for the 'monsters' that policy seeks to keep at bay), as well as for specific verbal tropes and analogies that help identify the elements of the imaginary" (Jasanoff, forthcoming: 39). Therefore, to understand this imaginary in the making it is necessary to explore the issues raised in these documents and to ask how they relate to visions of science-society relations. This is done in e.g. particular requirements, the key questions, but also in the pictorial materials used. The socio-scientific imaginary is additionally present in official statements of program representatives e.g. at public events. It is not, however, bound solely to the funding scheme proVISION. It is not something that is developed within proVISION. Attempts of assembling and stabilizing it can be seen in predecessor programs and related policy papers. And on an institutional level the imaginary is visible in other sustainability programs that focus more on developing technological fixes. The

relation between these different programs can also deepen our understanding of the imaginary at work here. And, finally, the actors engaged in the projects funded by proVISION are also partaking in the shaping of this socio-scientific imaginary. Their practices of futuring through which imaginaries are translated will be the focus of the second empirical chapter.

So for tracing how this particular imaginary is being assembled I will start out by describing the development and institutional setup of proVISION. This means describing its relation to Austrian sustainability strategies as well as to other funding schemes concerned with sustainability. In addition to that, it is important to understand the genealogy of sustainability research programs in Austria, i.e. the historical dimension of this assemblage process. Carving out the imaginary at work here it will also be important to explore the different elements that are assembled. Thus I will direct attention to a set of interrelated issues that are part of this alternative vision of science-society relations. First and foremost, a particular understanding of problems and challenges is central to ideas about sustainability as. Therefore, I will focus on how the problems to be solved are conceptualized. This particular idea of problems that call for new ways of approaching them lead to another set of issues characteristic for this imaginary: it is closely related to epistemic and social re-orderings, i.e. particular collectives that are constituted through these narratives and related to that a novel distribution of responsibilities and agency. The last empirical subchapter will deal with imaginations about 'Zukunftsfähigkeit' (future-ability). Looking at this central notion in (especially German-speaking) sustainability research discourse I will ask how ideas about risks are assembled in this imaginary and how they are used to render transdisciplinary sustainability research necessary and legitimate. I will conclude this chapter by summing up the observation and attempting to carve out the 'socio-scientific imaginary' guiding sustainability research in Austria.

5.1. Assembling and Rehearsing an Alternative Imaginary in Austrian Sustainability Research

ProVISION is a funding scheme of the Austrian Ministry of Science and Research (BMWF). The program aims to foster transdisciplinary research in the area of sustainability. In doing so, it is positioned as a means for *implementing*⁵⁷ Austria's sustainability research strategy (FORNE) as shown e.g. in the following quote from the program website:

"It is aimed at implementing Austria's FORNE strategy (research for sustainable development) and – together with complementary research programmes – creating the scientific basis for the country's sustainability strategy."⁵⁸ (engl. orig.)⁵⁹

This strategy is the result of a collaboration of various Austrian federal ministries, defines Austrian research and development policy and is supposed to bring together science, technology and economic development with sustainability issues. Research and technology are thereby understood as driving forces for economic development: "Future-able and innovative economic development is a central goal of policy in the areas of research- and technology"⁶⁰ (Paula, Smoliner, & Tiefenthaler, 2004: 3). In its introduction the Austrian strategy is situated within a broader framework of sustainable development by referring e.g. to the Brundtland Report as well as to different climate summits and conferences.

The funding scheme proVISION started in 2003 when researchers and practitioners involved in sustainability research were invited to comment on the outline of the funding scheme ('Einladung zur Stellungnahme'). One program organizer describes this activity as a "participatory procedure"⁶¹ (PL01: 447) and explains this further as a process in which comments on the funding scheme were asked from both, "from Praxis and science"⁶² (PL01: 473). These statements were collected and then used to refine the initial idea of the funding scheme as proposed by the program coordinators. At the

⁵⁷ As in the chapters before, when referring to terms or phrases from quotes I have already used I will mark them by italicizing them throughout the empirical part of this thesis.

⁵⁸ proVISION website. Accessed August 8, 2013: <http://www.provision-research.at/cms/scripts/active.asp?sprache=2>.

⁵⁹ Unless marked ('engl. orig.') the quotes throughout the empirical chapters are translations by the author. In these cases I will provide the original quotes in the footnotes.

⁶⁰ "Zukunftsfähige und innovative Wirtschaftsentwicklung ist ein zentrales Anliegen der Forschungs- und Technologiepolitik" (FORNE: 3)

⁶¹ „partizipatives Verfahren“ (PL01: 447)

⁶² "aus der Praxis und aus der Wissenschaft" (PL01: 473)

beginning of 2004 an official program 'kick-off' was organized for researchers and practitioners. The guiding idea of this event was to make sure that a broad range of actors should be able to participate right from the start. proVISION thus was framed as explicitly participatory and inclusive from the very beginning. As it says e.g. in the description of the picture below - a photograph taken from the website of the proVISION kick-off website: "All participants are integrated in the development of the research concept"⁶³.



Illustration 1: Picture of the proVISION Kick-Off event

Following these procedures the first call was published at the end of 2004 and the first projects started in 2005. The second call for project was launched in 2007.

This brief story about the procedure of setting up the program nicely shows some of the ideas about science and society that are central to proVISION. Such discourses about 'participation' and 'integration of actors' build on the idea of a gap between science and the so-called "social reality"⁶⁴ that is supposed to be "bridged"⁶⁵. Additionally, this procedure positions proVISION as a funding scheme that promotes an alternative way of doing science and research and an alternative way of positioning science within society.

This idea of being an alternative to common funding schemes is also visible in the institutional set-up of sustainability research funding as proVISION is not the only funding scheme engaged in sustainability issues. There is a second funding scheme that

⁶³ "In die Entwicklung des Forschungskonzeptes sind alle TeilnehmerInnen eingebunden." Website of the Environmental Agency Austria. Accessed May 29, 2014.

⁶⁴ http://www.umweltbundesamt.at/aktuell/presse/lastnews/newsarchiv_2004/news040310_1/,

⁶⁵ ProVISION website, key issue 7. Accessed February 14, 2012: <http://www.provision-research.at>

⁶⁵ ProVISION website. Accessed February 14, 2012: <http://www.provision-research.at>

is referred to as a “partner programme” on the proVISION website⁶⁶. This program - called ‘Technologies for Sustainable Development’ (from now on: TSD) - also deals with the issue of sustainability. It is situated at the Federal Ministry of Transport, Innovation and Technology (BMVIT) and focuses mainly on technological developments. It is organized in different sub-programs called ‘Building of Tomorrow’, ‘Energy Systems of Tomorrow’ and ‘Factory of Tomorrow’. Technological innovations are regarded as means for realizing ideas of attainable futures. Thereby these future technologies are interwoven with the future of “Austria's position in the field of technology” and economical stability. These programs lay out a vision of Austria where energy is used efficiently, the country is an innovation leader and Austrian economy is prospering.

Thus, already at this level, there is a clear institutional demarcation between sustainability as a technological and sustainability as a societal issue. Participation is handled quite differently in these two programs. Whereas proVISION – as I showed above – emphasizes the need for participation and explicitly focuses on producing knowledge transdisciplinary TSD rehearses more ‘traditional’ boundaries between science and society or experts and publics.

“While its partner programme “Technologies for Sustainable Development” run by the Federal Ministry of Transport, Innovation and Technology (BMVIT), is primarily aimed at technological innovations, proVISION investigates the impact of climate change on ecosystems, regional development and quality of life.”⁶⁷

This distinction builds on the idea of a clear-cut boundary between technological innovation on the one side and not so technological *structural and social innovation* on the other:

“On an international scale, there is general agreement that the concept of sustainability is a constituent element of future-oriented research and development and that research will play a key role in this area. In addition to innovation in the field of technology, structural and social innovation will be of great importance.”⁶⁸

What is interesting is that TSD allows for communities or companies to propose projects. This is framed as cooperation instead of transdisciplinarity, which does not imply proVISION’s imaginations about relations on an epistemic level. The way or ‘mode’ of

⁶⁶ ProVISION website. Accessed February 14, 2012: <http://www.provision-research.at/cms/scripts/active.asp?sprache=2&id=8&vorlage=3&rubrik=8>.

⁶⁷ ProVISION website, mission statement. Accessed February 14, 2012: <http://www.provision-research.at>

⁶⁸ TSD website. Accessed August 25, 2014: <http://www.nachhaltigwirtschaften.at/english/>

producing engineering knowledge for these technological innovations is not questioned. At the same time proVISION states quite explicitly in the 2nd call for projects that it is not interested in “technological research and mobility research” (BMWF, 2007). Technology can only be a part of projects funded by proVISION as long as they deal with questions like “how societal conditions influence technology development and to what extent the nature-society interaction is influenced by technology” (ibid.).

Through this distinction proVISION is explicitly performed as an alternative mode of doing science and research. The distinction is not only inscribed in the set-up of two distinct funding schemes, it also works on a broader institutional level as these funding schemes are also assigned to different ministries. While proVISION is a funding scheme of the Ministry of Science and Research (BMWF), TSD is financed by the Ministry of Transport, Innovation and Technology (BMVIT). Locating proVISION at the Ministry of Science and Research and establishing distinction between a technological and a research-oriented sustainability program, however, becomes consequential for the funding program: proVISION’s imagination of producing knowledge consists of two different levels respectively demands two different things simultaneously from researchers who want to get funds for their projects: First, it is about scientific projects, i.e. to produce and circulate knowledge, which can be used for sustainable development. Extra-scientific actors are allowed to participate in scientific projects that are about producing knowledge about sustainable lifestyles and influencing behavior. They are kept out when it’s about developing technological solutions. Second, and this concerns mainly the scientists involved, it is about constantly reflecting on and thereby modifying the ways in which knowledge is produced. Thus, it is about testing a model of knowledge production that is expected to be sensitive to the different societal needs.

But it is important not to forget, that this depiction of the institutional set-up and the distinction of two partner programs with proVISION as an alternative way of producing knowledge is also central part of proVISION’s self-presentation. It is thus both symbolic and material. Presenting sustainability research as consisting of two separate partner programs in the program documents has to be understood as an integral element of the socio-scientific imaginary that is manifest in proVISION. The quotes above stabilize a distinction between two different imaginaries: a dominant imaginary that is ascribed to proVISION’s partner program, an imaginary that centers on ‘technologies for sustainable future’. It is the imagination of technoscience producing technologies for the benefit of

present and future generations. ProVISION is imagined as an alternative, producing 'knowledge for a sustainable future'. Knowledge instead of technological innovation becomes key to our collective attainable futures. Thus, the differentness of proVISION as well as the distinction between two different imaginaries is performed both materially as well as a symbolically through the institutional set up of sustainability research in Austria.

It is also noteworthy to mention that proVISION was not the first program in the area of sustainability research in Austria. It is the successor of a funding scheme called 'Kulturlandschaftsforschung' (KLF), which was started in 1995 and, similar to proVISION, was a part of the implementation of Austria's National Environmental Plan (NUP)⁶⁹ of 1995. KLF was introduced by a joint 'initiative' of the BMWF together with other ministries and the federal states (Haas & Meixner, 2005). On several occasions representatives of the funding scheme as well as researchers funded by proVISION mention the importance of this predecessor program for sustainability research in Austria. The connection of the two funding schemes is also clearly visible on the timeline on the program website. The start of this timeline is marked by an entry named 'KLF Bilanzseminar' that was held in 2002. The end of KLF is thus equated with the beginning of proVISION. This indicates a close relation of the two funding schemes. Both programs are part of the same overall idea of an alternative way of doing science.

Needless to say KLF also was concerned with sustainability research. The Ministry of Science and Research depicts the programs as closely related due to sharing the same *research principles* and their difference to other research funding schemes:

"Both programs, KLF and proVISION, are distinct from other thematic programs due to the research principles: next to inter- and transdisciplinarity the program requires internationality and anchorage in the regions. Clear, generally intelligible language is a further principle, which was already promoted by KLF. Both programs are counting on the cooperation of the federation and federal states."⁷⁰

⁶⁹ Austria's 'Nationaler Umweltplan'. Accessed April 30, 2013. <http://www.cedar.at/data/nup/nup-english/index.html>

⁷⁰ "Beide Programme, KLF und proVISION, unterscheiden sich von anderen thematischen Programmen durch die Forschungsprinzipien: neben Inter- und Transdisziplinarität fordert das Programm Internationalität und Verankerung in den Regionen. Klare, allgemein verständliche Sprache ist ein weiteres Prinzip, das bereits in der KLF gefördert wurde. Beide Programme setzen auf die Kooperation von Bund und Bundesländern." Website of the Ministry of Science and Research. Accessed April 8, 2013. http://www.bmwf.gv.at/startseite/forschung/national/programme_schwerpunkte/provision/

Two things are important to remark here: first, there are rehearsal processes going on that are visible in the continuation of different funding schemes emphasizing their shared principles. And second, these two funding schemes stabilize at the same time a particular imagination of similarity through difference. Amongst other things they are similar in being different to other funding schemes. KLF and proVISION are thus both presented as alternative modes of doing research against the background of other research programs following a more traditional imaginary of science and research. This imaginary is present mainly as something that KLF and proVISION do not want to do.

The call for interdisciplinary and transdisciplinary collaboration for securing “basis of life for future generations”⁷¹ that is very important in proVISION is already present in the KLF documents. This shall be achieved through making researchers “go out of science and step into dialogue with society”⁷². Transdisciplinarity thereby is mainly understood as the normative demand for scientists to enable a *dialogue* between *science* and *society*. What is interesting here is that the programs are characterized by a shared set of ideas concerning the conduct of science and very explicitly so. It is not (only) research on a particular thematic area that is funded by these programs, but research that commits itself to a shared set of values and principles.

However, we can also see differences between the two programs that illustrate a certain degree of development and therefore reveal the dynamic features of this imaginary. There is e.g. a contrast in how the set-up process is described. Whereas proVISION is anxious to highlight the heterogeneity of actors involved in setting up the program KLF documents state that the set-up process of the program included members from the “Austrian research community”⁷³. Ideas about agency and thus also about who is responsible for this alternative vision of science-society relation seem to be open to change. These members of the research community were expected to get involved in an “interdisciplinary discussion-process”⁷⁴. This initial focus on interdisciplinarity instead of transdisciplinarity is also mentioned a program manager in her account of the historical developments of these ideas within KLF:

⁷¹ “Lebensgrundlagen auch für zukünftige Generationen”. KLF website. Accessed May 13, 2011.

<http://klf.at>

⁷² “hinausgehen aus der Wissenschaft und in einen Dialog mit der Gesellschaft treten”. Ibid.

⁷³ “die österreichische Forschungsgemeinschaft”. Ibid.

⁷⁴ “interdisziplinärer Diskussionsprozess”. Ibid.

“Well, the requirements for the projects that were funded in the beginning were much less clear and much less demanding than in the second phase of this program. AN (.) and in my, well ‘d say at the end of this program KLF this inter-, in the second phase, in the course of this program the aspiration emerged that the collaboration should not merely be interdisciplinary but also transdisciplinary. I.e. also the collaboration of science and the representatives from the extra-scientific Praxis, yes?”⁷⁵ (PL01: 149-156)

Whereas at the beginning of KLF the focus was put on interdisciplinary research, the attention shifted towards the inclusion of *representatives from the extra-scientific Praxis* later on. Whereas the quote above represents a narrative reconstruction of particular developments, such subtle shifts in the imaginary are by no means restricted to the different programs that succeed each other. Such shifts can also be observed within the single programs as e.g. within the different calls of proVISION. Whereas in the 1st call for projects transdisciplinarity as a research principle is not mandatory for all the projects, it is so in the second call.

Considering the portrayal of proVISION as a direct successor of KLF and also the different themes that pervade both funding schemes proVISION needs to be understood as a rehearsal of a socio-scientific imaginary already in the process of being assembled and stabilized similar to Felt’s (forthcoming) analysis of the historical process in which imaginaries are assembled and stabilized through continuous rehearsals. Already within KLF the central idea of being an alternative mode of doing research is visible: knowledge for the common good that needs to be produced by bridging the gap between science and society. In that sense, ideas of attainable futures of society are entangled with ideas about how to produce knowledge. Still there are also historical developments visible concerning the imaginations of what opening up knowledge production means.

⁷⁵ “Also die, die Anforderungen an die Projekte, die am Anfang vergeben wurden, waren viel weniger klar und viel weniger anspruchsvoll als dann in der 2. Phase dieses Programmes. Und (.), und in meine, also ich würde sagen am Ende dieses Programms Kulturlandschaftsforschung war diese Inter-, also in der 2. Phase, es ist im Laufe dieses Programms auch immer stärker der Anspruch zu, zum Vorschein gekommen, dass die Zusammenarbeit nicht nur interdisziplinär sein soll, sondern auch transdisziplinär. Das heißt auch also über Zusammenarbeit von Wissenschaft mit, mit Vertretern aus der außerwissenschaftlichen Praxis, ja?” (PL01: 149-156)

5.2. Articulating the Present Problems of the Future

The idea of promoting an alternative way of producing knowledge, however, poses an immediate question: why is an alternative even necessary? This question leads to the particular understanding of problems in sustainability research. In a nutshell, the story goes something like this: our contemporary society faces new kinds of problems and challenges. These problems are unprecedented and a particularity of 'our' time. They are beyond the problem-solving capabilities of 'traditional' science. In order to deal with these problems new ways of producing knowledge are necessary.⁷⁶ For understanding the changes in knowledge production that are envisioned it is crucial to focus in more detail on how this story unfolds and on how exactly the problems are imagined that call for these changes. What I think is especially interesting in proVISION and in sustainability contexts more generally is the **temporal constitution of environmental problems**. It should be clear by now that time is not a framework for our actions but is rather 'brewed' in our everyday practices (Latour, 1993); it is interesting to look for the times (and thus futures) that are made through particular conceptualizations of environmental problems. In this sense, I look at different ways in which problems are woven together with temporal narratives in proVISION. In doing so I draw mainly on proVISION program documents. Additionally, I will also refer to broader policy narrations these documents refer to in order to see how particular narrations relate to other stories about problems in sustainability research and more broadly speaking sustainable development.

"Focusing on sustainability, it is aimed at making knowledge available for solving the most urgent problems in provision for nature and society: adaptation to climate change and its consequences, suitable life and work models, responsible use of natural and industrial resources, and environmental protection."⁷⁷

⁷⁶ Interestingly this story seems to be of no big importance to the program 'Technologies for Sustainable Development'. Instead of narrations about problem, this program focuses more directly on the conservation of a status quo. Its main goal is to "secure our prosperity and quality of life in the long run" (TSD website); keeping things as they are. The future in these stories consequently merges with the present as e.g. in this quote from one of the subprograms 'energy systems of the future': "Zukünftige, den Anforderungen von „Nachhaltig Wirtschaften“ gerecht werdende Energiesysteme sind durch folgende Eigenschaften gekennzeichnet" (TSD website). Characteristics of future systems can be described in present tense without any reference to uncertainty. The future is hardly distinguishable from the present. In this sense technological innovation is needed for 'securing' an eternal now. This is a different way of putting Nowotny's idea of an 'extending present' (Nowotny, 1985)

⁷⁷ ProVISION Website (engl. orig.). Accessed August 8, 2013: <http://www.provision-research.at>

The quote above is taken from the program website and addresses the kind of knowledge the program wants to produce. There are several things that are telling in the quote above and that is precisely what makes it a neat entry point for looking at various interrelated stories about problems, challenges and knowledge.

Central to this quote is the idea that knowledge needs to be *made available* in order to solve the *most urgent problems*. Thus, the issue of urgency is put prominently in problem-related narrations of proVISION. The question is, what makes problems urgent and what does urgency mean in this context? Urgency first of all means that there is little time left for consideration and that time for acting is now. Such narrations thus relate a perceived time pressure to a need for action. On an epistemic level this means that actions need to be taken regardless of uncertainties and lack of scientific knowledge about possible consequences. The socio-scientific imaginary guiding proVISION thus assumes or postulates a particular relation of knowledge, (political) action and attainable ways of living.

Focusing on the present as the locus for action this understanding also indicates a change in how the relation between the future and the present is imagined. In order to understand how they articulate the future let's now look at the following quote:

“Provision for nature and society, sustainability, climate change, quality of living, spatial development – these are pressing issues. Battles of distribution are part of them. Burden and Benefit, living environment and livability are being distributed. These struggles are fought out in social reality, primarily in the intersection of society and nature, where decision for or against the better state are made in each and every moment. How do we fashion the relation of nature and society: as discord? As an alliance?”⁷⁸ (BMBWK, 2005: 5)

The issue of urgency reappears in this quote as *pressing* (bedrängend). What makes this quote a nice exemplar for the particular understanding of the relation of the future and the present is the statement that we make decisions *in each and every moment*. This relates to the issue of urgency, because decisions need to be made constantly and thus constantly futures are being shaped in the present. In this understanding the present

⁷⁸ "Vorsorge für Natur und Gesellschaft, Nachhaltigkeit, Klimawandel, Lebensqualität, Raumentwicklung – das sind bedrängende Themen. Verteilungskämpfe sind ihnen eingeschrieben: Verteilt werden Lasten und Nutzen, Lebensraum und Lebensmöglichkeiten. Ausgefochten werden diese Kämpfe in der sozialen Wirklichkeit, vornehmlich in jenem Schnittfeld, wo Gesellschaft und Natur aufeinandertreffen, wo in jedem Moment Entscheidungen fallen für oder gegen den besseren Zustand. Wie gestalten wir die Beziehung zwischen Natur und Gesellschaft: als Zerwürfnis? als Allianz?" (BMBWK, 2005: 5)

seems to be ‘extending’ as Nowotny has famously pointed out (1995). This means that the future can no longer be the imaginary space in which all problems will be solved. The present as the consequences of our actions right now reaches out into the future. However, the idea of multiple intended and unintended consequences, I think, implies that there is still some openness left. Futures are constantly made and unmade by our actions. This issue is also addressed by Felt when she speaks about ‘collateral futures’⁷⁹, i.e. the futures that are co-created by the choice of particular futures.

The quote above also hints at what is imagined to be at stake. The decisions that are to be taken *in each and every moment* decide whether or not the *better state* can be achieved. proVISION narrations can therefore be understood in Jasanoff and Kim’s terms as ‘futuristic’ (Jasanoff & Kim, 2009); the future is present as a better way of living, an attainable state of affairs. Thus, the focus on the present as time to act in the imagination of proVISION is always accompanied by the more anticipatory idea of *provision*.

As I stated above this focus on *urgency* also relates to debates concerning knowledge and political action. Actions that need to be taken on the basis of knowledge are framed in terms of *adaption* and *protection* in the long term. The socio-scientific imaginary guiding proVISION thus assumes respectively postulates a particular relation of (scientific but uncertain) knowledge, (political) action and attainable ways of living.

Stories about urgency and the focus on the relation of knowledge and action in the proVISION documents can be regarded as a rehearsal of ideas famously captured in the so-called ‘precautionary principle’ (UNCED, 1992). This principle basically reformulates the understanding of the relation between necessary political action and the state of scientific debate:

“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” (UNCED, 1992: principle 15)

⁷⁹ The concept was presented in a talk held at the conference “Zukunftsexpertise. Zur Generierung, Legitimierung, Verwendung und Anerkennung von Zukunftswissen“ held in January 2013 at the Center for Interdisciplinary Research of Bielefeld University. The talk was entitled “Kollaterale Zukünfte: Zu den (An)Ordnungen von Morgen“

Action in this quote is given priority over the certainty of scientific facts especially when there is the potential of damage. Where proVISION highlights a continuation of decision making the precautionary principle emphasizes irreversibility.

The problems understood in this way not only call for immediate action, but for a particular kind of action. This results from the fact that they are additionally described as **novel and unprecedented**:

“Climate change due to the greenhouse effect, shortage of water resources, relative reduction in agricultural area and global forest area (relative in relation to population figures), soil degradation, species extinction, global development disparities and migration, urbanisation and urban sprawl: these are the emerging trends in this century.”⁸⁰

The phenomena sketched out in the quote above are environmental problems. The interesting thing is that they are *emerging* and a distinct feature of *this century*. They are depicted as novel and characteristic to our time and consequentially previous generations of scientists were not forced to deal with these kinds of problems. Together with certain problems thus the present is constituted as ‘our time’, a particular era that is distinct from the past. The novelty of these problems partly lies in the scale of their possible effect. No matter where they originate, they can become possibly hazardous globally. ProVISION frames this as a “global environmental crisis”⁸¹. This framing of problems creates new relations between globality and locality in the proVISION narrations. New problems that are global call for solutions on a local level. The two thus become inseparably linked. As a consequence these problems are also described as increasingly complex as the interrelation between global and local phenomena needs to be accounted for.

In this way, such narrations about newness and complexity render traditional modes of knowledge production insufficient for properly managing them and call for new ways of dealing with these contemporary problems. In this sense proVISION calls for opening up knowledge production as

“Knowledge can not be the only determinant of precautionary behavior, because it is incomplete, tainted with uncertainty and risk.”⁸² (BMWF, 2007: 4)

⁸⁰ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

⁸¹ Ibid.

⁸² “Wissen kann aber nicht die einzige Determinante vorsorgenden Handelns

In addition to knowledge, a precautionary society needs to rely on a set of “intersubjectively agreed upon norms and values”⁸³ (ibid) in order to answer the question “How do we want to live?”⁸⁴ (ibid.) Key to solving these problems and answering this question, then, is - as a participant at a proVISION related event of the Ministry of Science and Research framed it - to ‘break open’ science.

Framing problems in this way, proVISION mobilizes imaginations present also in international sustainability documents. Already the discourse of the Brundtland-Report shares this understanding of particular problems being characteristic for the times we live in. The initial moment for this new understanding of problems was the moment when “we saw our planet from space for the first time” (World Commission on Environment and Development, 1987). The Brundtland-Report equates this image with the Copernican revolution. Jasanoff has pointed out the importance of this narration in the Brundtland-Report as it marks a change in how we view our world. This picture constitutes the beginning of understanding ‘the environment’ as globally interrelated problems that possibly affect everyone. Thus, through this image the local and the global becomes entwined. This ‘re-imagining’ of earth and the establishment of a “global perspective” (Jasanoff, 2001: 321) also closely entwined with a re-framing of risks, an assumed need for global action and the rise of modeling approaches on an epistemic level. More recently policy debates refer to problems such as climate change or global warming as “grand challenges” (Lund Declaration). Similar to other sustainability-related documents grand challenges are described as having a defining quality to them, they are challenges of “our time” (ibid.). Next to anthropogenic climate change issues such as an aging society or scarcity of resources and energy supply are regarded as such grand challenges.

However, not only policy discourses emphasize the uniqueness problems that we are facing. Also scholars engaged in the debate about new modes of knowledge production enforce to this imagination. In their work on ‘post-normal science’ – that is often referred to in writing on transdisciplinarity (Hirsch Hadorn, Bradley, Pohl, Rist, & Wiesmann, 2006; Klein, 2004) and also resonates in proVISION - Funtowicz and Ravetz highlight this particularity of contemporary problems as novel and complex:

sein, denn es ist unvollständig, behaftet mit Ungewissheit und Risiko.“ (BMWF, 2007: 4)

⁸³ “intersubjektiv vereinbarte Normvorstellungen und Werte“ (ibid.)

⁸⁴ “Wie wollen wir leben?“ (ibid.)

“The phenomena, being novel, complex and variable, are themselves not well understood.” (Funtowicz & Ravetz, 1993b: 742)

These *phenomena* addressed by Funtowicz and Ravetz are mostly environmental issues. They are increasingly complex as they are situated on a global scale (with their temporal scale being hard to estimate) with extremely high stakes and heterogeneous actors involved. As these phenomena are additionally *novel* we have not yet developed adequate means of handling them. By describing them in this way the authors direct attention to questions concerning the knowledge we have at our disposal respectively need in order to deal with them. Dealing with sustainability in their view necessarily means dealing with the uncertainty of scientific knowledge.

This short list of examples nicely shows how the idea that humankind is facing novel problems that are unique in history – although it has been constitutive for sustainability narrations from the very beginning - still needs to be rehearsed in policy rhetoric and thereby stabilized as a basic imagination of the problems we are facing.

Thinking about the temporality of environmental problems two more interrelated strands of narration appear to be particularly important in the proVISION documents: the question **when problems become relevant** and the question of **how long we have to prepare the necessary actions**. Crucial to the way in which problems are described in the proVISION documents concerns the question of when problems are actually imagined to unfold their threatening potential. Framed as threats these problems are to some extent problems right now because they are problems to come. This, however, bears consequences for how to deal with these challenges. In the proVISION program documents we find an array of different threats that are mobilized to help articulate the need for a specific kind of knowledge and new way of producing it. proVISION refers to contemporary developments that need to be dealt with such as we have seen above.

These are environmental problems on a global scale that are in an interesting way constituted as problems through their inherent spatio-temporality. Climate change is understood as a global problem right now exactly because of its possible local effects in the future. Thus, it is anticipated developments that are conducive in constituting the problems depicted in the quote above. This is also visible in another quote from the 1st call for projects in the proVISION framework in which Austria is depicted as overly exposed to the effects of global warming:

“Climate change is of great relevance in Austria. Temperatures have increased by 2°C over the last 100 years, while they have risen by just 0.6 to 0.8°C on average globally. Also an increased variance concerning precipitation is recognizable, which will become more intense in the years to come. Regarding current state of knowledge Austria will be hit by extreme events (droughts, floods, heat waves) with partly devastating consequences for both ecological and socioeconomic systems more frequently than previously.”⁸⁵ (BMBWK, 2004: 10)

Weather data from Austria is compared to global measurements. This comparison depicts Austria as above the average when it comes to climate change. Austria thus becomes an entity that is defined in its relation to global developments. So do its problems as the *relevance* of the data presented here receives its significance mainly through the comparative arrangement with a *global average* that acquires the role of a benchmark. This quantitative assessment is then extrapolated to the future and translated into possible local consequences that can be ecological as well as social and economic. Climate change is subtly translated from a global phenomenon in a highly localized set of interrelated problems. Concrete threats such as e.g. *droughts* are also presented in this quote. These are not entirely new phenomena. Their threatening potential mainly lies in an increased rate of their occurrence.

This conception of problems is also reflected in the imagined ways of dealing with them. In the quote above we saw ‘adaption’ and ‘protection’ as a main aim of the knowledge that is produced in proVISION projects. These strategies are both anticipatory practices. Adaption as well as protection is a practice that refers to potential future threats and thus relates present action to knowledge about particular developments. Therefore, through theses narrations forward-looking knowledge of different sorts is also rendered necessary.

It is additionally notable that what is actually understood as environmental problem also varies in regard to duration. As we heard above, urgent measures need to be taken to set sustainable developments on course. In other places the problems are imagined to stay with us for quite a long time. Phenomena such as climate change and so on are e.g.

⁸⁵ “Dem **Klimawandel** kommt in Österreich hohe Bedeutung zu. Die Temperaturen sind hier in den letzten 100 Jahren um bis zu 2°C gestiegen, während sie sich im globalen Mittel nur um 0,6 bis 0,8°C erhöhten. Auch ist eine höhere Varianz in den Niederschlägen bemerkbar, die sich in den kommenden Jahren höchstwahrscheinlich verstärken wird. Nach derzeitigem Wissensstand wird Österreich häufiger als früher von Extremereignissen (Dürren, Hochwasser, Hitzewellen) mit teils verheerenden Auswirkungen sowohl auf das ökologische als auch auf das sozioökonomische System betroffen sein.“ (BMBWK, 2004: 10)

described as “trends of this century” (BMWF, 2007: 3), which might “threaten our livelihood in the long run” (ibid.). This in turn poses difficult questions concerning methodology (e.g. what time frames to choose for scenarios or modeling) as well as questions about who actually is affected and therefore might or should be concerned. This hints at a tension in the temporal and representational politics of proVISION. If threatening problems are situated in a future that is imagined as very close by, potentially affected actors are easier to integrate than in cases where problems manifest over the next century. Thus, in the proVISION imagination of environmental problems very different futures are constituted. Now who is supposed to ‘represent’ future generations affected by problems a century from now?

In the Brundtland-Report we can find similar portrayals of problems in terms of the future potential threats of current developments:

“All countries may suffer from releases by industrialized countries of carbon dioxide and of gases that react with the ozone layer, and from any future war fought with the nuclear arsenals controlled by those nations.” (World Commission on Environment and Development, 1987)

This understanding of problems also resonates in current policy discourse visible in the Lund Declaration, where problems are mainly described as threatening processes, as a quick look at the phenomena listed as ‘Grand Challenges’ in this document shows: “global warming, tightening of supplies of energy, water and food, ageing societies, public health, pandemics and security” (Lund Declaration). Except for public health, pandemics and security the issues raised are all explicitly procedural and thus follow a temporal logic compared to what I have described above.

Summing up, environmental problems are a main element in the socio-scientific imaginary guiding proVISION. These problems are co-constituted with particular temporalities, i.e. ways on interpreting the relation of past, present and future (Latour, 1993). As I have shown, there are multiple temporalities at work in the ways problems are understood. The future depicted in these accounts is a singular point in a linear continuation of a current development that started in the past. E.g. the threatening potential of rising temperatures is based on the assumption of linearity. Such a conception of the future is quite common in quantitative accounts like e.g. risk analysis where a predictability of futures is assumed often on the basis of records of past events (Funtowicz & Ravetz, 1993b; Stirling, 2006). This way of interpreting the passage of

time is also related to ideas of irreversibility or so-called lock-ins or path-dependency, which puts a stronger emphasis on the present as decisive moment. It is right now that certain decisions lead to solidifying one out of many possible futures. However, making decisions in ‘every moment’ (BMBWK, 2005) as often described in the proVISION documents indicates that there is a multiplicity of possible futures as the outcome of our present actions. Note that this conceptualization differs from both the linear temporality present in the idea of a steady development of temperatures from the past to the future and ideas of irreversibility. Furthermore, futures are conceptualized differently concerning their distance from the present. It is thus important to consider that particular stories about environmental phenomena respectively problems are co-constitutive with multiple conceptualizations of futures and thus multiple temporalities.

So while Nowotny rightfully argues that the present is being increasingly extended in modern societies this might not be the whole story. In this sense, I think that her conclusion that the future as a temporal category loses significance and even tends to be abandoned (1989: 53) does not hold. Rather, I would argue with Adam and Groves (Adam, 1998; Adam & Groves, 2007) that, within practices of collectively imagining societal and scientific futures, we see not a single category of the future but multiple interrelated temporalities. The interesting thing then is to ask for their particular relations in concrete practices and how through such practices rooms for manoeuvre are opened up or closed down. The future that is made part of practices in the present emerges as an object that needs to be negotiated constantly. In this sense, the idea of an extended present that is always concerned with the future nicely ties into the concept of ‘anticipatory regimes’ (Adams et al., 2009). It is thus important to learn more about how conceptualizations of the future relate to practices of producing and circulating knowledge. This holds especially true in a case where knowledge is considered a key element in attempts of actualizing desirable futures. Before we can do that, however, it is important to understand how the particular constitution of problems in sustainability research is linked with social and epistemic re-orderings in the understanding of proVISION.

5.3. Ordering Science-Society Relations

As Funtowicz and Ravetz point out conceptualizations of problems and epistemologies are closely related. As they put it in “every age, science is shaped around its leading problems” (1993b: 754). They regard environmental problems as defining for our

current moment in history and relate them to science stating that in order to be able to handle these phenomena of our 'age' knowledge production needs to change:

"Our work has been motivated by the realization that the new problems facing our industrialized civilization, although requiring scientific inputs for their resolution, involve a problem-solving activity that is different in character from the kind that we have previously taken for granted." (Funtowicz & Ravetz, 1992: 253)

Accordingly, the temporality of problems is closely related to a particular **epistemology** in the socio-scientific imaginary guiding proVISION. In order to be able to make the right decisions and actions a particular kind of knowledge is needed: anticipatory knowledge, knowledge about 'the future' to enable particular actors to calculate⁸⁶ possible effects of our actions in the present and thus take care of Austria's future 'responsibly'. An assumed need for anticipatory knowledge is also visible in one of the central questions of the funding scheme:

"How can we investigate provision for the vulnerability of society and nature?"⁸⁷

This question hints at the need for knowledge about the future.⁸⁸ But as we have seen the imagination of sustainability research renders hitherto ways of producing knowledge inadequate for solving the novel and increasingly complex contemporary problems:

"Knowledge – scientific and non-scientific – is a must for making decisions. However, knowledge cannot be the only determining factor in sustainable action, as it is incomplete, full of uncertainty and risk. A globalised world society cannot assume that it will be stabilised with knowledge."⁸⁹

Knowledge needs to be produced according to changing modes of production; science needs to "explore new avenues methodologically" (Paula et al., 2004: 5). Knowledge about the future or 'precautionary outlooks' (BMBWK, 2004) that are supposed to be used in decision-making processes need to be produced together with extra-scientific actors. Hence, this quote explicitly directs attention to the relation between science,

⁸⁶ I use the term 'calculate' here on purpose in order to refer to the quantitative logic prevalent in the preferred methods of manufacturing of anticipatory knowledge.

⁸⁷ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

⁸⁸ This is even clearer in the original German Version: "Wie können wir die Verwundbarkeit der Gesellschaft und der Natur vorsorgend in den Blick nehmen?" (proVISION website: Vision). This version not so much focuses on 'investigation' but more on 'taking something into account' or 'looking at something' and combines it with the idea of precaution or prevention.

⁸⁹ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

political decision-making and the environment. For solving problems in a *globalised world* it does not suffice to merely produce anticipatory knowledge. Additionally, new, more open and democratic modes of producing knowledge are needed. As a program manager puts it: "Knowledge from the life-world shall be blended with scientific knowledge"⁹⁰

This also relates to a more general imagination of a need to change ways of producing knowledge:

"If science conceives itself as part of public life, it can play a significant role in decision processes. It can help to prepare decisions by linking knowledge and filtering out issues for making subsequent decisions if necessary. In addition, it is predestined to direct society's view to certain areas that it considers important."⁹¹

Science in this quote is supposed to become part of the public, i.e. take part in decision-making processes. Through the particular constitution of problems as possible future threats and the related **epistemic re-ordering** simultaneously certain collectives are stabilized and thus a **social re-ordering** takes place⁹²: Austria as a particular entity and together with it the community of transdisciplinary sustainability researchers that are supposed to deal with the problems depicted in the program documents.

Let us start with Austria: in the proVISION imaginary a particular imagination of Austria is stabilized and at the same time a relation between global problems and their local effects is established. In this sense, climate change is a global problem that does not affect Austria and its citizens right now. The effects of global warming, however, might lead to severe problems e.g. for Austrian winter tourism due to lack of snow.

However, the threatening global developments and their effects have not yet reached Austria, prevention is still possible. This is also clearly visible in the pictorial material that is used on the proVISION website.⁹³ The pictures below are taken from this website

⁹⁰ proVISION unterwegs. Accessed April 20, 2013. http://www.provision-research.at/proVISIONunterwegs/dl/ausstellung/080724_Programmtrailer.mp4; Transl. T.V. - "Es soll lebensweltliches Wissen mit wissenschaftlichen Wissen verschmolzen werden"

⁹¹ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

⁹² This argument is developed by my colleagues and myself in a similar fashion in Igelsböck J, Felt U, Schikowitz A, Völker T (2011): Between Entanglement and Purification: Participatory Research Imagined and Practiced, Presentation@Annual Meeting of the Society for Social Studies of Science (4S), 2-5 November 2011, Cleveland, USA

⁹³ proVISION website. Accessed February 14th, 2012. <http://www.provision-research.at/>

and show Austrian landscapes that are not yet touched by problems such as climate change or scarcity of water resources. We see beautiful lakes and rich green valleys and grassland. These landscapes are mostly not even touched by civilization, and if civilization is visible it is in the form of people enjoying nature or technologies that can easily be framed as being part of a sustainable way of life such as windmills.



Illustration 2: Pictures of Austrian landscapes taken from the proVISION website

What we see is thus an imagination of Austria completely free of the threats described in the proVISION documents. And this difference I think is quite telling. Because what is pictured here can be understood as what Jasanoff and Kim describe as “attainable futures” (2009: 120) with the main difference that these pictures sort of show the present and the future simultaneously; a future that is mainly reflected in terms of a conservation ideal. This means that the present Austria as imagined by policy makers is green, healthy and free of problems. This imagination of the present, however, is at the same time an imagination of an attainable future. Austria is supposed to stay this way, or as proVISION puts it, this Austria needs “protection”⁹⁴ and “responsible care”⁹⁵. Therefore, these pictures might also show an imagination of Austria after the current threats have been managed. It is also present at various official occasions or project meetings, where Austria is always presented as a particular green country in comparison to others. Yet this green country is endangered as I outlined above. It is a fragile future that is depicted here and thus this temporality differs from the one present in the program documents of proVISION’s ‘partner programme’ TSD where the relation of present and future appears to be more stable.

Together with the problems described in this way these visualizations can be read as an imaginary of ‘protecting’ Austria from the grand global challenges or when the local is forced to find an articulation with global change to adapt “to climate change and its consequences”⁹⁶ it says on the proVISION website. The threats emerge from and have become visible in other places but may reach Austria in the future unless countermeasures are taken right now. Thus, temporal and spatial aspects are entwined in the constitution of Austria and its landscapes that need protection from threatening environmental phenomena. Austria (and its ‘green’ landscapes) shall be preserved as it is right now for the future.

In this way the problems that are depicted in the proVISION imaginary are constitutive for a second collective: transdisciplinary sustainability researchers and their partners. In the introductory quote to this chapter one of the aims of proVISION is described as *making knowledge available*. This need to make knowledge available to a broad spectrum of heterogeneous actors is closely related to the idea that contemporary

⁹⁴ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

⁹⁵ Ibid.

⁹⁶ Ibid.

problems can only be solved on the basis of knowledge. Knowledge produced in traditional ways by science is no longer considered to be up to the task. The *we* that needs to *investigate provision* in the quote above thus refers to a collective of researchers and non-scientific partners. Thus, one important idea in the program is that the knowledge in order to be available needs to be produced by scientists and so-called “non-scientific partners”⁹⁷ together. This idea is clearly visible in the 2nd call of the program when criteria for the evaluation of projects are outlined. One of these criteria is the number of so-called ‘Praxispartners’⁹⁸ (from now on PP) that are collaborating in the project. The program even articulates guidelines concerning the overall number of PPs that shall become part of the projects of the second call (2nd call: 10). So the collective of the transdisciplinary researchers consists of researchers from different disciplines and PPs. But what exactly are PPs and how are they imagined to contribute to the projects?

“Scientific work is carried out with non-scientific partners also involved in generating knowledge by contributing their way of approaching problems, expertise and experience to research, thus maximising efficiency.”⁹⁹

The quote above, although speaking about *non-scientific partners* and not explicitly mentioning the term Praxispartner, indicates a basic understanding what these actors from social reality are supposed to bring into transdisciplinary projects. A PP in this understanding is an actor from a certain domain outside academia that holds a particular kind of *expertise and experience* concerning his or her snippet of reality. This comes with a certain way of *approaching problems* that supposedly differs from scientific approaches. Whereas in the quote above the area outside academia is not further described, the program is more specific about where the non-scientific actors are coming from in other places. They can come from different areas such as “schools, museums, authorities, business companies” (BMBWK, 2005: 5). Additionally, collaborations with “interest groups, with artists, with media, with different publics” (ibid.) are envisioned. Interestingly in the quote above the aim of integrating PPs is described as *maximising efficiency*. This can relate to dealing with the problems at hand, thus contributing to the overall goals of *adaption* and *protection* as depicted in the initial

⁹⁷ Ibid.

⁹⁸ The term ‘Praxispartner’ that is used synonymously with the notion ‘extra-’ or ‘non-scientific partner’. It refers to actors that come from outside of science, the so-called ‘Praxis’ (the distinction between practice and theory resonates in this term) and are supposed to collaborate as partners of the researchers in proVISION-funded projects.

⁹⁹ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

quote. Efficiency, however, can also be related to the objective of *making knowledge available*. In this reading the underlying model of science society relations is the one where science produces knowledge and actors from social reality respectively PPs are integrated for matters of knowledge transfer. This reading is also present in program documents when transdisciplinarity is described as “[i]mplementing the results in practice” (ibid.), which is supposed to be “part of the project work” (ibid).

The idea of integrating non-scientific actors also relates to the concern, that scientific knowledge is not sufficient for dealing with contemporary problems. proVISION assumes that scientific knowledge is necessarily uncertain and that therefore values are needed as a basis for decision making. The future in this sense

“relies on its members’ joint decisions concerning the question of how they want to live, a question we must keep asking ourselves.”¹⁰⁰.

In this model science provides uncertain knowledge whereas non-scientific actors are integrated in knowledge production to bring in values. A different imagination of knowledge is visible here: knowledge that shall explicitly be value-laden in contrast to more ‘traditional’ scientific knowledge that is objective and detached, however imbued with uncertainty. Again, the *we* in this quote is not further defined, which I think not only addresses researchers and PPs, but additionally includes the funding scheme and the program coordinators as well as the ministry itself into a collective that needs to care for the future of society and thus aims to establish a particular imaginary about science society relations. E.g. Johannes Hahn, former Minister for Science and Research, also encourages the need for a more open way of producing knowledge when he states “Science can only be successful when it is happening with the people”¹⁰¹. The future in this model is an open one that does not seem to be too close. *Members* of society are able to make *joint decisions* about *how they want to live*. This idea presupposes that there is something to choose from and thus it differs e.g. from lock-in narrations about the future.

In an interesting way the guiding imaginary of proVISION performs at the same time integration and separation in different stories about the actors and collectives that are doing scientific work and are at the same time affected by it. While heterogeneous actors

¹⁰⁰ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

¹⁰¹ proVISION unterwegs. Accessed April 20, 2013. http://www.provision-research.at/proVISIONunterwegs/dl/ausstellung/080724_Programmtrailer.mp4; Transl. T.V. - “Wissenschaft kann nur erfolgreich und nachhaltig sein, wenn sie mit den Menschen passiert”

are supposed to take part in knowledge production, tasks and duties seem to be separated on different levels. In the following I will elaborate on this the idea of integration and values and explore questions related to a re-distribution of responsibility.

5.4. Re-distributing Responsibility

As I showed above the need for new ways of producing knowledge is narratively constructed by referring to particular problems; problems that are novel, more complex and threatening on a global scale. In order to deal with these “grand challenges of our time” (Lund Declaration) knowledge needs to be produced differently than before.

This also means that relations between science and society are re-ordered in very particular ways on different levels, epistemic, moral and social. Key in re-ordering these relations are ideas about the **distribution of responsibility**. On a policy level the notion of ‘Responsible Research and Innovation’ (RRI) is currently gaining some momentum¹⁰². Owen and his colleagues claim that science no longer can be content with being ‘in’ society. Science needs to produce knowledge ‘for’ society ‘with’ society (Owen, Macnaghten, & Stilgoe, 2012). Such questions concerning the responsibility of science in governing the development of their work have been issue for debate for a long time. They are framed e.g. as ‘unintended’ side effects of technologies in environmental discussions where policy makers with the support of scholars produce ever new ideas of how to govern emerging (bio)technologies can be achieved (Jasanoff, 2005; Rose, 2001; Tutton, 2011). Different versions of technology assessment or research concerned with the ethical, legal and social implications of technoscience are probed in order to find ways of dealing with the responsibilities of science towards society in more or less participatory ways (Barben et al., 2007; Guston & Sarewitz, 2002; A. Rip & Kulve, 2008).

In proVISION science-society relations are re-ordered on a moral level through narrations about the distribution of responsibility. In these stories different areas of society are distinguished and particular relations and mobilities between these spheres are imagined.

¹⁰² This is visible e.g. on a European level in the framework program ‘Horizon 2020’ where a demand for a changing relation of science and society is also framed as ‘Responsible Research and Innovation’ as part of the program section ‘Science with and for Society’: Horizon 2020 website. Accessed May 30, 2014: <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society>

The proVISION narrative starts from the assumption of an anthropogenic causation of environmental issues. Humankind is responsible for a global environmental crisis:

“Internationally the insight is established that humankind causes a global environmental crisis and endangers its livelihoods in the long run”. (BMWF, 2007: 3)

Building on this, it is argued that humankind can also be held responsible (and regarded as able) for dealing with this global crisis. In that sense, one of proVISION’s core concerns is described as “making knowledge available for [...] responsible use of natural and industrial resources”¹⁰³ in the program’s mission statement. This describes the idea that a particular kind of knowledge is needed for acting responsibly regarding environmental issues. “How can we take a responsible approach to tackling climate change and regional development? [...] What kind of science culture does a sustainable society need?”¹⁰⁴ are among the questions projects that want to get funded within this framework are supposed to deal with. Ideas of new modes of knowledge production are thus related to ideas about a new distribution of responsibility as a quote from the Austrian strategy for research for sustainable development exemplifies:

“Research and innovation have a central role in supporting a sustainable development. For doing so science needs to strike new paths and e.g. collaborate with actors from outside the science system.”¹⁰⁵ (Paula et al., 2004: 5)

The *central role* of research and innovation lies in *supporting* sustainable development. This, however, goes beyond merely providing knowledge, which is understood as being opposed to *new paths* and no longer regarded as sufficient. These new paths are leading away from the so-called *ivory tower* as one of the central demands within the proVISION program documents is that science is supposed to leave the ivory tower:

“Sustainability research must go beyond the ivory tower and needs to maintain a dialogue with society. Going from the academic system to social reality however means recognising social actors as equal research partners, adapting scientific habits and scientific language accordingly. The sustainability dialogue also means that researchers

¹⁰³ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

¹⁰⁴ Ibid.

¹⁰⁵ “Forschung und Innovation haben eine zentrale Rolle bei der Unterstützung einer nachhaltigen Entwicklung. Dazu muss die Wissenschaft auch methodisch neue Wege gehen und z.B. mit Akteuren außerhalb des Wissenschaftssystems kooperieren.” (Paula et al., 2004: 5)

have a duty to integrate the social component in scientific action right from the outset.”¹⁰⁶

The picture of the ivory tower thereby implicitly refers to an imagination of traditional science as detached from society. Put simply this imagination goes something like this: Science in the ivory tower is a place where objective, universal knowledge is produced and nobody cares whether this kind of knowledge is of any use for society. The quote above nicely shows how in stories about the ivory tower two spheres are distinguished: the *academic system* on the one side, *social reality* on the other. In contrast to science social reality is depicted as a sphere that is somehow more ‘real’ and inhabited by actors that have superior access to this reality. This sphere is also referred to as the realm of ‘practice’. Whereas science is supposed to produce knowledge, its application or ‘social action’ as it is put in the proVISION narration is clearly associated with *social reality*. In this distinction between different spheres that need to be *bridged* still more traditional ideas of science as theoretical and detached from social processes and social life as imbued with interests and values are re-imagined and stabilized.

In the quote above we can see a moral reordering. Science no longer can retreat to this safe place free from questions of societal responsibilities; a place in which researchers produce knowledge and leave it to politics to ensure that it becomes relevant for society. Researchers engaged in sustainability issues are supposed to assume *a duty*, namely going out into social reality and engaging with so-called *social actors* (which researchers accordingly are not). Based on this normative claim researchers are expected to somehow go beyond this assumed distinction and get engaged in a *dialogue* with society. Thus, the general mode of interaction between science and society imagined by proVISION is dialog. This idea is also rehearsed by one of the program coordinators who states: “The projects have to go out, enter into a dialogue with people outside of science.”¹⁰⁷ Talking about a dialog implies the idea of (at least) two *equal* partners engaged in a conversation. In the imagination of proVISION however, such notions of equality are often accompanied by ideas of hierarchy between science and society. This is especially visible when it comes to imaginations concerning mobility. Science is imagined to be the mobile part of the dialog; it is able (and obliged) to *go out* towards

¹⁰⁶ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

¹⁰⁷ proVISION unterwegs. Accessed April 20, 2013. http://www.provision-research.at/proVISIONunterwegs/dl/ausstellung/080724_Programmtrailer.mp4; Transl. T.V. – “Die Projekte müssen hinausgehen, in den Dialog treten mit Menschen außerhalb der Wissenschaft.”

society. This is also visible in narrations about localizing research and *selecting* particular regions:

“Regions should preferably be selected where several projects or programmes are present and could possibly be linked.”¹⁰⁸

Scientific actors are supposed to *select* particular regions for collaboration. This selection then is not only guided by a rational of problem-solving. Additionally, inner-scientific criteria are important such as possible overlaps and the opportunity of making *links* between different projects. So while science is imagined as being active society on the other hand is hardly moving at all. Motionless and unchanged it stays where it is awaiting (knowingly or not) science to come and solve or prevent its problems.

However, as science is depicted as the mobile part in this relation it needs to ‘adapt’ (BMBWK, 2005) its ‘habits’ (ibid.) so that it becomes useful for society. In the narration of proVISION, science has to show what it has to “offer”.¹⁰⁹ Additionally, it needs to think about “what is expected of society”.¹¹⁰ This indicates a changed understanding of imaginations about science and society relations: the authority of scientific knowledge is no longer given. Science is in a position where it needs to constantly prove how it can be useful for the so-called ‘lifeworld’:

“In social reality science gets roped into these distribution battles; it engages, becomes political, needs to legitimize itself in unfamiliar ways, and becomes effective in the design of societal norms.”¹¹¹ (BMBWK, 2005: 5)

In this quote it becomes clear how the *duty* of going out is simultaneously understood as collaborating with extra-scientific actors. Science is imagined to become *political* and supposed to *engage*. This shall happen not only on a social and epistemic level. The requirement to leave the ivory tower means to engage on a moral level to intervene in *the design of societal norms*. Thus we see a double movement. Societal actors are supposed to contribute their values to the production of supposedly value free scientific knowledge. But also science needs to *design* norms. Mobility thus is not only a spatial

¹⁰⁸ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

¹⁰⁹ Ibid.

¹¹⁰ Ibid.

¹¹¹ “In der sozialen Wirklichkeit gerät Wissenschaft in jene Verteilungskämpfe; sie mischt sich ein, wird politisch, hat sich in ungewohnter Weise zu legitimieren, wird wirksam in der Gestaltung gesellschaftlicher Normen.” (BMBWK, 2005: 5)

feature. It also relates to the ability of science to change and adapt to different conditions in *social reality*.

This overall responsibility to go out and collaborate with societal actors to support sustainability also rehearses the idea of responsibility on a temporal dimension that is already present in the Brundtland report; namely the idea of being responsible also for future generations:

“Some consume the Earth’s resources at a rate that would leave little for future generations”(World Commission on Environment and Development, 1987)

At a proVISION public relations event the back then minister for science and research Johannes Hahn states

“I think in our actions as persons with political responsibility we should always think about what this means for the decision-making possibilities of our children and our children’s children.”¹¹²

Producing knowledge in *provision for nature and society* thus refers to a responsibility for future generations that needs to be considered and incorporated into knowledge production processes. However, the program explicitly highlights that there are no clear ideas about how exactly this *going out* and *engaging* shall be done. Issues that relate to concrete methods are framed as a ‘key issue’ of the program and articulated as a question:

“How can scientific knowledge and social action be combined?”¹¹³

Knowledge and *action* are presented as two seemingly distinct elements in the quote above. Still the distinction is stable but a *combination* of the different actors related to these distinct spheres of knowledge and action is depicted as attainable. For this combination different ways are imagined as possible in the program documents. Next to abstract concepts like transdisciplinary collaboration there are also more practical and already well-established formats like e.g. “public participation”¹¹⁴ (BMBWK, 2005) as potential modes of *going out*.

¹¹² proVISION unterwegs. Accessed April 20, 2013. http://www.provision-research.at/proVISIONunterwegs/dl/ausstellung/080724_Programmtrailer.mp4; Transl. T.V. - “Ich glaube wir sollten in unserem Handeln als politisch Verantwortliche immer drüber nachdenken, was bedeutet das für die Entscheidungsmöglichkeiten unserer Kinder und Kindeskinde.”

¹¹³ proVISION website. Accessed April 20, 2013. <http://www.provision-research.at/cms/scripts/active.asp?vorlage=15&id=62&rubrik=62>

¹¹⁴ “Öffentlichkeitsbeteiligung“ (proVISION Prinzipien)

Summing up, science is ascribed a duty or responsibility to contribute to efforts concerning sustainable development. This support shall enable humankind to avoid self-inflicted environmental problems to actualize their threatening potential. In order to act responsibly towards our environment science has to get out of the ivory tower and engage in a dialog with social reality. Actors from outside academia also have to meet particular *expectations*: they are supposed to contribute values and their particular (local) experiences. Through these stories of distinct areas and different mobilities and simultaneously power relations are rehearsed and stabilized. Science is depicted as the active, mobile part that has to engage with societal actors and thereby also undergo internal changes. It has to provide its knowledge and get it ready for dialog with a somehow passive 'life-world' that stays in its place and seems to await instructions.

What we see here is how through the socio-scientific imaginary guiding proVISION science-society relations are being re-ordered on social, epistemic and also moral levels. Whereas the image of the ivory tower refers to an underlying imagination of a linear model of innovation (Godin, 2006) - according to which science is producing knowledge independently and innovations for society are the consequence of this knowledge and in this way does not take responsibility for the knowledge produced - the attempt to establish an alternative imaginary is clearly visible in these narrations. In this imagination of attainable science-society relations the distribution of responsibility appears to be changing as scientists are ascribed a *duty* to engage more actively in *making knowledge available*.

However, as we have seen proVISION also refers to a more traditional imaginary of doing research when classical hierarchies are being re-produced when scientists and researchers are imagined as active parts that have to sort of empower extra-scientific actors. This nicely shows the messy business of trying to stabilize a particular imaginary against the background of another, more dominant one.

5.5. Questioning our 'Zukunftsfähigkeit'

Jasanoff and Kim state that they focus on imaginaries "to show how different imaginations of social life and order are co-produced along with the goals, priorities, benefits and risks of science and technology." (Jasanoff & Kim, 2009: 141) Therefore, after pointing out how environmental problems are temporally constituted and how thinking about problems in this way also contributes to social as well as epistemic and

moral re-orderings of imaginations concerning the relation between science and society, it is now important to ask how risks are framed. What is imagined to be at stake in the imaginary guiding proVISION?

Debates concerning the framing of risks often circle around the notion 'Zukunftsfähigkeit'. The term is often used in sustainability policy in German-speaking countries as e.g. in the German translation of the Agenda 21 policy document, a product of the United Nations Conference on Environment and Development (UNCED), which was held in Rio de Janeiro in 1992. In this document it is a translation of sustainability, e.g. when writing about "sustainable use of factors of production" (UNCED 1992: 2.14.c). In contrast to the much more common translation 'Nachhaltigkeit', Zukunftsfähigkeit in German is interesting because it explicitly refers to ideas about particular (attainable) futures. The term is widely used in sustainability contexts and beyond. There are foundations such as e.g. the 'Stiftung Zukunftsfähigkeit'¹¹⁵ or research institutes that engage in issues of Zukunftsfähigkeit from a demographic perspective¹¹⁶. The notion is not only used in sustainability contexts but also applies e.g. to organizational structures of dental offices.¹¹⁷

The term focuses on the ability or capability to build, create or reach certain futures, utopian as well as dystopian. However, the use of the notion in sustainability research contexts poses several questions: who or what can be future-able and who can or even should make somebody or something zukunftsfähig? Are there particular practices that are future-able? Is it something that can be learned or achieved? What are the features of future-ability? And of course the question that relates to the stakes and the way risks are framed: What happens if we fail to become zukunftsfähig?

The term Zukunftsfähigkeit appears in proVISION's first call for projects when the goals of the program are outlined. In a reference to Austria's national strategy for research for sustainable development (FORNE) one of the goals of proVISION is described as "design of future-able natural and social systems" (BMBWK, 2004: 6). These systems are further differentiated into "functional natural systems" (ibid.), "optimized social systems" (ibid.), "resource efficiency" (ibid.), "usage of renewable natural resources" (ibid.), and "user-

¹¹⁵ Stiftung Zukunftsfähigkeit. Accessed April 28, 2013. <http://www.stiftungzukunft.de/>

¹¹⁶ Institut für demografische Zukunftsfähigkeit- Accessed April 28, 2013. <http://www.demografie.org/>

¹¹⁷ 'Über die Zukunfts-fähigkeit neuer Modelle.' Accessed April 28, 2013. <http://www.chance-praxis.de/aktuelles/ueber-die-zukunftsfaehigkeit-neuer-modelle-ein-bericht-aus-leipzig-die-erfolgreiche-praxiseroeffnung-von-dr-z/>

optimized systems solutions” (ibid.). As we can see future-ability is closely related to notions like functionality, optimization and efficiency, thus using quite utilitarian terminology. What is depicted thereby is a future that, like a machine, consists of well-oiled elements (that are of course renewable).

The FORNE strategy, providing the frame for the funding scheme proVISION, puts Zukunftsfähigkeit prominently in its introduction:

“Future-ability is becoming a central societal and political question in the face of global trends like climate change and the increasing consumption of resources and energy sources and the development of global population.” (Paula et al., 2004: 4)

The notion Zukunftsfähigkeit in this quote relates to *trends* like climate change and scarcity of resources and directs attention to what is at stake. It does so as Zukunftsfähigkeit is not secured, much more current developments make it a *central societal and political question*. The Austrian strategy thus stresses the importance of thinking about our Zukunftsfähigkeit. The collective referred to and thus possibly affected by these trends are not local communities, the question of future-ability possibly affects a *global population*.

Being zukunftsfähig does not only refer to (global) environmental issues. In sustainability research narrations referred to by proVISION the term depicts both **being economically successful as well as scientifically excellent**. This is described as yielding a ‘double dividend’ (BMBWK, 2004), an idea that is already present in proVISION’s predecessor program KLF. In an evaluation report on the program different kinds of innovation are described as necessary pre-condition:

“For the future-ability of a country both economic-technological innovations as well as societal innovations are essential for handling political tasks.”¹¹⁸ (Huettl, R. et al. 2003: 7; transl. T.V.)

The innovations depicted in the quote above relate to imaginations about Austria’s future as a so-called ‘innovation leader’ (Austrian Federal Government. 2011). Zukunftsfähigkeit in this sense frames sustainability research as possibility to strengthen Austria’s position as innovation leader:

¹¹⁸ “Für die Zukunftsfähigkeit eines Landes sind sowohl wirtschaftlich-technologische Innovationen als auch gesellschaftliche Innovationen im Umgang mit den politischen Aufgaben erforderlich”

“Based on the stage of development already reached Austria plays a leading role in sustainability research. To expand and internationally connect these strengths is an essential objective of Austrian science and innovation policy”¹¹⁹ (Paula et al., 2004: 5)

This idea of Austria being a leader when it comes to sustainability research relates to the story I outlined above, in which the country is described as extraordinarily ‘green’ and threatened from the outside by global problems. However, this reading of the term *Zukunftsfähigkeit* is a quite positive one. There are global challenges that can be managed if societal and political actors work together. Dealing with this challenges means simultaneously increasing scientific and economic excellence. This story about future-ability performs a particular model of science-society relations that rehearses imaginations slightly different from the ones we encountered so far in this chapter: science strives for excellence and scientific knowledge production leads to innovation in the area of sustainability. In this sense, science and innovation are closely entwined with economic prosperity. Knowledge production is not an issue here and epistemic orderings remain stable. This also fits together well with the machine-like terminology I mentioned above.

Besides positioning sustainability research as a means for strengthening Austria’s role as an innovation leader in the area of sustainability (research), the question of future-ability can also be read in a more **fatalistic** way. When future-ability is a ‘central question’ this leads to thinking about what might happen if we fail to become *zukunftsfähig*. In proVISION’s first call for projects the starting point is the belief that humankind is threatening its own “livelihood in the long run” (BMBWK, 2004: 3). Also, the program focuses on taking “the vulnerability of society and nature” (BMBWK, 2004) into account. In talking about *livelihood* and *vulnerability* *Zukunftsfähigkeit* concerns the survival of humankind. At stake in this narration therefore is the (global) future of life on earth.

Imaginations similar to this can already be found in the Brundtland Report:

“We are unanimous in our conviction that the security, well-being, and very survival of the planet depend on such changes, now.” (World Commission on Environment and Development, 1987)

¹¹⁹ “Aufgrund des bereits erreichten Entwicklungsstandes spielt Österreich heute eine führende Rolle in der Nachhaltigkeitsforschung. Diese Stärken weiter auszubauen und international zu vernetzen, ist ein wesentliches Anliegen der österreichischen Wissenschafts- und Innovationspolitik.” (Paula et al., 2004: 5)

This idea of *Zukunftsfähigkeit* as an attempt to secure the very being of a future is also consistent with a heading of the first chapter in the Brundtland that is entitled “A Threatened Future” or with other statements like “We must be ever mindful of the risk of endangering the survival of life on Earth.” (ibid.) However, Brundtland refers mainly to political efforts in order to “ensure both human progress and human survival” (ibid.). Participation is envisioned as a part of these efforts in decision-making processes. This is quite similar to narrations concerning *Zukunftsfähigkeit*. However, the imagination of sustainability research within the framework of proVISION additionally focuses on collaborative efforts of science and society in the production of knowledge for (joint) political action.

Such stories about future-ability are often closely related to ideas about possible lock-ins. Stories about lock-ins basically describe the idea that once particular decisions are made or if we fail to make the right decisions at the right moment a chain of unintended effects will unfold that can’t be stopped. In order to become *zukunftsfähig* or to prevent particular futures from becoming real, actions are needed right now. Our *Zukunftsfähigkeit* is continuously at stake and imagined as quite fragile and unstable. The future narrated here is possibly multiple and a function of actions in the present; every moment is ‘decisive’ in bringing one particular future on track, “[i]n every moment decisions are made for or against the better state” (BMBWK, 2005). This imagination is closely related to the concept of ‘irreversibility’ that is already present in the Austrian National Environmental Plan¹²⁰:

“This is clear evidence that such a development, which involves fundamental and in part irreversible changes in the availability of the natural foundations supporting all life, is untenable over the long term.” (NUP: 1.2.)

Put this way the future appears as a direct consequence of our actions in the present and thus also becomes governable. Another variation of the path dependency figure is the example below, taken from the Brundtland Report:

“The Commission has noted a number of actions that must be taken to reduce risks to survival and to put future development on paths that are sustainable.” (World Commission on Environment and Development, 1987)

¹²⁰ Austria’s ‘Nationaler Umweltplan’. Accessed April 30, 2013. <http://www.cedar.at/data/nup/nup-english/index.html>

These statements both call for putting developments on certain ‘paths’ in order to avoid going extinct. Combining spatial and temporal metaphors the quote indicates a pre-established structure that increases the possibilities of particular developments at the expense of others. In doing so, these *paths* lead to other places, the “temporal realm beyond the senses” in as Adam and Groves put it (2007: 3). The imagination therefore is that once developments are on a particular path it is easy to follow them down the road. The particular temporality here is noteworthy: developments that are taking place in the future (therefore not now) need to be put on paths now (which is the present). Referring to the idea of path dependency thus makes possible a narration about the future as a direct consequence of actions right now. The present as the time to act as well as knowledge about possible effects of these actions thus gain importance and legitimacy. However, the present is not clearly defined, which means that it is not clear when paths are taken and further action becomes unnecessary. This option simply does not exist. In this sense paths can be continuously re-paved *in every moment*. Stories about the risks and path dependency respectively lock-in thus combine linear and non-linear temporalities.

As I attempted to show the use of the notion *Zukunftsfähigkeit* nicely shows how risks are framed in two interrelated ways and how that is consequential on a social and epistemic level. First, becoming *zukunftsfähig* refers to a particular relation of science, innovation and economics. Sustainability research shall provide scientifically excellent results, which will lead to innovations that will strengthen Austria’s economic position and help establish the country as an innovation leader. Additionally, quality of life will be improved:

“Research for sustainable development aims for increasing the competitiveness of both the science and the economic system and simultaneously to improve living- and environmental conditions”¹²¹ (Paula et al., 2004: 8)

Second, environmental problems like climate change or scarcity of resources threaten the livelihood on a global scale. In this sense *Zukunftsfähigkeit* refers to the possibility that humankind is in danger of having no future at all. Moreover, imaginations about the risk of possible lock-ins suggest that we need to put developments on *paths that are*

¹²¹ “Forschung für nachhaltige Entwicklung zielt darauf ab, die Wettbewerbsfähigkeit des Wissenschafts- und Wirtschaftssystems zu erhöhen und gleichzeitig die Lebens- und Umweltbedingungen zu verbessern” (Paula et al., 2004: 8)

sustainable right now or it might be too late. On an epistemic level – as I showed above – this leads to an emphasis on producing knowledge about the future respectively on potential outcomes of our actions in the present. Knowledge about what might be the right steps for (hopefully) granting survival on earth and – as a side-effect – stabilizing Austria’s position as a pioneer in sustainable living styles and the competitiveness of its science and economy. Thus, with its *Zukunftsfähigkeit* at stake, humankind is supposed to develop models of acting and producing knowledge about possible future outcomes of our actions in the present.

5.6. Discussion

I set out with the aim to explore collective imaginations of science-society relations in sustainability research in Austria and the imaginative resources that are drawn on in sustainability policy. In doing so I asked how ideas about “attainable futures” (Jasanoff & Kim, 2009: 120) or “preferred ways of living and social order” (Felt, forthcoming: 3) are mutually constitutive with particular ideas about science and modes of producing knowledge. This meant exploring imaginations about knowledge production and distribution in sustainability research and carving out a particular socio-scientific imaginary that is guiding sustainability research as a collective imaginative resource: **a socio-scientific imaginary of preserving and preventing**. Austria is imagined as an extraordinarily green country; a place that is at the same time subject to global developments such as climate change and clearly distinct and potentially sealed off. This imaginary simultaneously addresses attainable futures of society and futures that need to be prevented. It is about preserving a present status in the face of potential effects of global environmental problems. This is visible e.g. in ideas like ‘adaption’ or ‘mitigation’ as future-oriented practices that are central to proVISION. These are ideas mainly concerned with conservation. Even when change is promoted as e.g. in an improvement of the quality of life or further economic growth this merely addresses the stabilization of a current process; it is thus the status quo with an added temporal dimension. Thus, the imaginary guiding proVISION at the same time adheres to “desirable and desired futures” (Jasanoff, forthcoming: 6) and the ‘monsters’ (Dennis, forthcoming) that need to be contained. The interesting thing is, and that’s why I am talking about a socio-scientific imaginary, these futures shall be achieved through the production of knowledge. In order to keep Austria the way it is – extraordinarily ‘green’ and an ‘innovation leader’ in sustainability issues – a particular relation of science and society is needed *making*

knowledge available for political action. Knowledge thus is considered key for a livable and prosperous future. In order to preserve and prevent knowledge needs to be produced and circulated in new ways. Science needs to leave the infamous ‘ivory tower’. New relations between science and society are called for. Epistemic, social and moral re-orderings thus are co-constitutive.

This imaginary is already visible in the institutional set-up of the funding scheme proVISION attempts of establishing participatory processes are visible. At the same time inner-scientific boundaries are drawn, according to which social sciences are responsible for producing transdisciplinary knowledge, whereas simultaneously natural and engineering sciences are ‘free’ from such requirements. This practice of material and symbolic boundary drawing simultaneously stabilizes a difference between two imaginaries: a dominant and already established imagination of knowledge production and transfer and an imaginary promoting more ‘democratic’ or ‘inclusive’ ways of producing knowledge that is performed as an alternative and is still in need of stabilization. This need directs attention to the fact that imaginaries “can originate in the visions of single individuals” (Jasanoff, forthcoming), but in order to become imaginaries they need to be collectively adopted. They need to be publicly rehearsed by actors and gain stability through being institutionally anchored. At the same time, however, they are beyond the control of single actors. They are stabilized through a broad network of human and non-human actors. This stabilization does not necessarily through intentional acts of working on an imaginary. Still, as especially Felt points out work is needed to ‘nourish’ an imaginary. Therefore, “it is important to trace the process of developing this imaginary across time” (Felt, forthcoming: 21). ProVISION in this sense is one instance in the process in which this socio-scientific imaginary is being assembled and stabilized. On a policy level I described the predecessor program KLF and framework policies like FORNE as other instances in which the imaginary and its development is visible. Other examples are attempts of universities to re-order science-society relations. Exemplars for such attempts are the so-called ‘research platforms’ of the University of Vienna¹²² or the ‘research campuses’ in Germany.¹²³

¹²² Information website of the University of Vienna concerning interdisciplinary research platforms. Accessed August 19, 2014. <http://rektorat.univie.ac.at/en/research-platforms/>

¹²³ Website for the RWTH Aachen. Accessed August 19, 2014. <http://www.rwth-aachen.de/cms/root/Die-RWTH/Aktuell/Pressemitteilungen/September/~cwzc/Doppelter-Sieg-fuer-RWTH-bei-BMBF-Foerderung/?lidx=1>

Thinking about the idea of multiple contending imaginaries as brought up by Jasanoff and Kim (2009) the set-up with two *partner programmes* points to the fact that we are dealing with at least two competing imaginaries that are simultaneously guiding Austrian research funding. On the one hand there is the more 'traditional' idea of science producing (technoscientific) knowledge in experimental settings for subsequent application (Daston & Galison, 2007; Harding, 1991; Shapin & Schaffer, 1985). This imaginary is related to scientists being (mostly technical) experts detached from society producing technoscientific knowledge. This applies to the so-called partner program of proVISION, 'Technologies for Sustainable Development'.

Against the background of this more traditional and very powerful idea of science, policy makers and proVISION program authorities contribute to stabilizing a different vision of science-society relations. This imaginary calls for a different way of producing and circulating knowledge as I have shown above. As I will show in the subsequent chapters, this tension is also present in research projects funded by proVISION, when researchers who on the one hand willingly buy into the socio-scientific imaginary guiding proVISION on the other hand draw on more traditional imaginative resources for making sense of the program requirements, thereby carving out their own spaces for retreat.

Here then lies a difference to other work done on imaginaries (Jasanoff & Kim, 2009; Pickersgill, 2011). ProVISION as a funding scheme can be regarded as an imaginary in the making; as an attempt to create and stabilize an imaginary – even though in a niche - against the background of a way more dominant imaginary. It is the attempt of a particular constellation of actors to establish an alternative vision of how to produce knowledge. By trying to materialize this vision they contribute to the stabilization of an alternative socio-scientific imaginary. In the case of proVISION these actors are to different degrees research funding authorities together with researchers engaging in this program. Trying to establish such an alternative, however, is a tricky business. One of the main tensions that these actors need to deal with has to do with authority and legitimacy. Although aiming to establish an imagination of science-society relations that opposes traditional views in many regards, the actors engaged in this endeavor still need to refer to the traditional imaginary of science and research in order to remain their authority.

After describing the institutional set-up of proVISION I looked at the problems dealt with in sustainability research. I highlighted the temporal constitution of environmental

challenges and argued that the problems envisioned in Austrian sustainability research are to a certain extent problems to come. Problems that have not yet reached an environmentally friendly country and its extraordinarily 'green' and 'natural' landscapes. This is important as thinking about the problems 'of our time' as novel and complex is closely related to calls for a new mode of producing knowledge. In doing so, proVISION refers to concepts such as 'mode 2 science' or 'post-normal science' as well as to authors related to transdisciplinary research networks and emphasizes the need for changes in the relations of science and society in producing knowledge for sustainable development. In conceptualizing problems like this ideas of preparedness and acting before it is too late are also reinforced.

This constitution of environmental challenges, however, has consequences when it comes to processes of stabilizing collective imaginations. The particular constitution of environmental problems as possible future threats points to a difficulty of this particular imaginary and climate science and sustainability in general. The studies mentioned above describe to different extents processes of stabilizing sociotechnical imaginaries somehow related to nuclear power. While Jasanoff and Kim talk about the bombings of Hiroshima and Nagasaki, Felt directs attention to the role of the Chernobyl accident in stabilizing a particular Austrian imaginary:

"It was the Chernobyl accident in April 1986 that finally stabilized the anti-nuclear position, which was to gradually become an integral and legitimate part of political culture. The debate shifted from *potential* risks to accounting for the *actual* casualties and massive consequences that this accident had for people and the environment across Europe." (Felt, forthcoming: 10)

In a similar manner Grundmann and Stehr (2011) describe the discovery of the so-called hole in earth's ozone layer as particularly important in the process in which scientific knowledge became powerful and eventually lead to political action. They describe it as an "Alarmsignal" (ibid.: 197) that changed the framing of the problem.

What becomes apparent when comparing these arguments to the imaginary that becomes manifest in proVISION is that debates on climate change and sustainability notoriously lack such incidents that would contribute to the stabilization of the imaginary as put forward within proVISION. Instead of waiting for an environmental catastrophe, the imaginary of preserving and preventing relies on a particular way of producing and distributing of knowledge that focus on participatory production of

knowledge that is supposed to allow for political action on the basis of uncertain knowledge. As M. Callon, Lascoumes, and Barthe (2009: 109) put it, “[i]f the end justifies the means, only debate can justify the end.”

In this sense, collectively shared imaginations of novel problems and the science needed to deal with them leads to changes in the ideas about the responsibilities of science. It is no longer sufficient for science to produce knowledge claims in its *ivory tower*. Rather scientists are supposed to *go out* and engage in political decision-making processes. This moral re-ordering goes along with a changed understanding of the future. Rehearsing ideas already present in the Brundtland report the future is thought of in terms of ‘care’ (Adam, 1998; Adam & Groves, 2007; Felt, Barben, et al., 2013; Anemarie Mol, 2008). Thinking about transdisciplinary sustainability research in terms of care touches on an issue central to the socio-scientific imaginary guiding proVISION. It directs attention to changing understandings of actors producing, circulating and using knowledge and thus to changing ideas about knowledge itself; questions about the subjects and temporalities of care. Who is supposed to care for the knowledge produced and for how long? The most intuitive answer to this question is that scientists are supposed to care for the knowledge they produce and engage with the supposed ‘users’ of their knowledge and about its ‘application’. A more implicit imagination related to this claim is that also political actors and the public should care for scientific findings and the supposedly necessary actions that follow. We are thus witnessing a call for a changing relation of scientific knowledge claims and political action and the actors involved.

In this sense, the socio-scientific imaginary I am describing is closely related to what Stehr (2005) thinks of as ‘knowledge politics’. He uses this term to describe practices of regulating and monitoring knowledge production and to direct attention to the issue of scientific knowledge and the conditions of its potential use by particular actors. In this sense the socio-scientific imaginary is strongly linked to changing ideas about the role of the public and its relation to scientific knowledge claims. ProVISION seems to oppose the idea of a linear model of innovation, i.e. the idea that knowledge kind of automatically evolves into applications. Therefore extra-scientific actors are supposed to participate in knowledge production. Thinking of Stehr’s definition of knowledge as enabling social action we can therefore see how a different socio-scientific imaginary is taking shape. Knowledge is not imagined as a fixed entity that is ‘floating’ from one actor to the other. Much more the emphasis is put on locally situated, inclusive practices of

knowing. Extra-scientific actors in this imagination contribute a particular framing of the problems and a particular expertise to knowledge production practices. They are thus no longer imagined as deficient lay persons as in the infamous deficit model but as knowledgeable actors. Sustainability research as presented in the funding scheme proVISION thus entails changes in the way science-society relations and thus the place of science in society is imagined when it comes to conceptualization of problems and to the range of actors and their involvement in producing knowledge. These changes also concern issues of representation, authority and participation.

In standard accounts of science since the 17th century scientists have been regarded as legitimate spokespersons representing nature and working for the greater good (M. Brown, 2009; Shapin & Schaffer, 1985). The issue of representation now is viewed more critically. Scientists are no longer regarded as speaking for nature as STS writing has directed attention to the multiple ways in which science and politics are entwined. Therefore, the role of scientists, experts and policy advisors is also rendered problematic. Extra-scientific actors and actors from 'social reality' need to become part of knowledge- and decision-making practices in order to represent particular regions and communities. This also indicates a shift in the imagination of extra-scientific actors respectively members of 'the public'. They are no longer mere receivers of scientific knowledge but are ascribed a more active role. They are supposed to bring in a different kind of knowledge. They can be thought of as 'intelligent' in John Dewey's sense:

"Persons whose interests have been enlarged and intelligence trained by dealing with things and facts in active occupations having a purpose (whether in play or work) will be those most likely to escape the alternatives of an academic and aloof knowledge and a hard, narrow, and merely "practical" practice." (Dewey, 2004: 148)

Intelligence as understood by Dewey thus directs attention to the ability to act in cases where no scientific consensus is available; to the relation between knowledge that is uncertain and political action; and to the relation between knowledge claims, action and care:

"But this fact only indicates the need of persistent care to see to it that the function of intelligence is invoked to its maximum possibility." (Dewey 2004: 53)

Knowledge and the relations between heterogeneous knowledgeable actors are imagined differently in proVISION. As knowledge is no longer exclusively a set of true

statements but regarded as a process of exchange also knowledge relations are supposed to go beyond temporally restricted encounters.

From this perspective, representation becomes an ongoing process, rather than a series of isolated moments of authorization.” (M. Brown, 2009: 210 et seq.)

Thinking of representation and authority the question then becomes who is now authorized to speak for nature if it is no longer scientists? Who actually gets to represent what and how? Who chooses actors that supposedly represent ‘the real world’? Which kinds of empowerment are taking place and what kind of hierarchies get (re-)inscribed in these practices? Questions like these point to the re-production of power relations within heterogeneous assemblages producing knowledge in participatory research settings. In looking for answers to these questions I will thus follow Brown’s suggestion “that political and scientific authority are intertwined in culturally specific ways” (M. Brown, 2009: 212). Asking how the socio-scientific imaginary that is manifest in proVISION gets translated in various research projects in this sense means looking at how it is translated in particular epistemic cultures and communities. Or as Brown puts it:

“The notion that laypeople should have opportunities for challenging expert claims also raises the difficult question of whether, to what extent, and under what conditions laypeople can actually make such challenges on a reasonable basis.” (ibid.: 218)

Questions concerning who is supposed to participate in transdisciplinary projects also relate to asking what is at stake in this imaginary and how the risks are framed. Therefore, I turned to the notion ‘Zukunftsfähigkeit’ that is used in German-speaking countries as an equivalent for sustainability. Stories related to this notion picture the goal of Austrian sustainability research as stabilizing and extending the country’s standing as innovation leader when it comes to this branch of science. In this way, both excellent science and a prosperous economy are envisioned as a consequence of investing in sustainability research. Failing to become future-viable on the other hand is depicted as a dystopian scenario of destroying natural resources and thus the foundations of (human) life on earth. Being zukunftsfähig in this sense means being able to grant our survival (and the survival of future generations) on earth.

These different re-orderings add up to a socio-scientific imaginary of preserving and preventing as I already stated in the beginning of this discussion. Ideas of preventing

certain futures and in doing so preserving Austria also relates to an imaginary recently described by Felt that centers on ideas of keeping Austria free of particular technologies:

“The refusal of technological options allowed the emergence of another sociotechnical imaginary: one of Austria being an alternative innovation space with at the core a clean energy production through hydroelectric and solar power as well as an organic food culture caring for its environment.” (Felt, forthcoming: 3)

In her study about the imagination of Austria as a country free of nuclear energy Felt directs attention to how this particular idea of what Austria stands for has developed over time and still needs to be publicly affirmed. In doing so, she highlights that imaginaries need to be thought of as changeable and in constant need of rehearsal (ibid.: 17). In a similar manner also the various funding programs concerned with sustainability issues, the statements of policy actors at public events or in the media can be regarded as bits and pieces in the attempt of establishing an alternative socio-scientific imaginary. Austrian sustainability research thus provides a nice site for exploring imaginaries in the making.

Also Jasanoff and Kim do mention multiple imaginaries overlapping and contesting each other on a conceptual level:

“It would be naïve, too, to think that there are unique imaginaries guiding the production of knowledge or knowledge-based technologies in the contested spaces of democratic policymaking. Yet, of multiple contending sociotechnical imaginations at play in any society, some tend to be more durable at the national level because powerful instruments of meaning-making and goal selecting often lie with the control of nation states” (Jasanoff & Kim, 2009: 123)

In their empirical writing, however, there is little talk about such dynamics. Much more they focus on the durability of imaginaries, which seem to be quite stable and once established just prevail shaping national policy decisions. The case of imaginaries in the making calls for focusing on their dynamic features. I assume that these features can be addressed on (at least) two levels. Felt talks about the development and refinement of imaginaries in “gradual, long-term, bottom-up formation, always in need of rehearsal and (re)stabilization.” (Felt, forthcoming: 24) Thus, exploring imaginaries means to direct attention to the “work needed to construct this kind of sociotechnical imaginary, to nourish and keep it alive as well as to naturalize it” (ibid.: 3). This perspective emphasizes a different methodological position: supplementary to asking how

imaginaries are efficacious in guiding policy decisions the moments and instances in which such imaginaries are contested, rehearsed and stabilized need to be dragged to the fore.

However, imaginaries are not only dynamic on a temporal dimension. I would like to stress the dynamic nature of imaginaries by looking at actors and ask how they use particular imaginaries as a resource: how are imaginaries translated in research practices by actors engaged in proVISION-funded projects? How are they reflected and diffracted, contested, rehearsed and stabilized in actual knowledge production? This is quite similar to Felt's approach of looking for imaginaries in group-discussions on Nano-technologies (ibid.: 5ff.).

There is no reason to assume that researchers who are funded by proVISION just passively adopt the imaginations of doing research proposed within the funding scheme. In that sense, I do not understand imaginaries as a stable template guiding research. Much rather, it remains an empirical question how researchers appropriate the ideas of the funding scheme and how they draw on different imaginative resources to make sense of its requirements in their research practices. Similar to what Pickersgill refers to as "highlighting the role of sociotechnical imaginaries within more micro-social processes" (2011: 28) or Felt's approach of looking how citizens refer to particular imaginaries I aim to explore socio-scientific imaginaries as resources that are available to researchers. I will thus ask in the following chapters how researchers funded by proVISION translate the program requirements and thus are guided by, while at the same time re-shaping the imaginary in their futuring practices. In this sense, the research projects provide suitable sites to observe the dynamic traits of socio-scientific imaginaries.

6. Futuring and the Translation of Socio-scientific Imaginaries

The previous chapter focused on the socio-scientific imaginary that is guiding transdisciplinary sustainability research in Austria and on the historical process in which this imaginary was assembled. This imaginary is presented as an alternative to supposedly 'traditional' ways of producing knowledge and highlights the importance of (anticipatory) knowledge for solving contemporary problems. Knowledge about developments on a global level and their potential effects or impacts on Austria is deemed necessary for steering Austria into a sustainable future; the goal is to 'adapt' to the challenges posed by global climate change in the imagination of proVISION. In this way, ideas about desirable as well as dystopian futures together with a conceptualization of the future as shapeable and governable by human actors become central elements of this socio-scientific imaginary. The overall goal is to preserve Austria and its particularly 'natural' landscapes (think about the pictures of the beautiful Austrian landscapes) the way they are in the face of environmental threats.

In this chapter I will turn to the **futuring practices** of researchers and their Praxispartners (PPs) in projects funded by proVISION. This notion refers to socio-material practices in which different kinds anticipatory or forward-looking knowledge are produced and circulated for dealing with particular challenges or threats related to sustainability issues. Futuring understood like this is not about efforts of making a particular future, but about a multiplicity of activities related to attempts of solving actual problems that bring about different futures. This also implies asking how futures are made in locally situated material practices instead of focusing on grand narratives of how our conceptions of the future change in the long run.

Exploring such practices of futuring directs attention to the relation between the different futures that are produced and negotiated and to the simultaneous re-orderings on social, epistemic and moral levels. Questions of who is supposed to participate, which kind of knowledge(s) and expertise count in which situations as well as questions concerning the responsibility for the outcomes of the projects and project partners are addressed in these practices. The notion also puts emphasis to the question when futures are things to be negotiated and debated and when and in which places they appear as objects: when/where are they matters of fact and when/where are they

matters of concern? (Latour, 2004) At the same time it is important to keep in mind that researchers as well as extra-scientific actors, in their little stories and accounts of their practices, actively engage in framing and re-framing ideas about knowledge, participation, subject positioning and responsibilities, thus ideas about what the actual situation is and ought to be. This means that - although I mainly follow spoken and written accounts of different actors - futuring also relates to 'ontological politics' (Annemarie Mol, 1999). Through producing anticipatory knowledge and making decisions based on this knowledge particular realities and with that particular futures get enacted at the expense of others.

Futuring practices are at the same time a means to explore how researchers inscribe into and simultaneously also re-shape the socio-scientific imaginary guiding proVISION. Guided by STS sensitivities for co-productionist analysis I do not assume that futuring takes place independently from any context nor do I assume stable framework conditions that pre-determine the actions of actors. Rather, I start my analysis of futuring practices from the assumption that these practices are mutually constitutive with the 'framework conditions' in which they take place. In this chapter the term 'framework' thus refers not only to social, institutional and material conditions, but also to the imaginative resources actors draw on to make sense of their practices. I am thus interested in how researchers and their PPs **translate** these different envisionings of science-society relations in their practices of producing anticipatory knowledge. For doing, so I draw on recent writing on collectively shared imaginations in order to explore "the work needed to construct this kind of sociotechnical imaginary, to nourish and keep it alive as well as to naturalize it" (Felt, forthcoming: 3). This means focusing on the dynamic aspects of imaginaries. While Felt describes how citizens draw on a variety of different imaginative resources to make sense of an emerging technology, my case is slightly different. The researchers in proVISION become part of the attempt to establish an alternative imaginary of science-society relations; this is the socio-scientific imaginary I described in the previous chapter.

In this sense, I regard the funding scheme proVISION as no stable entity on the level of imaginations. I may be a relatively fixed entity concerning its institutional set-up and the actors involved. However, when it comes to the attempt to establish an alternative socio-scientific imaginary the researchers and extra-scientific actors involved in the various projects are from an analytical perspective equally important. They are the ones that can

help establish a particular imagination or can be the ones to contest it or particular elements of it. Therefore, they are key in what Felt refers to as ‘assemblage’, ‘rehearsal’ and ‘stabilization’ of an imaginary.

I think of these actors as active agents in establishing this particular socio-scientific imaginary. For doing so, I conceptualize these practices of researchers as a process of **translation** as John Law describes it with his conceptual pair *traduction/trahison*:

“So that is **traduction**, a similarity. But **trahison**, difference, is not far behind. And the difference has to do with the form of ontology being performed. We started, I think, with the assumption that coherent realities might be performed and discovered. With its attempt to draw things together, to centre them. But the pull to the centre has become more and more difficult to sustain. **Traduction** has given way to **trahison**. And ontological centering to practices of ontological choreography; ontological ambivalences, and finally to ontological patchwork.” (Law, 2003: 10)

Law points out that translation is always some sort of betrayal (*trahison*); it is always at the same time similarity and difference, never can be exactly the same. Translation in this sense can be used to describe the researchers’ practice of fitting their research projects into the imaginary of *proVISION*. Thereby they do not simply act out prescriptions by the book. Rather, the notion translation in this form directs attention to the practices in which the researchers adapt and transform it; it directs attention to the similarities and the differences in which the actors involved in *proVISION* projects appropriate the imaginary.

In this understanding the funding scheme is not regarded as pre-existing. Put bluntly, there is no funding scheme without the projects. The idea that is captured within the notion of ‘translation’ is that a funding scheme is not a fixed entity. What the funding scheme is can only be observed in the socio-material practices of its translation, i.e. the practices in which researchers mobilize the funding scheme in their research practices respectively their accounts of these practices. I am thus interested in how actors contribute to the making of this socio-scientific imaginary and how researchers and their partners representing ‘social reality’ narrate the relations between the funding scheme *proVISION* and their own research practices. Such narrations are visible in interviews as well in project proposals, official project descriptions and various outputs.

“It is that we are witnessing a shift in the character and the role of narrative (21) in STS writing, and especially in the character and role of chronological narrative. For if we are

no longer able to draw things together to tell great stories about the growth or decline of networks, then what is there to tell? No doubt there are many possible responses. But one is this: that we need to attend to lots of little stories, and then to the patterns that subsist **between** those stories, patterns that will often **not** reduce themselves to the chronology of narrative, patterns that do not form a chronological narrative - because there **is** no narrative." (Law, 2003: 8)

In this sense, I am interested in the 'little stories' in which researchers and their partners talk about their ways of doing transdisciplinary sustainability research. Because it is exactly in these stories where particular translations of the imaginary that is guiding proVISION are expressed. Following Law this is not a 'merely' discursive matter of course. Narrating and telling stories is a way of ordering the world (Law, 1994, 2003; Ricoeur, 1991)

Doing this analysis I will draw on material from interviews and focus groups as well as on research proposals, research reports and projects descriptions as available on proVISION websites and websites related to proVISION. The stories told in these materials are an entry point to the various translations of the proVISION and imaginaries. In these translations the alternative socio-scientific imaginary guiding proVISION is rehearsed and stabilized as well as contested. Additionally, I will also draw on ethnographic observations of various project meetings.

The story I am going to tell in the following pages will in broad strokes mirror the outline of the previous chapter. I will start out in dealing with how researchers describe their practices of writing proposals to see how and if they talk about any difference to their usual practices. Building on that, I will examine how the focus on producing anticipatory knowledge in transdisciplinary sustainability research plays out in the actors' translations of imaginations concerning contemporary problems and their stories about social and epistemic re-orderings. In a next step, I will ask how these re-orderings relate to the moral organization of research and explore how researchers and their PPs mobilize imaginations concerning a re-distribution of responsibilities. I will end the chapter by asking what is actually at stake according to and for actors engaged in transdisciplinary sustainability research and conclude by reflecting on how researchers ideas about the future relate to their practices of producing anticipatory knowledge and to the stabilization of the socio-scientific imaginary I described in the previous chapter.

6.1. 'The future' as a Field of Funding Possibilities?

When we¹²⁴ talked with the researchers about their transdisciplinary projects the interviews mostly involved stories about setting up these projects and about writing proposals. I want to start with these stories about the project beginnings, because they are interesting in terms of the researchers' framing of the funding scheme proVISION. They talk extensively about the process of designing and submitting research projects describing it as a complex and, at times, frustrating task of looking for opportunities, interpreting the requirements that are put forward in program documents, and adapting their sometimes in some way pre-existing projects and project ideas to what they assume the funding schemes 'want'. Therefore, I want to argue that they do neither passively subscribe into a present funding scheme and its imaginary nor do they design projects from scratch. Rather, they actively work with what they perceive to be the program requirements and thereby translate the particular imaginary in specific ways. Simultaneously, they engage in a promissory discourse in which they address the specific requirements of the funding scheme and the knowledge they are going to produce.

A frequent narration concerns practices of **looking for funding possibilities**. Researchers describe a process of mutual shaping in which they are scanning given possibilities for funding and see where they might *fit*¹²⁵:

"Yes, basically you have to say that (...) the approach was really easy there, that means – you know that – that means, we (...) we are looking for project-possibilities und see whether we fit. That was pragmatically put the approach." ¹²⁶¹²⁷ (P08_m01: 34)

They are submitting proposals to different programs that are possibly compatible with their research interests. In this quote a researcher shares with us that in his view this is a *pragmatic* approach. Also in the quote above our interviewee assumes without hesitation that we are familiar with this practice and that this is a common feature of

¹²⁴ The interviews where conducted by my colleagues Ulrike Felt, Judith Igelsböck, Andrea Schikowitz and myself in changing constellations. Therefore, when I talk about the interviews I will use the personal pronoun 'we' to acknowledge their contributions to the interviews.

¹²⁵ Unless stated otherwise all quotes are translated by the author.

¹²⁶ The interviews, which provide the material for this case study, were conducted in German. If not noted otherwise the translations are mine. In order to enable readers to reconstruct my translations - which are of course already a form of interpretation – I included the original transcripts as footnotes.

¹²⁷ "Ja, also ganz grundsätzlich muss man sagen, das... Zugang war da wirklich sehr einfach, das heißt - Sie kennen das sicher auch – das heißt, wir... wir suchen eigentlich immer, oder wir schauen was es an Projektmöglichkeiten gibt und schauen dann, ob wir dort hinein passen. Also das war eigentlich wenn man so will, pragmatisch gesehen einmal der Zugang." (p08_m01: 34)

how science funding works. This practice is described as quite difficult and funding resources are presented as scarce. This idea of science thus describes a system of competition for scarce resources in which researchers need to be *pragmatic*. One researcher refers to the difficulties of the Austrian research landscape as *clutching at every straw*:

“You are funny – because the program (...) you are clutching at every straw that you can see for financing and you have no alternative. In fact we are submitting in nearly every program.”¹²⁸ (P09_m01: 181)

While this researcher expresses his discontent with this situation, he also assures us that such practices are without alternative. He even regards the question as *funny*, a clearly cynical remark that might be understood as an expression of surprise caused by our question. In order to deal with this perceived scarcity the whole research landscape needs to be *grazed*:

“Yes, and proVISION, it was the first call where we submitted and we got it. Yes, I mean there are calls which we pay no attention to, these FFG-calls with I2V or so, that’s not what (...) what I am interested in or where I got that much of expertise, but there (...) even there we are in with (...) a project – this I2V was a different call – however, we try to graze the research landscape – there isn’t that much in Austria anyway. What you don’t get EU-wise, you look that you try to get some national funding.”¹²⁹ (P09_m01: 198)

While stating that he does not consider every single funding possibility this researcher describes the situation as one of constant scarcity. This points to the reciprocal relationship between a researcher and his or her (institution’s) research foci respectively expertise on the one hand and resources for getting funded on the other. *Grazing* in this sense hints at a perceived imperative to constantly look for funding possibilities in situations of scarcity. It is interesting to note that the issue of anticipatory knowledge or transdisciplinarity doesn’t come up in these accounts a lot. It

¹²⁸ “Sie sind gut – weil um das Programm... also man klammert sich ja an jeden Strohalm den man für Finanzierung sieht und also hat gar keine Alternative. Eigentlich sind wir dabei bei nahezu allen Programmen einzureichen.” (p09_m01: 181)

¹²⁹ “Ja, und beim... bei proVISION, das war eben der erste Call wo wir halt dann eingereicht haben und haben wir das dann damals bekommen. Ja, also (.) ich meine es gibt schon noch Calls wo man sich... wir uns nicht darum kümmern diese FFG-Calls mit I2V oder so, das ist nicht so was... was mich interessiert oder wo ich so die Expertise habe, aber auch da... selbst da sind wir mit [] am Projekt drinnen - das I2V]war irgendein anderer Call – aber jedenfalls, wir versuchen halt möglichst die Forschungslandschaft abzugrasen - soviel gibt es in Österreich eh nicht. Was man EU-mäßig nicht erreicht, schaut man halt, dass man da ein bisschen national dazu fördert“ (p09_m01: 198)

seems as if the production of knowledge about the future is merely another field to *graze* for the researchers.

While most researchers tell in some way a story of being pragmatic and adapting to a given situation against the background of an imagined ideal-type kind of process in which only scientific interests guide researchers, others combine their narrations with such more traditional ideas of doing research:

“The thing is, projects originate from a burning interest and you usually take several attempts until a projects receives funding. In the course of this development you need to be mindful of the criteria of the programs, which change, and if transdisciplinarity is an important point you correspondingly try to cover this aspect.”¹³⁰ (P02_m01: 21)

This researcher explains how he starts with a *burning interest* and then makes *attempts* to get his idea funded. This quote can be read as a reference to ideas about researchers motivational structures that are a part of a traditional idea of science in which scientists and researchers pursue their interests without caring much about social applicability. This account builds on the assumption that the knowledge produced will become relevant in the future. Still, when it comes to the particularities of the funding scheme at hand he expresses a more pragmatic approach when stating that he is willing to *cover* additional *aspects* such as transdisciplinarity.

Especially when it comes to transdisciplinarity researchers emphasize the influence of the funding scheme. One researcher in this sense tells us that the program influences the way they design their projects especially in regard to the particular actors that are included:

“Well I think, (.) proVISION plays the role, because they are financiers, that they finance particular projects, particular projects come into being, right? So if you, if you come here and say you want to establish transdisciplinarity as a project strand then this is a motor that brings certain people together. And I would also see it like that. Because of these project-requirements people are brought together, to conduct such projects in the first place”¹³¹ (P02_f05: 255)

¹³⁰ “Die Sache ist die, Projekte entstehen aus brennendem Interesse und man unternimmt in der Regel verschiedene Anläufe, bis dann ein Projekt eine Finanzierung findet. Und im Zuge dieser Entwicklung muss man auf die Ausschreibungskriterien der Programme achten, die sich ändern, und wenn Transdisziplinarität ein wichtiger Punkt ist, dann versucht man dementsprechend diese, diesen Aspekt mit abzudecken.” (P02_m01: 21)

¹³¹ “Also ich denke, (.) Provision spielt die Rolle, dass sie Leute, dass dadurch, dass Finanziers da sind und bestimmte Projekte finanzieren, kommen auch bestimmte Projekte zustande, würde ich sagen, gell? Also

She describes proVISION as a *motor* for a particular kind of integration. Thus researchers as well as their partners perceive the program as a productive force within the process of designing projects. In this sense we can assume that the program's particular focus has an influence on the practices in which knowledge is produced and circulated. This influence of program requirements, however, is far from determining how the projects actually turn out. Once one of these scarce possibilities for funding is identified researchers, according to their narrations, still need to sort of **interpret** the program documents in order to **understand** the program manager's intents:

"Praxispartner in the sense of, it is a wish of the program, to integrate Praxispartner, you try to find out in the application phase, what the program designers could have meant by Praxispartner und you try to identify them, so the project has chances for sponsoring, very easy, that's the way I did it and obviously it worked out quite well." ¹³² (FG_08: 157)

In the quote above a researcher talks about his practice of identifying the program requirements reframed as *wishes*. In this case the idea of the so-called 'Praxispartner'¹³³ (PP) is addressed. Researchers need to think about what a PP might be and what might be meant by *integrating* PPs. Thus, although the program articulates seemingly precise requirements researchers still narrate the need of de-coding respectively making sense of those guidelines. In the understanding of this researcher the chances of the project being accepted by the program depend crucially on an accurate interpretation of the program's *wishes*. Getting funded in this way becomes a proof that his interpretations of the program documents were correct. In this narration the quality of the project proposal is equaled with the degree to which the author is able to decipher a program-code and articulate reasonable promises of what is going to be achieved in the projects.

wenn man, wenn man hergeht und sagt, man will jetzt als Projektschiene Transdisziplinarität schaffen, dann ist das natürlich ein Motor, der bestimmte Leute dann auch zusammenführt. Und so würde ich das auch sehen. Also durch diese Projektvorgaben werden die Menschen zusammengeführt, um solche Projekte überhaupt durchzuführen" (P02_f05: 255)

¹³² "Praxispartner im Sinn von, es ist ein Wunsch des Programms, Praxispartner mit aufzunehmen, das versucht man in der Antragsphase herauszufinden, was könnten die Programmgestalter gemeint haben mit Praxispartner und die versucht man dann zu identifizieren, damit der, da, das Proposal eine Chance hat auf Sponsoring, ganz einfach, so hab ich das gemacht und es hat offenbar ganz gut funktioniert." (FG_08: 157)

¹³³ As already mentioned in the previous chapter, this term refers to transdisciplinary collaborators from 'social reality' or precisely the 'Praxis'. The imagination of the funding scheme is that these actors – regional community representatives, NGOs and so on – collaborate as equal partners in the projects. How this notion is 'lived' in research practices is one of the questions posed in the project 'Transdisciplinarity as Culture and Practice'. The final report of this project can be downloaded here:

[http://sts.univie.ac.at/fileadmin/user_upload/dep_sciencestudies/pdf_files/Preprints/Endbericht Transdis als Kultur und Praxis 2013.pdf](http://sts.univie.ac.at/fileadmin/user_upload/dep_sciencestudies/pdf_files/Preprints/Endbericht_Transdis als Kultur und Praxis 2013.pdf)

Thus, researchers see a need to write research proposals according to a given funding scheme's rationale. This practice goes beyond mere thematic steering in the case of proVISION as researchers feel obliged to integrate elements like 'educational cooperations' or 'PPs' into their projects. They adopt the program's ideas of doing research and constantly seesaw between their own – or those of their discipline or research department - standards and their interpretation and understanding of what the program managers might want. However, in practices of *interpreting* the program's *wishes* researchers do adapt the program's requirements and thus, regain a certain degree of freedom. Thus, proVISION does not only fund research in a particular thematic area, it additionally aims to direct the researcher's approach of knowledge production. Researchers, however, criticize this process, e.g. when they complain about the great variety of different aspects that need to be integrated in this particular program:

“Actually it turned out that there were some things that were disturbing under quotation marks in the articulation of the project proposal and amongst others that was the notion of transdisciplinarity, because it (...) for most of the (...) the people of the project team were not (...) it wasn't that clear what was actually meant by that and the definitions we found, as you said in the beginning, also weren't a 100% clear: what (...) what is it actually? I mean, intra, inter – yes, it is that easy to define that, but the trans was (...) yes, a bit of a problem, no? Generally speaking, what was the case with proVISION that means (...) it is probably still the same: they try to bring to many aspects into the projects that (...) in the end can't (...) be really preserved. So you should consider that, that and that, but ok, that's a different thing, no? That (...) actually there's this beautiful notion in agriculture (...) the – what is it called again – the (...) milk, no oviparous-wool-milk-pig [Verbatim translation. According to <http://dict.leo.org> an equivalent would be all-in-one-device or Swiss army knife; TV]”¹³⁴ (p08_m01: 38)

¹³⁴ “Tatsächlich hat sich dann heraus gestellt, dass es ein paar Kleinigkeiten gab dabei, die so störend unter Anführungszeichen waren, also auch bei der Formulierung des Projektsantrag und unter anderem war das dieser Begriff Transdisziplinarität, weil das ga (...) also zumindestens für die meisten die (...) die im Projektteam waren nicht (...) nicht so eindeutig war, was darüber gemeint ist und die Definitionen die wir gefunden haben, so wie Sie einleitend vorher gesagt haben, auch nicht zu 100% klar waren: was (...) was ist das eigentlich? Ich meine, intra, inter – ja, ist das schon nicht immer ganz leicht definierbar, aber das trans war (...) ja, ein gewisses Problem, na? Dann, generell muss man sagen, was bei proVISION ein bisschen eine Sache war, das heißt (...) oder ist, vermutlich noch: man versucht dort glaube ich in die Projekte irgendwie zu viele Aspekte hineinbringen die (...) die schlussendlich nicht (...) nicht ganz wirklich gewahrt werden können. Also man soll das berücksichtigen, das, das, aber ok, das ist eine andere Sache, na? Das (...) der wu (...) die (...) gerade im landwirtschaftlichen Bereich gibt es ja den schönen Begriff der (...) der – wie heißt das schnell – der (...) der Milch oder Eier legenden Wollmilchsau.“ (p08_m01: 38)

One thing that is interesting in this quote is again the expressed need to interpret the funding scheme's requirement and an uncertainty about what transdisciplinarity actually means. The second thing is that this researcher perceives the requirements of proVISION as sort of an overload and that too much is expected from this mode of research. Interestingly the requirements are described here in terms of *too many aspects*, i.e. additional tasks that need to be executed.

However, – and I think this might be a special case for sustainability research and that is why it is important to keep in mind the particular combination of transdisciplinarity and sustainability in this program - even if researchers articulate critique concerning different aspects of the funding scheme and its requirements, they share the ideological or more normative assumptions of the program. An idea about how the world and with that a particular relation of science and society ought to be. According to this vision, opening up science to extra-scientific actors and producing knowledge about the future in participatory settings is the most fitting way to deal with contemporary problems, also framed as 'Grand Challenges'¹³⁵ in recent policy discourses. These challenges are more complex than previous problems and can thus not be solved by referring to knowledge produced in traditional disciplinary settings. Inter- and transdisciplinary ways of producing knowledge about the future are needed. Although researchers criticize the program and particular prescriptions of the program, they do not question the need for changing the very ways knowledge gets produced:

“I think there is no way around it. I think there is a lot, in applied research anyway, a lot being realized too.”¹³⁶ (P01_m01: 960)

Much more - like in the quote above – the idea is that opening up science is something that needs to be done. It is even regarded as something that cannot be avoided. This implies a sort of momentum and indicates that participatory ways of producing knowledge are becoming increasingly important, no matter what. This directly relates to the issue of anticipatory knowledge as transdisciplinary modes of research are described as especially important for creating a better future world; it is good for 'the cause':

¹³⁵ <http://www.era.gv.at/space/11442/directory/11495/doc/12942.html>, 9.5.12

¹³⁶ “Ich glaube, es führt überhaupt kein Weg daran vorbei. (.) Ich glaube, es wird auch sehr viel, sozusagen in der angewandten Forschung sowieso sehr viel (.) umgesetzt auch.” (p01_m01: 960)

“I am working (.) on three projects (...) there are funded and non-funded projects – I wouldn’t even count this one because I got so many small projects, when a school wants to have assistance for a project, where you think: it would be interesting, we are going to do that, because it is good for the cause, but larger projects maybe five. Yes.”¹³⁷ (P01_f04: 283)

And the *cause* this PP refers to in this quote is, according to her, to “change the world into [laughs] the positive”¹³⁸ (p01_f04: 894).

After researchers identify funding possibilities and interpret the respective requirements they go on to ‘**customize**’ their ‘**burning interests**’. Researchers talk about how they actively design their projects according to requirements of given funding schemes. In doing so, they also adapt to respectively translate a given imaginary of doing research. In the case of proVISION this means to integrate the particular standards articulated in the program documents into the project designs:

“Yes. proVISION had (...) guidelines, that you need a research-education (...) to include a cooperation, to include a region, etc., so that was a quite extensive list of (...) of issues, which you had to work off and that’s why (...) that it was happening in a transdisciplinary context, that just happened, yes. So we (...) we wanted to point out that we included all those aspects in a customized way in the project, so that we (...). Like others too.”¹³⁹ (P09_m01: 23)

This practice of *customizing* is regarded as a common situation for researchers as the researcher states at the end of the quote. It is something that others equally do. Yet still the narrative construction of a common practice seems to indicate a perceived need for legitimating this practice. This customizing work is in the view of the researchers necessary due to the scarcity of funding possibilities and the related struggle for resources. They need to engage in promissory discourses when they *customize* their

¹³⁷ “Also ich arbeite (.) so grob an... es gibt finanzierte und nicht finanzierte Projekte – also das würde ich schon fast gar nicht mehr darunter zählen, weil ich so viele Kleinprojektchen, also wo halt eine Schule halt eine Projektunterstützung gerne hätte, wo man sich denkt: naja, interessant ist es schon, das machen wir schon jetzt auch noch oder so, weil das schon gut für die Sache ist, aber so in größeren Projekten vielleicht fünf. Ja.” (p01_f04: 283)

¹³⁸ “die Welt ins [lacht] Positive verändern” (p01_f04: 894)

¹³⁹ “Ja. proVISION hat ja noch eine (...) also weiter – ja – Vorgaben gehabt, dass man eben Forschungs-Bildungs (...) eine Kooperation einbindet, dass man Regionen einbindet, etc., also das war eine ziemlich umfangreiche Liste an (...) an (...) an Inhalten, die man da quasi abarbeiten hätte sollen und drum (...) aber dass das im trans (...) die Tät (...) im transdisziplinären Kontext passiert, das hat sich eh ergeben, ja. Also wir haben (...) wir wollten darauf hinweisen, dass wir also drauf geschaut haben alle diese Aspekte maßgeschneidert sozusagen in dem Projekt unterzubringen, damit (...) Wie so andere auch.” (p09_m01: 23)

projects. Additionally, to the fact that transdisciplinarity itself can be understood as a promise for a kind of knowledge that helps steering society towards a better future (Felt, 2010), also the researchers themselves use promises as resources for doing research (Borup et al., 2006; Felt, 2007). This also becomes visible in narrations about the constant risk of not getting a project funded. They frame their decisions of including particular work-packages into the proposal or not in relation to the funding chances and thus according to a given program rationale. Thereby, a constant seesawing between content related arguments and assumed program rationale is going on:

“I just said: if I only did two, than the wit is gone – yes? Because the (...) just two, the (...) it is already the limit to do just three types of regions for Austria – but maybe it would be more intelligent to focus on just one, yes? That would have made it much easier for me, but maybe then the project would have been shot down, yes? So that is always a risk.”¹⁴⁰ (P09_m01: 931)

The work of adjusting a research proposal however is described as a complex task, because the requirements of a program are not clearly spelled out. This is a problem for researchers as failing to accurately interpret and customize their projects might lead in to a situation in which the projects gets *shot down*.

As this brief detour into researchers' narrations about their practices of developing projects nicely shows that the seemingly straightforward task of submitting a project is a complex practice. Funding possibilities need to be **looked for** and **identified** in a situation of scarcity and competition. Researchers in this sense use quite desperate metaphoric language and talk about 'clutching at every straw' or 'grazing the research landscape'. Once found these funding schemes and their requirements still need to be **interpreted** in the right way in order to have a chance of being funded. After that the projects researchers have in mind or sometimes also already up their sleeves need to be **customized**. This is always done in the light of the permanent risk of projects being **shot down**. Through such practices both the projects researchers have in mind as well as the funding schemes are mutually shaping each other. Their projects are neither completely

¹⁴⁰ “Ich habe nur gesagt: wenn ich nur zwei machen würde, dann ist der Witz vorbei – ja? Weil dann (...) nur zwei, dann (...) – ist (...) ist eh schon die Grenze, dass man es versucht Österreich in drei Regionstypen einzufangen - aber wahrscheinlich wäre es gescheiter sich zu fokussieren auf vielleicht nur eines, ja? Und da hätte ich mir wahrscheinlich auch leichter getan, aber möglicherweise wäre dann das Projekt abgeschossen worden, ja? Also das ist immer ein Risiko.” (p09_m01: 931)

fixed and readily submitted for funding, nor are they developed with the PPs from scratch.

What becomes clear when looking at these stories of researchers is that - while researchers basically share the idea of an **attainable future** that needs to be achieved through the application of particular modes of producing knowledge - indeed a lot of work goes into the **translation** - in Law's sense - of funding schemes by researchers. The openness of a funding scheme thus allows for traduction/trahison, for similarities and differences in the way they are materialized in particular projects. Thus, it comes as no surprise that the socio-scientific imaginary guiding proVISION is also translated in various ways in the futuring practices of researchers (and their PPs). Translating the proVISION imaginary relates to particular practices of doing research and modes of producing knowledge. In doing so, researchers together with their PPs also of course enact particular realities (and futures) in their research projects.

The question now is: are these practices different in the case of producing anticipatory knowledge concerned with sustainability in transdisciplinary settings and if so how? At a first glance the translation work I described so far does not necessarily differ from what can be observed in any kind of funding scheme. The main difference, one could argue, lies in the fact that in contemporary research funding it is the future that becomes the field that researchers are *grazing*. They can do so because there is an increasing demand for knowledge that is supposed to be of some relevance for our futures - we still live in a time of anticipatory regimes, remember? The interesting thing is that for getting funded researchers need to engage in promissory discourses that come back to them - as we have learned for the sociology of expectations - in the form of particular demands. Researchers describe this side of the funding scheme as a *motor* that brings about particular practices. The promise to engage in futuring in transdisciplinary sustainability research thus comes with certain requirements. In this way, the future becomes the backdrop against which knowledge production takes place. But what then does this tell us about futuring practices? Which kinds of futures do the actors have in mind? Whose futures are at stake here and which kind of time horizons are researchers and their partners interested in? Put shortly: how does the fact that this program focuses on the participatory production of anticipatory knowledge relate to their practices? These questions can of course also be turned upside down: how does the

actors' ideas about knowledge production relate to the anticipatory knowledge produced?

6.2. Dealing with Problems to Come

One of the central elements in the socio-scientific imaginary guiding proVISION is a particular idea of contemporary problems: 'problems to come' that are novel, complex, global, and potentially disastrous and thus call for anticipatory knowledge in order to be managed. Additionally, the complexity of these novel problems calls for more participatory approaches towards producing this knowledge. Knowledge is supposed to be *made available for solving the most urgent problems* as it is put in the proVISION mission statement. Several questions arise from this aim of the program: How do researchers and their partners establish research questions and thereby translate the idea of problems to be solved by transdisciplinary research? What are the futures that shall be achieved or prevented? And what are the researchers' ideas of the future and how do they relate to their research practices?

To explore these questions it seems worthwhile to start with the official project descriptions on websites or in project proposals. As I already indicated above, proposals can be regarded as anticipatory respectively promissory discourse presenting the vision of a project to the imagined audience of a selection panel. As a demand that comes with this genre such texts mostly start out with a quite concise description of the projects aim and its expected contribution to particular problems. In such texts – this comes as no great surprise - the proVISION imaginary concerning problems is mostly adopted.

In the opening paragraphs of most project descriptions and proposals we can find ideas about **how local and global developments relate** to each other or how projects intend to deal with this assumed relation. In the description of a project on the proVISION website e.g. it says in regard to the aims of the project “[t]he connection between global changes, climate changes and agriculture with health and the quality of life is shown.”¹⁴¹ Another example for such a rehearsal can be seen in the quote below from a project that aims to produce land-use scenarios for decision-making purposes:

“Global change and its effects on the environment and society is one of today’s most pressing issues. Globally induced environmental, social and economic changes strongly affect regions and society. [...] Thus, stakeholders at the regional and the local level are

¹⁴¹ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

faced with having to tackle the varying socio-economic and environmental impacts of global change on different locations.” (Prop_R: 9; orig.)

This quote is a neat exemplar about how imaginations about global problems and the models about the relation of global and regional levels are stabilized. In this top-down model *globally induced* changes *affect* multiple local regions. This way of conceptualizing global/local relations also has a temporal dimension: *the most pressing issues* – a phrase that is also prominently featured in the proVISION program documents – are exactly the *effects* of these changes on a global level. These effects are expected to hit the various localities in the near future. It is a menacing future made of different looming *impacts* that need to be dealt with in the present. This is where the issue of participation becomes important. Local actors are ascribed an important role as they are assumed to “transfer politics to practice and fundamentally affect spatial and economic development” (ibid.). Imaginations concerning participation are thus translated in a special way as they are framed in terms of responsibility here. But to do so first global problems need to be made workable:

“The project will ‘downscale’ effects of global (not just climate!) change to Austrian regions. It will form transdisciplinary working alliances for developing strategies of adaptation and mitigation that match exactly the locally observed disadvantages.” (Prop_R: 13; orig.)

Global challenges need to be *downscaled* as it is put (already in quotation marks) in the quote. Dealing with global problems in the proVISION documents is framed in terms of *adaption* and *mitigation* on a local level. The aim of transdisciplinary sustainability research consequently is to “examine and downscale global change effects to local and regional level” (Prop_R: 7; orig.) and building on that to “develop strategies to anticipate and cope with globally induced changes” (ibid.). But how is this *coping* conceptualized? Whereas some projects talk about *mitigation* and *adaption*, others refer to concepts like “resilience” (Prop_R: 14) and “adaptive management” (ibid.). What is visible here is the same temporality at play as on a program level: problems that are not here yet, but will most probably be so very soon. Terms like resilience and adaption have in common the idea that a system needs to be able to absorb possible future impacts that cannot be fully anticipated in advance. The main goal thus is to increase the ability of particular systems to preserve or retain its status quo in the face of not yet fully understood local effects of climate change. In focusing on these concepts the importance of the future is for present

action is highlighted. Decisions in the present are oriented towards possible events in the future. Adaptive management thus can be described as a futuring practice that aims at making the not yet controllable with a special focus on the preservation of its actual status.

While in the quotes above elements of the proVISION imaginary are clearly visible, there are also other cases in which different translations of problems are visible. This is especially the case when it comes the **collectives that are imagined to be affected** by certain problems. This means that the issue of whose problems are to be dealt with is translated in multiple ways. On a spatial level the idea of global problems that somehow impact on Austria or particular regions is not shared by all projects. In some cases local problems are directly addressed without referring to broader issues or challenges:

“Community X is characterized by a process of rapid growth of woodland that occurs due to insufficient incomes in agriculture (primarily pasture land). The project shall develop a model, with which options for stopping or at least for slowing down this process can be examined, e.g. through the development of tourism in cooperation of agriculture and national park or through transregional cooperation.”¹⁴² (Prop_Q: 5)

The problem described in this quote addresses the increase of woodland in a particular region. The project’s aim then is to provide anticipatory knowledge concerning options for how to stop this process. It is potential local futures that are to be produced in these practices; ideas and concepts for how this particular region might develop in the future. The reasons for the increase of woodland do not play much of a role; developments on a global scale are not referred to.

Similarly, other projects address Austria as the scale on which problems are present without mobilizing imaginative resources concerning adaption or mitigation of global developments. This is visible e.g. in a project that is interested in the relation of *national accounts* and *sustainability*:

“The system of national accounts needs to be extended and enhanced in order to make it a meaningful tool for monitoring and analyzing the state of sustainability of economies.

¹⁴² “Die Gemeinde X ist von einem raschen Verwaltungsprozess gekennzeichnet, der durch mangelnde Einkommen in der Landwirtschaft (v.a. Grünland) entsteht. Das Projekt soll ein Modell entwickeln, mit dem Optionen zum Anhalten oder zumindest zur Verlangsamung dieses Prozesses überprüft werden können, z.B. durch Entwicklung von Tourismus in Kooperation von Landwirtschaft und Nationalpark oder durch überregionale Kooperation.” (Prop_Q: 5)

For Austria, indicators have been developed that measure welfare and quality of life at national scale.“ (Prop_Y; orig.)

This project describes sustainability as its normative framework and then mobilizes Austria and particular regions as its units for analysis. This is referred to in the quote above as the *national scale*. Thus, the researchers are interested in relations between national and local levels. Globality is invoked on the level of research questions, when the “consequences for the management of typical crops if climate changes” (Prop_Y; orig.) are addressed. However, climate change here is not described as a global phenomenon as mainly changes in local weather conditions are of interest.

But these practices of futuring direct attention to another set of questions: how do these local futures relate to the global problems that are so central to the proVISION imaginary? Models about the relation of global and local issues also imply ideas about related futures. In the example about the increase of woodland the researchers do not care about the global future. At least they are not explicit about it. In other projects, however, actors engaged in the various projects become more explicit about how they think their work matters. Already in the first chapter I mentioned a project collaborator who talked about this kind of research being good for the cause. She stated that the overall goal of her work is to “change the world into [laughs] the positive”¹⁴³ (p01_f04: 968). What we see here is an idea in which different local futures add up to an attainable global future. It is sort of a ‘crowdsourcing’ model of the future in which our common future becomes the responsibility of situated local actors. This resonates with Marres’ work on material participation (2012) when she argues that we need to shift our attention from single events and education towards our everyday material practices when it comes to our ideas of public participation in environmental issues. Participation, so the argument goes, is not so much something that depends on the willingness of actors, but much more on “the socio-technical-material arrangements that facilitate or rather fail to facilitate environmental action.” (Marres, 2011: 528) Also, in this account our collective future is dependent on localized material practices. However, it seems important to remain sensitive for the limits of such an idea of a crowdsourced future.

This way of conceptualizing the future also plays out on an epistemic level. As in the imaginary guiding proVISION on a program level also in the official program documents

¹⁴³ “die Welt ins [lacht] Positive verändern“ (p01_f04: 968)

researchers relate the **need for anticipatory knowledge** to the challenges they describe.

“Sustainable development from the local to the global level is thus a very challenging and multi-faceted topic. Knowledge about mechanisms and long-term effects of global change is still scarce and afflicted with a high level of uncertainty.” (Prop_R; 9; orig.)

In order to meet these *challenges* knowledge about *long term effects* is needed. At the same time the *uncertainty* of such knowledge is also described as a problem. The issue of uncertainty is rehearsed in several of the project proposals. This lack of factual knowledge is regarded as a problem as this leads to a situation where “the public debate is steered by vague speculations instead of knowledge” (Prop_P; orig.). Mere *speculation* is here distinguished from actual *knowledge*, which is regarded as necessary “in order to give advises (sic!) for future development.” (ibid.). What we see here is the rejection of a particular futuring practice in favor of another, supposedly more scientific one. Anticipatory knowledge is understood as an inevitable means for planning and development. This is also expressed in the following quote:

“This transdisciplinary inventory and analysis provides the foundation for the ultimate goal of project Z, i.e. the development of strategies focusing on the sustainable spatial development of tourism regions under the influence of global warming. Any sector specific analysis of the planning instruments applied so far does not completely meet the challenges associated with sustainable spatial development.” (Prop_T; orig.)

This quote describes a need for planning and at the same time a need for changing strategies due to the *influence of global warming*. Thus, we see a rehearsal of the proVISION imaginary that describes a need for anticipatory knowledge that is produced in the face of complex global challenges. Additionally, the trope of the insufficiency of scientific knowledge in the face of these challenges is visible:

“Neither specific expert know-how, nor holistic approaches are easy to implement in this matter.” (Prop_P; orig.)

Both *know how* and more *holistic approaches* are needed. In this quote an idea present in sustainability discourse is visible: scientific knowledge is regarded as *specific*, i.e. specialized on certain areas. It is contrasted to *holistic* accounts of knowledge focusing on relations. Both are needed to solve contemporary problems related to global warming.

Anticipatory knowledge thus becomes relevant for dealing with the problems at hand. In the quotes above, however, it is not clear how exactly this is supposed to be done. Thus, questions remain to be answered concerning who holds these different kinds of knowledge and related to that whose problems are to be dealt with and who is supposed to solve them eventually? This question thus relates to ideas about particular actors that are supposed to have the capacity to deal with them. One of the main ways to handle these issues we encountered is to **compartmentalize research problems**. ProVISION on the one hand calls for applicable knowledge and a science for problem solving respectively making knowledge available for solving problems. At the same time - in its idea about a 'double dividend' – the program rehearses a discourse on scientific excellence and economic success. In the proposals these ideas are often combined: imaginations about problems are combined with ideas about science that is at the same time scientifically excellent and brings forward applicable results. One proposal e.g. builds a distinction between “Praxis-Problems” (Prop_Q: 5) and “scientific problems” (ibid.). Another project differentiates even more kinds of problems in talking about “scientific problems”¹⁴⁴ (Prop_T), problems that need to be tackled by “empirical social science” (ibid.), “problems of regional development” (ibid.), “economic problems” (ibid.), and “problems concerning the method and science of planning” (ibid.).

So we can see the imagination of threatening global challenges that need to be dealt with urgently is rehearsed in the proposals except for the tendency to split up problems and thus re-producing traditional boundaries. Ideas about what the problems are and who the actors are that are supposed to deal with them become more complex and messy in the stories of researchers reconstructing their practices in the interviews as e.g. in the following quote of one of our interviewees:

“Yes, I think this is an up to date topic, in lots of areas from politics to economics the question is posed, which kinds of effects certain activities have for the space, the environment, environmental goods, eco-system services. And in this case in the end it was a sector, I’m just saying it, there are more sectors, but I would claim that agriculture is the main sector that, I think, has the most land responsibility in Austria, that we looked at in more closely, but through the activities of our partners we also had settlement as a topic in it, infrastructure somewhere as a topic in it, consumption again causes some

¹⁴⁴ The German original talks about “naturwissenschaftlicher Probleme” thus addressing the natural sciences as distinct from social sciences and humanities. This distinction is necessary as the term ‘Wissenschaft’ in contrast to the English term ‘science’ comprises all of these different branches.

shifts in settlement, road traffic in agricultural usage, a typical network of drivers and aftereffects, so the over-topic is, I think, the main topic involves human activities in the environment, space, yes.”¹⁴⁵ (P02_m03: 147)

This researcher describes a range of different problems that are all connected to each other. He is telling a story about different *sectors* that relate to different issues. These issues are then closely connected to particular *partners*. In this account again a distinction in different problems respectively issues and their relation to particular actors is introduced, which is then translated into project designs in which every actor is assigned responsibility for a particular work-package. Dealing with ‘Praxis-problems’ mostly becomes a separate work-package assigned to specialized actors. Research projects in this sense are consisting of a *scientific part* that is sometimes framed as *basic research*. This part of the project then is used as *basics* for other parts of the project, in which knowledge is supposed to *encourage discussion processes in a society* or even lead to *changes in behavior*¹⁴⁶. Following this distinction, researchers also divide the project outputs accordingly and talk about results that are *relevant for practice* and output that needs to satisfy *highest scientific criteria*¹⁴⁷.

¹⁴⁵ “Ja, ich denk einmal, das ist ein aktuelles Thema, in vielen Bereichen von der Politik bis zur Wirtschaft stellt man sich die Frage, welche Auswirkungen haben gewisse Aktivitäten auf den Raum, auf die Umwelt, auf Umweltgüter, auf Ökosystemdienstleistungen. Und in dem Fall war's im Endeffekt ein Sektor sag ich jetzt einmal, es gibt mehrere Sektoren, aber der Hauptsektor würd ich einmal behaupten ist die Landwirtschaft, die ja, denk ich mal, die größte Flächenverantwortung in Österreich hat, den wir uns genauer angeschaut haben, aber wir haben durch die Aktivitäten der Partner durchaus auch Siedlungswesen als Thema drinnen, Infrastruktur irgendwo als Thema drinnen, Konsum bewirkt wieder irgendwelche Veränderungen im Siedlungswesen, Straßenverkehr in der landwirtschaftlichen Nutzung, sozusagen ein typisches Netz von Treibern und Folgeerscheinungen, damit das Oberthema ist, denk ich, ja, das ist das Hauptthema, um was sich eigentlich vieles dreht, welche Auswirkungen haben menschliche Aktivitäten auf die Umwelt, Raum, ja, also von dem her.“ (P02_m03: 147)

¹⁴⁶ “Das ist der wissenschaftliche Teil, wo ich einfach glaube, ja, das ist auf einer Ebene, wo, wo Wissenschaftler miteinander kommunizieren und auch sich austauschen können und auch Lösungsansätze entwickeln können. Da ist die Frage, inwieweit die Gesellschaft dann mit diesen Modellen effektiv was anfangen kann. Die Kommunikation dazu ist dieser Weg, inwieweit kann man mit diesen Modellen, die jetzt bei weitem noch nicht fertig sind und bei weitem noch nicht umfassend sind und bei weitem auch noch nicht auch nach dem Projekt, ich meine, wir sind in einer Grundlagenforschung eigentlich, gell, diese anwendungs-, versucht, anwendungsorientiert zu sein, aber wir wissen einfach noch viel zu wenig. Und wie kann ich das, was wir allerdings schon wissen, vermitteln, dass das in, in der Gesellschaft zu einer Diskussion führt? Und das ist dieser zweite Teil. Wie, auf welcher Ebene kann ich der Disk-, kann ich in der Gesellschaft, also auf, auf welchen Grundlagen aufbauend auf dieses Projekt, was kann ich heranziehen, um in einer Gesellschaft Diskussionsprozesse anzuregen, die dann auch zu Verhaltensänderungen vielleicht irgendwann einmal führen, oder zumindestens Überlegungen führen können?“ (P02_f05: 583)

¹⁴⁷ “Unser Interesse ist, möglichst praxisrelevante Ergebnisse zu liefern, die spezifische Praxis ist aber dann eine andere als das, was wir an Output liefern können. Das heißt, (.) wir stehen in dem Zielkonflikt, auf der einen Seite (.) höchsten wissenschaftlichen Kriterien entsprechenden Output liefern zu müssen, das ist auch unser Anspruch, wir kriegen viel Geld dafür, und gleichzeitig Aufgaben zu erfüllen, die unmittelbar für die Verwaltung verwendet werden können. Dadurch, dass wir im Projekt nicht

Another researcher describes this way of doing research as even more akin to basic research as he is normally used to. He distinguishes the proVISION-funded project he is engaged in from his other work, which interestingly he describes as more problem-oriented:

“The standard for us is rather that an industry company approaches us because it has problems with sewage purification, or an authority, because she it has some water protection problems and cannot master it: ‘We have this problem. Which steps shall we take on order to, or shall a regulation or administrative order be issued, and we don’t know how this administrative order.’ So this is normally, or that is the usual procedure. Research based on proposals is not that common with us as it is in basic research, to ponder: Aha, this would be interesting for us and we want to go in this direction, so we do that, apply for this. So this proVISION project is somewhat of an exception where we said, I mean, this also exists, but it is not our usual, or the, what is applied the most.”¹⁴⁸ (P01_m01: 146)

In this quote the researcher uses the distinction between basic research and commissioned research as an imaginative resource for making sense of his proVISION project. He describes his usual work as dealing with actors from industry who approach him with a particular problem that he then solves. In contrast, he frames his proVISION project as more akin to *basic research* as he and his colleagues are able to become more active in the choice of the problem they want to address.

What is interesting about this way of listing problems and the distinction between basic and applied research is that this practice establishes particular boundaries that allow the researchers to simultaneously adopt the idea of problems that are there out there in social reality and need to be solved while at the same time stabilizing demarcations between science and society and thus referring to a more traditional socio-scientific imaginary. This way of constructing problems re-introduces a departmentalization that

vorgesehen haben, dass es da so eine transdisziplinäre Abteilung gibt, die das macht, haben wir in dem Fall ein Defizit.“ (P02_m01: 340)

¹⁴⁸ “Der Standard bei uns ist eigentlich, dass ein Industriebetrieb, weil er mit Abwasserreinigung Probleme hat, oder ein Behörde, weil sie irgendein Gewässerschutzproblem hat, und dem nicht Herr wird, an uns herantreten: „Wir haben dieses Problem. Welche, welche Schritte sollen wir da jetzt setzen, damit wir dieses, oder soll eine Regelung oder eine Verordnung erstellt werden, und wir wissen nicht, wie diese Verordnung.“ Also das ist normalerwei-, oder das ist eher die übliche Vorgangsweise. Bei uns ist weniger diese Antragsforschung üblich, so wie’s in der Grundlagenforschung ist, dass man sich überlegt: Aha, das würde uns eigentlich interessieren und in die Richtung wollen wir weitergehen, also machen wir das so, beantragen wir das. Also ist eher das, das Provisions-Projekt ein bisschen die Ausnahme, wo wir gesagt haben, ich meine, es gibt das auch, aber es ist nicht unser, unsere übliche, oder die, die am meisten angewendet wird.“ (P01_m01: 146)

is supposed to be transcended in transdisciplinary research. Additionally, a particular practice of futuring can be observed that is related to implicit ideas about how knowledge is supposed to matter for and at the same time in the future. Related to that we can also see a model of future change. Knowledge is produced in different work packages and disciplines. Researchers work according to their expertise. The knowledge, similar to Vannevar Bush's idea of basic research, is supposed to become relevant to the PPs in the future; mostly so without the need for active intervention of the researchers. These ideas are closely connected to the linear model of innovation and its inherent temporality that is based on the assumption of a future relevance of knowledge that will somehow unfold automatically. This practice of futuring also has important implications for understandings of responsibility. I will come back to that later on.

Whereas in the narrations above boundaries between science and social reality are being re-produced, other interviewees focus more on the **participatory processes in setting up research projects**. This way of framing leads to emphasizing issues like giving the PPs opportunity to bring in their views already early in the project or – even more in accordance with the proVISION imaginary – in the phase of writing a research proposal:

“Until I (.) visited the site X so to say near Y and had a lengthy conversation with (.) na, the abbot, abbot Z – am I right here? – and this would be a, a flicker of hope in the opening, in the broa- the broad discourse, societal references. And then it also become clear that the topic needs to be opened up anyways, we had extended to to nutrition and tourism, which was also discussed in context to a scientist.”¹⁴⁹ (P04_m01: 106)

This researcher talks about how the interactions with local actors helped carve out the research project already in the phase before submitting it to proVISION. Such narrations rehearse the idea of the problem as being part of social reality. However, the motive is slightly nuanced at it is not only the PPs that sort of determine what the problems are. Much rather, it is scientists themselves that articulate problems and PPs are then in a second step allowed to contribute their ideas, i.e. their local knowledge or experience. Researchers usually adapt these inputs from PPs; they need to be *prepared* as one

¹⁴⁹ “Bis ich dann (.) zum einen Ort X hin- sozusagen bei Y besucht hatte, da ein längeres Gespräch hatte mit dem (.) na, der Abt, Abt Z – bin ich da richtig? - und das wär erst einmal eine, ein Hoffnungsschimmer in der Eröffnung, also in der brei- im breiten Diskurs, gesellschaftliche Bezüge. Und dann wurde auch klar, dass wir das Thema sowieso öffnen müssen, etwas breiter ansetzen müssen, hatten dann das erweitert auf Ernährung und auch Tourismus, was im Kontext auch zu einem Wissenschaftler diskutiert wurde.” (P04_m01: 106)

researcher puts it when we asked him about how he and the PPs decided on which research questions to tackle in their project:

“You asked if the questions of, from the Praxis, if they can be answered within the project, if these are scientific questions, I wanted to elaborate on that, but I lost the thread. I think that it is possible on principle, but mostly you have to prepare the questions, sort of massage them or sort of, so you maybe cannot answer them completely.”¹⁵⁰ (FG_05: 364)

Building on the distinction between scientific and extra-scientific questions this participant of a focus group discussion touches on the issue of how questions of the PPs can be made part of such projects. The researchers, who have to reformulate the questions and problems in order to be able to deal with them, usually do this. They are thus re-formulated according to particular disciplinary rationales. The motive of emergence of problems from social reality is thus translated into an iterative phase model in which researchers develop problems, which they discuss and reformulate with their PPs. In this translation, however, it is still the researchers who hold authority over the problems as it is them who need to *massage* the concerns of their partners in order to make them fit into a (scientific) project logic or to make them attractive for scientists, i.e. to make them scientific.

The issue of **urgency** and the related call for **immediate actions** that is quite prominent in the program documents of proVISION and also is expressed in the proposals is not very common in the researchers' narrations. However, when addressing the temporality of the problems or challenges particular regions are facing, it is mobilized by the researchers in relation to failing efforts of participation and the application of results:

“What is of course a valid critique is, no question about that, on the other hand, the way it went for us, there is the problem that actors, especially if the problem does not need to be solved immediately and on the spot, because, I don't know, an airport is built, as it is in other projects, but instead it is a problem to come. And you see that also actors are not very willing to take the process in their own hands, because we did indeed try that. We pre-drafted a project proposal for a implementation project, forwarded it to the community, we did indeed try to forward quite concrete things up to the point we can do

¹⁵⁰ “Sie haben gefragt, ob die Fragen von, aus der Praxis, ob man die im Projekt überhaupt beantworten kann, ob das überhaupt wissenschaftliche Fragen sind, auf das wollt ich eigentlich auch noch eingehen, hab ich dann irgendwie den Faden verloren. Da denk ich, das kann man grundsätzlich schon, aber man muss die Fragen meistens irgendwie noch zubereiten, irgendwie massieren oder irgendwie, also man kann sie vielleicht nicht gänzlich beantworten.“ (FG_05: 364)

it. To submit the project proposal, to finish its formulation, that would have been the task of the actors on site, they didn't pick it up."¹⁵¹ (P10_f01: 357)

Often when we talked to researchers about what happened after their projects had ended they told stories like the one expressed in the quote above. Stories about how results were at first welcomed by regional partners and about how follow-up activities tended to be dropped after a while in most cases. Researchers talk about problems that are not problems *right now* and that do not need to be solved *on the spot*. A central notion in such narrations that is related to the idea of a problem to come is the *degree of suffering* (Leidensdruck):

"and I think, it is, it might be a mixture of, of mentality, state of the problem, how actively does it really affect you, yes, is it really necessary immediately and on the spot to find a solution or not, as long as the degree of suffering (Leidensdruck) is not big enough, yes, is, it is probably difficult to actually mobilize people."¹⁵² (P10_f01: 400)

What is expressed in this notion is a conflict concerning the futures that are the issue in the projects. Using the notion *Leidensdruck* researchers basically say that the futures they tried to establish together with particular problems are not accepted by their PPs and thus, they do not take action accordingly. This points to the interesting fact that in the production of anticipatory knowledge and the simultaneous process of developing the problems to deal with in transdisciplinary settings also ideas about futures that matter need to be open to discussion. Most notably this applies to questions about when a particular future is going to happen. While researchers are often interested in long-term developments, their PPs tend to focus more on short-term futures. Hence, different futures are enacted in terms of the timespans that matter in particular projects. One of the projects for example produced models for calculating the weather in 30 years from

¹⁵¹ "Was natürlich eine berechtigte Kritik ist, gar keine Frage, auf der anderen Seite, so wie es bei uns gelaufen ist, schon noch das Problem besteht, dass Akteure, vor allem wenn das Problem jetzt nicht eins ist, dass jetzt sofort und auf der Stelle gelöst werden muss, weil da, weiß ich nicht, ein Flughafen gebaut wird, so wie das in anderen Projekten ist, sondern es ist halt so ein kommendes Problem. Und man sieht, dass auch Akteure nicht sehr bereit sind, diesen Prozess dann in die Hand zu nehmen, weil wir das schon sehr wohl versucht haben. Also wir haben ein, ein Projektantrag für ein Umsetzungsprojekt vorgedraftet, das der Gemeinde übergeben. Wir haben sehr wohl versucht, sehr konkrete Dinge zu übergeben bis zu dem Punkt, wo wir das können. Den Projektantrag dann einzureichen, fertig zu formulieren, das wäre dann schon wieder Aufgabe der Akteure vor Ort gewesen, das haben sie nicht aufgenommen." (P10_f01: 357)

¹⁵² "und ich denk mir, es wird schon, es wird eine Mischung sein aus, aus Mentalität, Problemlage, wie aktiv betrifft sie einen wirklich, ja, ist es jetzt wirklich notwendig sofort und auf der Stelle eine Lösung zu finden oder nicht, solange der Leidensdruck nicht groß genug ist, ja, ist, ist es wahrscheinlich schwierig, da wirklich Menschen zu mobilisieren." (P10_f01: 400)

now. Another researcher talks about this divergence and tells us that he would be interested in time spans of several thousand years:

“In landscape visualization in reality it is, the timespans – just a little example – if you say it is getting warmer, the timber line is going upward, region A [] is going upward, I mean, we wouldn’t have to depict 100 years but 5, 600 for it to be... to lead to visible changes in terms of the landscape.”¹⁵³ (P08_m01: 711)

He knows, however, that this kind of knowledge is not really relevant to the decision-making processes of his PPs. Another researcher also talks about the importance of choosing the right timespans:

“But it isn’t true, it was full, there were a hundred people there, maybe a hundred and twenty, nobody could sit down any more, the rest was standing. So that surprised me a lot, and that, I hold the fact that we were able, were able, the data, we didn’t talk about 2080, but 2030, accountable for that. In a time, where one is still affected, where he says, I’m skiing then and this is my future, not any future”¹⁵⁴ (P07_f01: 81)

She talks about futures that actually *affect* contemporary actors and distinguishes between *my future* and *any future*. What become visible here are processes in which futures need to be negotiated; in which temporal and representational politics collide. Different actors and problems that need to be solved are connected with imaginations of which futures matter. Thus, this is also a debate concerning whose futures matter. The problems that researchers talk about are situated in a future that is supposedly too far away to matter for the PPs. Therefore, they are not interested in respectively don’t act on the knowledge produced in the projects. That points to the importance of futuring practices in which researchers and their partners negotiate the ‘when’ of futures that matter. This is expressed in a slightly altered version also in the following quote, in which a researcher talks about the desirability of particular research project respectively its opposite, the disinterest of PPs:

¹⁵³ “Bei der Landschaftsvisualisierung ist in Wirklichkeit das, dass die Zeiträume - also nur mal ein kleines Beispiel – wenn man sagt es wird wärmer, die Waldgrenze wandert in die Höhe, also Region A [] wandert in die Höhe, ich meine, da müssten wir nicht 100 Jahre darstellen, sondern 5, 600 damit das überhaupt im... im Sinne des Landschaftsbildes zu sichtbaren oder erkennbaren Veränderungen führt.“ (P08_m01: 711)

¹⁵⁴ “Stimmt aber nicht, es war voll, es waren hundert, vielleicht hundertzwanzig Leute da, es konnten keine mehr sitzen, also der Rest sind gestanden. Also das hat mich sehr überrascht, also, und das, das schiebe ich drauf, dass es gelungen ist, es gelungen ist, die Daten jetzt, wir hatten nicht über 2080 geredet, sondern 2030. Wir hatten über Zeiten geredet, in denen man noch refinanzieren kann und muss. In der Zeit, wo es einen auch noch betrifft, wo sagt er, da fahre ja ich noch und das ist ja eigentlich ja meine Zukunft, nicht irgendeine Zukunft” (P07_f01: 81)

“No, I think simply a, a disinterest, there are a lot of people who are simply not interested, simply not. And you have to simply admit, a football game is more interesting to many compared to some, something, that's the way it is. Even if they talk about it, but interested. There are some politicians, some decision makers, they will do it and the rest is [prrrrt]. But this depends on the kinds of people, on, no idea, of the, the profession, all sorts of things. But I think, lots of areas interest, interest is just not there. In this case, the stakeholders, the agricultural actors, they have a certain interest. But there are not many others who are interested I guess. You need to be realistic about it, otherwise a lot of things wouldn't exist.”¹⁵⁵ (P02_m03: 1198)

In response to our question concerning possible resistance concerning the work of the researcher this interviewee is talking about *disinterest*. He relates the disinterest of a broad majority of actors to our representational democracy, which leads people to hand over responsibilities to local authorities and do not seem to bother any more. Our future in this view, and in the narration of the researcher this comes as an accusation, is not a crowdsourced future, but a future in the hand of *some politicians*. Of course in his view it should be otherwise. In this story the idea of transdisciplinary research and its difficulties are directly related to forms of social organization and the idea of the PP as a politically passive subject. Ideas about futures that matter for particular actors are in this imagination also related to ideas about who is responsible for caring about them. In this way, this quote directs attention to the social and epistemic orderings that are related to futuring in transdisciplinary sustainability research practices.

6.3. Socio-epistemic Orderings

Core to the alternative socio-scientific imaginary guiding proVISION are ideas about re-ordering science-society relations. This concerns epistemic, social and moral aspects of knowledge production. ProVISION assumes a need for anticipatory knowledge that is supposed to enable actors to deal with contemporary problems and make responsible decisions for the future. In this imagination particular ideas of Austria as a country

¹⁵⁵ “Nein, ich glaub einfach ein, ein Desinteresse, ich denk, es gibt sehr viele Leute, die interessiert's einfach, einfach nicht und das muss man einfach gestehen. Ein Fußballspiel ist interessanter für viele, wie irgendein, wie so was, das ist halt so. Auch wenn sie von dem reden womöglich, aber interessieren. Es gibt da irgendwelche Politiker, irgendwelche Entscheidungsträger, die werden's schon machen und der Rest ist [prrrrt]. Aber das hängt auch wieder vom Menschenschlag ab, von, keine Ahnung, von der, vom Beruf, allem möglichen. Aber ich denk einmal, vielen Bereich interessiert's, ist's Interesse einfach nicht da. Ich mein, in dem Fall, die Stakeholders, die Landwirte haben vielleicht ein gewisses Interesse. Aber viele andere interessiert das sowieso nicht, schätz ich einmal. Man muss das, denk ich aber einfach realistisch so sehen, sonst gäb's vieles nicht.” (P02_m03: 1198)

defined by its exceptionally green landscape and its expertise in sustainability issues are stabilized together with ideas about a particular collective supposedly responsible for keeping it that way: sustainability researchers and their Praxispartners. The aim is to integrate local actors from 'outside' academia into knowledge production processes. In this way, knowledge is supposed to be *made available* in order to deal with contemporary environmental (and not to forget: economic) issues. How do researchers translate these ideas in their narrations of their research practices? How do they make knowledge about the future available? How is the figure of the 'Praxispartner' mobilized in their accounts? And how does this relate to their concepts of science-society relations and the production and use of anticipatory knowledge? To answer these questions I will look at the ex-post accounts of researchers and their partners of their practices of producing anticipatory knowledge and especially focus on stories about collaboration and integration. In doing, so I will relate different translations of the Praxispartner to ideas about the production and use of anticipatory knowledge in transdisciplinary sustainability research.

In the public texts about the projects such as project descriptions or proposals the 'Praxispartner' is featured prominently and in a multi-faceted way.

"Already the design of the model and the parameterization of the actor model have been developed in an intense participatory process. In further consequence the model was used to develop options for a more sustainable development in the region together with the actors in the region."¹⁵⁶

In this description *intense* participatory practices are described as key to different phases of the respective project. Model development and the discussion of possible 'options' for the region are performed together by researchers and their PPs. Local partners are deemed necessary for *sustainable development* in the region based on the idea that it is local futures that are produced here. PPs are ascribed a special expertise when it comes to these futures that shall be achieved. Whereas this narration highlights the interactive and collaborative efforts, other projects enact more traditional

¹⁵⁶ "Bereits das Modelldesign und die Parametrisierung des Akteursmodells wurden in einem intensiven partizipativen Prozess erarbeitet. In weiterer Folge wurde das Modell verwendet, um gemeinsam mit Akteuren in der Region Optionen für eine nachhaltigere Entwicklung zu erarbeiten."
proVISION website: project description Q Accessed August 8, 2013: <http://www.provision-research.at>

imaginations about the relation between science and social reality when e.g. talking about ‘target groups’ or ‘knowledge transfer’¹⁵⁷

In the interviews as well as in the meetings we participated in we encountered a broad variety of different translations of the Praxispartner. Actors from social reality are often framed as potentially affected by particular developments and thus as the users of the knowledge produced in the projects. As such they are supposed to apply the knowledge and act according to the insights gained in the projects. They are ascribed different sorts of expertise or knowledge and get involved in different ways during the research process: in articulating the research problem, in defining parameters in modeling processes or in ‘validating’ the outcomes. These figures are all connected to different ideas about how to collaborate and what their particular contribution might be. Therefore, ideas about collaboration and the figure of the PP are closely related to ideas about how knowledge about the future ought to be produced and how it might become relevant.

6.3.1. ‘Reality checkers’ and knowledge for decision-making

One way in which PPs are involved in the participatory production of anticipatory knowledge (mostly computer models or simulations) is through giving **feedback**. Researchers present ideas or prototypes in several phases of the projects and their PPs are asked for their input. This can happen at the beginning of projects, where the general concerns of local actors are examined. Researchers e.g. discuss their ideas about which aspects should be part of a model and their extra-scientific partners have the possibility to articulate certain requests. This is framed e.g. as producing a “wish list” (p08_m01: 840) by one researcher. In such instances they are framed as “Reality-Checker” (FG_05: 317, orig.) and are as such ascribed the ability to judge whether particular questions posed in a project are relevant for a group of extra-scientific actors.

In these discussions different ideas concerning issues to consider for potential future developments are discussed. Thus, futures are being negotiated within the project group consisting of researchers and their PPs. Researchers talk about how such initial feedback on their ideas influenced the project design and consider it as an important input for their modeling activities. Researchers attempt to change the models according to the input of their PPs and come back to present the final products. This is often

¹⁵⁷ proVISION website. Accessed August 8, 2013: <http://www.provision-research.at>

happening in formats such as workshops taking place in the region. Mostly, projects and with them the collaboration between the researchers and the local actors or PPs end after such final presentations.

When the researchers present their final results to discuss them together with their PP, they describe such presentations as a means of *verifying* their results:

“for us this was a bit of a confirmation that we are not that wrong with what we’ve been thinking. So we used the stakeholder to verify our a-priori hypotheses, let’s put it this way, yes?”¹⁵⁸ (P09_m01: 248)

Engagement with the PPs in the region is described as a *confirmation* of their work by this researcher. Lack of contestation at such public events thus is described as approval that the results are *not that wrong*. They are ascribed a position as validators of the knowledge produced by the researchers.

Other moments in which giving feedback takes place are so-called “test runs” (p08:m01: 923). This is conducted in projects where an interactive tool is the aspired project outcome. In contrast to feedback formats not only the different content-related concerns can be expressed but also the concrete functionality is tested in such situations. The PP here is translated as a potential user of the tool in the making:

“I can’t test something that (...) I mean ready in the sense (...) lets put it that way, if I want to test (...) well let’s compare it with a suit or a dress: if I (...) if I have a fitting for that and I only have the cloth, the it’s a bit thin, no?”¹⁵⁹ (P08_m01: 950)

In the quote above the researcher talks about how such a ‘*test run*’ worked for them as a kind of a deadline. He compares it to a *fitting* of clothing, for which the researchers need to provide some prototype. The PPs here are imagined as holding an expertise as software-users and the experience-based expertise as actors from a specific region. Based on that expertise they can give feedback on how the tool *fits* their particular needs and thus is an adequate representation of the region. The feedback is collected via questioning the testers and is then used by the researchers for improving the tool.

¹⁵⁸ “das war für uns schon auch die (...) ein bisschen auch halt eine Bestätigung, dass wir nicht so falsch liegen was wir uns halt (...) halt überlegt haben. Also wir haben die Stakeholder quasi verwendet, um unsere a priori Hypothesen zu (...) zu verifizieren – sagen wir einmal so, ja?” (p09_m01: 248)

¹⁵⁹ “Ich kann ja noch nicht etwas testen was (...) ich meine fertig im Sinne (...) sagen wir so, wenn ich testen (...) also vergleichen wir es mit einem Anzug oder mit einem Kleid: wenn ich (...) wenn ich so quasi jetzt eine Anprobe für das mache und ich habe nur den Stoff, dann ist das ein bisschen dünn [] na?” (p08_m01: 950)

When collaborations take the form of giving feedback the aim of anticipatory knowledge is often described as adding decision-making processes. This is already visible in project proposals where scenarios and models are often presented as a means for “informing” (Prop_R: 16) **decision-making**. Local policy actors shall be provided with anticipatory knowledge on which they then can base their decisions. The participatory production of this knowledge allows for its applicability or “Praxistauglichkeit” (Prop_R: 5) according to this proposals narrative:

“In all of the three sub-projects researchers and Praxispartner develop future scenarios together, that serve as decision-making aid, to support sustainable structures of land-use and adaptive economic- and social structures for future development. In doing so concepts like ‘resilience’ and ‘adaptive management’ are conferred on practice-relevant questions and new approaches are applied to integrate quantitative and qualitative scenarios for different spatial and temporal scales.”¹⁶⁰ (Prop_R: 6)

In this quote we see all the elements that are also present in the proVISION documents: scenarios are presented as a way to depict a *future development* and thus to epistemically reach out to the future. These are *developed together* by researchers and PPs. Thus, also the issue of collaboration is put prominently in this quote. Additionally, the aim of this kind of anticipatory knowledge is addressed. In this account anticipatory knowledge is framed as a means of *serving* decision-making. Thereby, a linear model of scientific knowledge and (political) action is assumed. Knowledge about particular developments will – once successfully distributed – lead to corresponding actions in the future. To be a reliable source for decision-making, however, scenarios need to have certain features. Not every scenario seems to be equally fit for building the grounds for decision-making processes. In the narration of project-proposals characteristics of scenarios in this regard are being “workable” (Prop_R: 13), “usable” (ibid.) and “acceptable” (ibid.) “change scenarios” (ibid.). ‘Workable’ and ‘usable’ futures indicate the need for a certain degree of realism. Put differently the scenarios produced need to correspond to common sense ideas about the future; no utopian scenarios are wanted here. This is why PPs are needed as *reality checkers*.

¹⁶⁰ “In allen drei Subprojekten werden ForscherInnen mit PraxispartnerInnen gemeinsam Zukunftsszenarien entwickelt [sic], die als Entscheidungshilfe dienen sollen, um nachhaltige Landnutzungsstrukturen und anpassungsfähige Wirtschafts- und Sozialstrukturen für die künftige Entwicklung zu unterstützen. Dabei werden neue Konzepte wie „Resilienz“ und „Adaptive Management“ auf praxisrelevante Fragen übertragen und neue Ansätze zur Integration von quantitativen und qualitativen Szenarios für unterschiedliche räumliche und zeitliche Skalen verwendet.“ (prop_R: 6)

Although the proposals emphasize the need for a participatory production of scenarios, this process is mostly framed by theoretical concepts brought in by the researchers: on a basic level the decisions to be made shall lead to more sustainable actions with sustainability being a concept mostly brought up by the researchers and by the program itself. In the quote above the concepts *resilience* and *adaptive management* are emphasized. The projects aim is to use and ‘test’ these concepts. Project proposals thus articulate quite normative ideas about to what ends decisions have to be made. These ends as well as what sustainability actually means in a particular local context are hardly ever open for debate in the projects.

Researchers engaged in proVISION projects talk about models and scenarios as different ways of providing anticipatory knowledge for their local partners. The frame this kind of knowledge as a way of illustrating *development potentialities*:

“Potential development possibilities, what, what does the model say about what would, what could happen here, if certain measures are taken or not taken.”¹⁶¹ (P10_f01: 176)

Knowledge in this account is directly related in a causal manner to *actions to be taken*. PPs are presented with such potential developments and are then supposed to act accordingly after *reasonable levels* are identified:

“But it enabled us to say very concretely so to say: ok, like this... area X looks like this, these are the effects on the different sectors, and we don’t want that. And meaningful levels are left and those can very well be... they need to be carried to the political level as well as into the public space.”¹⁶² (P06_m01: 686)

On the basis of this anticipatory knowledge PPs are supposed to decide what they want and what they don’t want. This close connection of knowledge and action serves as a rationale for the importance of integrating PPs in the production of scenarios or models.

“Yes, no, it was important for the development process, i.e. the model was, it was not a model that was there at the beginning of the project or that we first developed and then

¹⁶¹ “Potenzielle Entwicklungsmöglichkeiten, was, was sagt uns jetzt das Modell drüber aus, was würde, was könnte hier passieren, wenn gewisse Maßnahmen getroffen werden oder nicht getroffen werden.” (P10_f01: 176)

¹⁶² “Aber es hat hier ermöglicht ganz konkret sozusagen: ok, so... so schaut Gegend X dann aus, das sind die Wirkungen auf die unterschiedlichen Sektoren, und das wollen wir nicht. Und es bleiben jetzt sozusagen sinnvolle Ebenen über und die kann man natürlich sehr wohl... die muss man zur politischen Ebene genauso tragen wie in den öffentlichen Raum.” (P06_m01: 686)

confronted the actors with, instead the participatory process always centered around the development of the model.”¹⁶³ (P10_f01: 130)

Local actors were supposed to take part in the development of the model. This practice is contrasted with approaches in which they are merely *confronted* with an already finished model. Taking part then mainly consists in giving feedback and contributing personal opinions concerning the importance of aspects and problems. Additionally, PPs are framed as *stakeholders* that need information for their decision-making processes. Describing such relations, researchers draw on more traditional imaginative resources and talk e.g. about difficulties concerning questions of ownership and control:

“But it was the case that you were engrossed by the question of participation und that you were also engrossed by the (...) the stakeholders, so that the research questions were adjusted almost entirely to pacify (...) to satisfy the stakeholders. So what they were not interested in (...) at least in this project (...) that wasn’t dealt with any longer, it rather appeared like (...) like a spotlight.”¹⁶⁴ (P09_m01: 229)

In this quote a researcher talks about the problem of PPs as sort of taking over the project. In this story researchers are mainly occupied with pleasing their partners, by which he understands adapting research questions according to their interests. The PP here is not only a collaborator but also re-framed as a *stakeholder*, i.e. someone who has interests of his or her own and additionally the power to get them acknowledged. This is also described as a process in which collaborators from the real world illegitimately “mutate into commissioners”¹⁶⁵ (P09_m01: 259). This additionally leads to a different understanding of the collaborative relationship, which is then framed in terms of control as only questions that suited the interests of the *stakeholders* or *commissioners* could be further pursued. In doing so, our interviewee also establishes a clear demarcation between scientific questions on the one side that are in danger of being ignored in order

¹⁶³ “Ja, nein, wichtig war es mal für den Entwicklungsprozess, das heißt das Modell wur-, es war kein Modell, das am Anfang des Projektes da war oder das mal wir entwickelt haben und dann haben wir die Akteure damit konfrontiert, sondern der Partizipationsprozess hat im Prinzip immer im Mittelpunkt gehabt die Entwicklung dieses Modells.” (P10_f01: 130)

¹⁶⁴ “Aber es war doch so, dass einem die partizipative Frage vereinnahmt hat und dass einem auch die (...) die Stakeholder so weit vereinnahmt haben, dass die Forschungsfragen schon [] nahezu ausschließlich dann darauf ausgerichtet worden sind, die Stakeholder befrieden (...) zu befriedigen. Also was die nicht interessiert hat, das hat man halt in dem (...) in dem Projekt zumindest nicht (...) vordergründig nicht weiter bearbeitet, sondern ist halt gelegentlich vielleicht aufgetaucht so als ein (...) ein Blitzlicht“ (p09_m01: 229)

¹⁶⁵ „Na jedenfalls [] und das war [] das ist eigentlich bei allen dieser Projekte so, wo man mit Stakeholdern arbeitet, dass die dann zum Auftraggeber quasi mutieren - ja? - dass der Auftraggeber [] dann zurück tritt und die immer stärker diese Rolle einnehmen auch wenn sie nichts dazu zahlen, na?“ (P09_m01: 259)

to *satisfy* the PPs' interests on the other. This skeptical account, however, is not the only way to frame the involvement of PPs in the production of anticipatory knowledge. Translating the proVISION idea of an alternative way of producing knowledge transdisciplinarity is differentiated from basic research exactly because PPs have their own stakes in the project and are, additionally, in a position to make certain demands. Researchers are in this case not able to just "have a good time"¹⁶⁶ (P06_m01: 2032) but instead need to engage with the needs of the researchers. Transdisciplinary sustainability research, one could add, is in this sense always morally commissioned as it is concerned with actualizing attainable futures in a particular region with their PPs.

An important feature of anticipatory knowledge is its assumed capacity to sort of de-emotionalize debates in decision-making processes. It can be used to balance disputes elsewhere mainly dominated by *emotions* and differing *interests*:

"That (...) on the basis of (...) of adequate examples about what is happening under particular circumstances, scenarios if you will, much of the emotions is out of the discussion. The (...) other thing is, you have to say, the discussion got more factual – a solution was not found, but at least the discussion was more factual and that was (...) the actual goal, whether you (...) get to questions and the goal with that device (...) to get emotions in the direction of the more factual. Whether it is going to lead to a solution (...) I think that belongs to (...) the realm of illusion. But on the other hand I believe in this illusion, because if issues are being discussed more factually, you are (...) one step closer to a solution than if (...) you discuss just emotionally, no?"¹⁶⁷ (P08_m01: 605)

¹⁶⁶ „Aber wenn der Praxispartner keinen Gewinn hat... das Problem ist, er muss vorher einzahlen – nicht? – weil die... die Förderung läuft dann von... von ihm. Es ist natürlich eine ganz andere Erwartungshaltung da. Projekte wie dieses nehmen das aber raus, na? Und es war sehr... sehr gut für alle Seiten – nicht? – weil ein dritter zahlt und die anderen sozusagen sich irgendwie einen schönen Tag machen können, sondern weil dieser... dieser... diese Verantwortung auch raus genommen wird: ich gebe dir das Geld und will unbedingt das haben – sondern das engt auch wieder diesen... diesen Wissensgewinn ein bisschen ein und das... vielleicht ist das aber ein Punkt wo Aspekte davon aber passieren müssen, na? In Grundlagenforschung wird das nicht passieren – kann ja nicht, weil das einfach nicht... nicht das Thema ist. Geht eine andere Richtung, hat ihren Sinn und Zweck, aber diese Transdisziplinarität ist eher wahrscheinlich mit genau dieser Themenstellung auch konfrontieren.“ (P06_m01: 2028)

¹⁶⁷ "Dass (...) dass das anhand von (...) von entsprechenden Beispielen was unter bestimmten Bedingungen, wenn man jetzt will Szenarien, passiert, plötzlich sehr viel von den Emotionen aus der Diskussion drauß war. Das (...) eine andere muss man dazu sagen, ja, die Diskussion wurde sachlicher – eine Lösung ist deswegen nicht gefunden worden, aber sie wurde wenigstens sachlicher und das war bereits (...) war eigentlich das Ziel, ob man (...) oder die Frage und das Ziel, ob man mit solchen Hilfsmittel schafft von (...) die Emotionen eher in Richtung Sachlichem zu bringen. Ob es eine Lösung herbei führt, das wäre (...) glaube ich gehört auch in die (...) in den Bereich der Illusion. Nur umgekehrt glaube ich sogar an diese Illusion sehr schnell oder sehr gut, weil wenn einmal sachlicher diskutiert wird, dann ist man der (...) einer Lösung schon einen Schritt näher als (...) als bei rein emotionaler, na?" (p08_m01: 605)

In the quote above a researcher depicts a situation in which the consequences of particular decisions - presented in the form of computer visualizations - lead to a less emotional discussion. At the same time it gets more focused and *factual* in the terminology of this researcher. Emotions and anticipatory knowledge are clearly separated. Thus, scenarios are a useful means for steering a discussion towards the *factual*. Anticipatory knowledge is deemed especially important in debates about the future where a great deal of uncertainty and thus speculation is involved. Scenarios, however, are not necessarily supposed to lead to *solutions*. Thus, solutions need to be found on other grounds than knowledge about possible futures. In this sense a clear distinction between knowledge and action and thus between scientific and the political is introduced. Concerning this point researchers seem to mobilize more traditional imaginations about science-society boundaries and what knowledge can or should do.

Summing up, when PPs are conceptualized as users of the final product they have a say in the production of the models and can give feedback as I described above. This kind of social and epistemic re-ordering is often visible in projects that produce anticipatory knowledge for decision-making. Futuring here is the utilization of futures as “tools” (p08_m01: 655) in decision-making processes for “conflict settlement” (ibid.). It is about producing different futures from which stakeholders then can choose. Uncertainties or difficulties of their production – their fictionality - disappear, the futures produced are regarded as stable entities - although of course as multiple stable entities - that help to get rid of emotions and interests in decision-making. The relation between researcher and PP is one of exchange of different forms of expertise. Researchers provide their technical knowledge about producing anticipatory knowledge while PPs provide their experience-based knowledge about a region to judge the adequacy of the researchers’ representations of ‘reality’. After the project has ended regional actors are supposed to use the project results and in the imagination of the researchers act according to these results they helped to produce. The researchers here thus translate the proVISION imagination of ‘making knowledge available’ quite literally: it is producing knowledge about potential developments and stops right there. Settling conflicts is not directly connected to finding solutions. The researcher – if appearing at all – and the scenarios function as mediators ‘de-emotionalizing’ discussions between stakeholders. Providing solutions is not the responsibility of science, it is even described as an “illusion” (p08_m01: 675). In this translation of the role of the PP we can see how the idea that the

projects are about knowledge for the future development of a particular region brings with it this particular co-constitution of researchers and their partners.

6.3.2. Accessing local hopes and fears and 'brokering' futures

In other accounts the figure of the 'PP from social reality' is translated as a way of **accessing a particular regions "local system knowledge"** (Prop_R: 20; orig.). An example for this translation is one project in which local actors produce drawings for the researchers in order to share their ideas about the future. These scenarios as are at once a means of generating knowledge and of raising awareness. To this end in one project scenarios are produced in workshops in the beginning of the project. Researchers then further develop these draft scenarios, which are later "validated" (ibid.) by the extra-scientific actors. In the end the scenarios are used in workshops "to discuss possible future strategies" (Prop_R: 17; orig.).

The interesting thing about this method of producing scenarios in this project takes place in what is called an *educational cooperation* by the program. In this cooperation school children are asked to draw the future:

"Educational cooperations with elementary schools in the reference region confront children with change in the direct living environment and bring in their view: children will take pictures, compare them with old pictures from their families and will then draw a picture of the future. The parents are invited to the presentation of the results and are asked to bring in their perspectives of the problem." (Prop_R: 6)

The children are asked to get an old photograph from people they know. Then they should go to the place on the photo and take a picture themselves. Additionally to these two photographs the children are invited to draw two different pictures of the future: a scenario of the future as they want it to be and a so-called 'doom-scenario'. These pictures are subsequently printed as card games for the children:

"During the closing event in the three schools every pupil received a quartet and a certificate. Further quartets were given to the school class (for optional sale, whereas the sales revenue should be for the benefit of the class or the school)." (FBK Synthesebericht: 2)

The scenarios are defined by the criterion of plausibility. It is plausible futures the researchers want in this project:

“scenarios are defined as future images of how change and transition affect three landscapes and the local population. To draw a picture of a plausible situation at a future date” (Prop_R: 16; orig.)

The main interest of the researchers in this project is to use these scenarios as research materials. The cards are analyzed according to the main topics, and how they are drawn. In doing so, the researchers attempt to learn more about the region’s imaginations about problems, why they are regarded as problems and how to solve them.

Local actors are framed as research subjects. According to a researcher, children “transmit” (p09_m01: 93) the problems of a region “unfiltered” (ibid.). Thus the idea is that children hold a particular kind of “expertise” (FBK Synthesebericht: 23) and that their views can be used as an “augmentation of the horizon of the researchers” (ibid.). Additionally to that and according to the project leader they also provide a somehow superior way of accessing social reality of the region:

“So the (...) the children reflected what the grown ups talk at home, just one example: in the part that took place in X the parents didn’t say: the foreigners paint all the walls – yes? – but the children said it – no? So there we learned from the children what the people were really thinking and what is not told, no? So you have the desire to present yourself as a good person and then not everything is told what is expected – no? Or what you don’t want to say just gets repressed – let’s put it that way – und the children say it unfiltered, no?”¹⁶⁸ (P09_m01: 93)

The scenario development had two aims: to learn something about the children’s - and simultaneously their parent’s - ideas about the region and additionally the exercise should allow for **sensitizing children for the pressing issues** of the region and the importance of current actions for potential future development. According to the project leader this idea was mainly brought up by the local *stakeholders*, who need to confront the problem of increasing labor shortage in the region and are therefore mainly interested in producing future personnel:

¹⁶⁸ “Also die... die Kinder haben praktisch also reflektiert was die Erwachsenen so erzählen daheim, also halt als Beispiel: in... in... der Teil der sich in... in... halt im Kamptal abgespielt hat, da haben die... die Eltern halt nicht gesagt: die Ausländer schmieren die Wände voll – ja? – sondern das haben die Kinder gesagt - nicht? – also von dort haben wir von den Kindern erfahren was... was wirklich auch noch gedacht wird was nicht so vermittelt wird, na? Also man hat halt doch den Anspruch sich als... als guter Mensch zu geben und dann wird vielleicht nicht alles gesagt, was man sich so erwartet - na? – oder was man gern... was man nicht sagen will, das wird unterdrückt – sagen wir so - und die Kinder sagen das einfach ungefiltert, na?” (P09_m01: 93)

“it was re-framed due to the stakeholders in the sense that that this aspect, in that case in the industrial space, of steering the interests of the children quite early was not an issue for us in the beginning. This issue was brought up by the stakeholders there, because we worked with elementary schools and because we heard from the firms where they see a shortage of young people and where they are afraid that the few big ones lure away the qualified workers and that none are left for them.”¹⁶⁹(P09_m01: 146)

Drawing the future thus serves two aims in this project. First, in a methodological sense it is regarded as a superior way to get access to the somehow unfiltered concerns in a region, to the “fears and joys of the future” (p09_m01: 526). And second, through drawing futures of their region children are supposed to be sensitized for certain problems and their interest for particular issues and topics can be aroused and thereby also steered in certain directions. Rather than trying to produce an objective representation of the real world out there – as it is the case with the translation of the PP as a user giving feedback - the idea in this project is much more to get unbiased access to the hopes and fears of the population of a region. Thus, these futures are deliberately more fictional (nevertheless plausibility is still regarded as important in the children’s drawings). However, in this project the future is understood as open to the active shaping of human actors. The idea is to make children think about the future and thereby make them realize that it is in their hands to shape the futures to come: it can either be utopia or dystopia. Futuring here is thus intentionally interventionist. Researchers and their partners aim at steering the region into a particular way by to raise children’s awareness for their ability to actively shape the future. This also tells us something about the timeframe of this futuring practice. Children’s’ awareness needs to be raised so they can make better decisions when they grow up. So here we see urgency performed as an intergenerational issue. There is still enough time so our children can solve contemporary problems. At the same time, however, they learn that the future is not a realm of ‘anything goes’. While children are expected to be imaginative, they are also invited to draw *plausible* futures, i.e. futures that are anchored very much in the present. A negotiation of futures thus takes place here in which the different actors

¹⁶⁹ “es hat sich durch die Stakeholder ein bisschen re-framed dahingehend, dass der Aspekt in dem Fall im industriellen Raum, dass man dort Kinder schon in... relativ früh an die... die Interessen halt lenken könnte oder sollte, das war für uns zu Beginn kein Thema – dieses Thema ist von den dortigen Stakeholdern aufgekommen, weil wir eben mit Volksschulen gearbeitet haben, weil wir von den Unternehmen gehört haben, wo... wo sie halt Nachwuchsmangel sehen und wo sie halt die... die Furcht haben, dass ihnen die paar großen die qualifizierten Arbeitskrä... also... also Arbeitskräfte abwerben und ihnen dann keine mehr bleiben.“ (P09_m01: 146)

engaged in the project in a collective effort establish which futures are plausible and thus acceptable for the group and which are not. This leads to another interesting issue: in both translations of the PP - as users and providers of feedback and as entry point to a region's 'fears and hopes' the PPs are imagined to represent a certain region or community. However, it is not always clear how these actors are selected and on what grounds and by whom their ability to represent a particular group of individuals (mostly 'the affected') and their ideas about the future is determined.

This conceptualization of researchers' relation to the PPs can thus be understood in terms of **raising awareness**. Awareness of the future consequences of actions in the present is supposed to change the behavior of individual actors in the long run. Knowledge of this kind aims to inform about cause-effect relations as one researcher tells us:

"So it happened a little in the run-up to lead the people to the issues by assembling such (...) such chains of cause and effect and systems analysis of the different influences of places and actors and of agriculture: what is effective how? – and: what effects does climate have? – and: how does that influence tourism-intensity? – and (...) they became aware of that during these (...) during these workshops."¹⁷⁰ (P09_m01: 243)

This quote strongly resembles ideas discussed in the debate on the public understanding of science. The public is not aware of how their actions influence their environment, therefore science needs to produce knowledge about these chains of causation and make the knowledge accessible for a wider public. Scientists help their PPs to realize and understand such connections. According to our interviewee in the quote above this happens throughout the whole research process. Another researcher talks a bit more about how awareness raising is done:

"So ours is to get the data, facts to the communities, schools, firms or to the general public, but also to the multipliers before that."¹⁷¹ (P01_f04: 133)

¹⁷⁰ "Also es war schon auch ein bisschen halt im Vorfeld, dass man die Leute dann so ran geführt hat indem man so (...) so Kausalketten zusammen gestellt hat und Systemanalyse auf die unterschiedlichen Einflüsse von Räumen und von Akteuren und von der Landschaft: was wirkt wie? – und: wie wirkt das Klima? – und: wie wirkt sich das auf die... auf die Fremdenverkehrsintensitäten aus? – und... Also das ist dann ihnen allen schon klar geworden und bewusst geworden in diesen... in den Workshops." (p09_m01: 243)

¹⁷¹ "Also unserer ist eher halt wirklich dann die Daten, Fakten dann an die Gemeinden, Schulen, Betriebe oder halt dann auch an die Bevölkerung zu bringen, aber eher halt auch zuvor die Multiplikatoren." (p01_f04: 133)

Researchers need to present *data* and *facts* at a variety of different occasions. The anticipatory knowledge produced in the project is presented in different formats such as workshops, lectures and so on. Participation in this narration is translated as a tool for science communication.

Translated in this way one of the main issues in transdisciplinary sustainability research becomes the *transport* of knowledge. The need to communicate the results is accordingly very present throughout the interviews. Our interviewees describe the communication of results as a necessity and are keen to integrate production and reflection about dissemination. They are aware that the knowledge will be communicated somehow, so they try to take part in deciding how the knowledge is being *brokered*:

“The collaboration transdisciplinary? (...) I mean, for a project like X I think it is really desirable, because the issues need to be brokered. Because someone is going to broker it anyway - it just depends on the work in the background and on the interest group.”¹⁷² (P01_m02 1338)

Researchers arguing this way translate transdisciplinarity as a way of *transporting* knowledge to their PPs, who are framed as *target groups*:

“There was a target group, in the sense that – I know that from my own experience and also with my daughters it is clearly visible – the issue of forestry, although it is economically not insignificant in Austria, it is normally two pages in books on geography and economy. So there is really little on that. And (...) yes. I mean what is there is not wrong but it is really very little und (...) and it was the attempt to transport something through such a system through visualization.”¹⁷³ (P08_m01: 86)

This researcher talks about an issue that he considers important and then about the means most suited to serve the purpose of knowledge transport; in this case *visualization*. Transdisciplinary collaboration thus is mobilized as a way of gaining control over how scientific content is being transported to particular PPs who are

¹⁷² “Die Zusammenarbeit transdisziplinär? (..) Ich meine, für... für so ein Projekt wie X finde ich es... finde ich es sicher erstrebenswert, weil die Sachen sicher auch vermittelt gehören. Weil vermitteln tut sowieso wer – es kommt immer nur darauf an mit welchen... mit welcher Arbeit im Hintergrund halt und welche Interessensgruppe.“ (p01_m02: 1338)

¹⁷³ “Also genau Zielgruppe war da schon, dass man sagt man - ich kenne es selber aus eigener Erfahrung und auch von meinen Töchtern sieht man schön – das Thema Forstwirtschaft, obwohl es in Österreich nicht wirtschaftlich gesehen nicht unbedeutend ist, ist es in den Geographiebüchern oder Geographie- und Wirtschaftskunde normalerweise zwei Seiten. Also da steht ganz, ganz wenig. Und (...) ja. Ich meine, das was dort steht ist nicht falsch, aber es ist halt wenig und (...) und es war halt da der Versuch, dass man auch über so ein System durch Visualisierung eher auch etwas transportieren kann.“ (p08_m01: 86)

understood here as *target groups* or *interest groups*. By making them participate in the projects researchers have more influence on what is *brokered* and how as they can react to the PPs understanding of what they are presented with.

While researchers talk a lot about how they bring knowledge about cause-effect relations into social reality, the issue of how knowledge will actually lead to action on the side of the PPs hardly comes up. Researchers seem to assume that once the knowledge is brought to the public practices will change accordingly. The issues discussed need to be relevant to the PPs. In the quote above the e.g. effects of a changing climate on winter tourism are discussed. However, the narrative mostly ends at the point where researchers present their findings. Applying the knowledge comes up merely as something in question as in the quote below:

“And the model also was the means of transfer because every time we went from a workshop with the farmers to a workshop with the community representatives we presented that’s how the model is right now and that’s the crucial aspects because that’s the way it has developed during the last processes. That means we had a new issue for discussion for the community representative right ahead, who also said yes to a lot of things, so there was a common understanding in the, in the weighting, that was really different, especially concerning the measures to take, whether the farmers are really willing to take the initiative”¹⁷⁴ (p10_f01: 264)

During the project PPs – farmers in this example – participate in adjusting the model. They become aware of their future through working with the model as a material entity and discussing its different *aspects*. The idea is that PP need to be close to the actual knowledge production practices in order to better understand the outcomes or as one researcher calls it to reach a *common understanding*. This common understanding refers to the anticipatory knowledge produced as well as to the actions that need to be taken by the local PP as a consequence of this knowledge. *Taking measures* then is described as something that depends on the *willingness* of the PPs.

¹⁷⁴ “Und das Modell war im Prinzip auch das Transfermittel, weil wir jedes Mal, wenn wir da von einer Workshoprunde aus mit den Landwirten dann in eine Workshoprunde gingen mit Gemeindevertretern, haben wir mal präsentiert, so steht das Modell jetzt da und das sind jetzt die wesentlichen Aspekte, weil das jetzt aus den letzten Prozessen sich so entwickelt hat. Das heißt, das war gleich wieder Diskussionsgegenstand für die Gemeindevertreter, die zu vielen der Dinge auch Ja gesagt haben, also da gab's schon ein gemeinsames Verstehen, in der, in der Gewichtung, da war's natürlich ganz unterschiedlich, ja, vor allem was, welche Maßnahmen wo greifen können, also ob's jetzt wirklich, ob die Landwirte bereit sind, da wirklich initiativ zu sein” (p10_f01: 264)

The idea that is expressed in these stories about raising awareness thus is kind of a two-sided one: on the one hand researchers talk about how through the PPs participation in the projects the anticipatory knowledge produced is able to address futures that matter for the PPs. Simultaneously, however, researchers also put effort into explaining to their collaborators why these particular futures matter. Raising awareness thus describes a futuring practice in which researchers and their partners from social reality negotiate futures of concern. In this sense, it is actually futures that are *brokered* in these encounters.

6.3.3. Users of pre-fabricated knowledge

Whereas proVISION aims to establish a particular idea of the Praxispartner as a somehow active collaborator and epistemic actor in research projects, the **PPs we talked to** draw on more traditional imaginative resources when it comes to of science-society relations and their own positions in knowledge production practices. A teacher responsible for such an educational cooperation describes herself as a *user* of knowledge:

“I then (...) I am the User [uses the English term; T.V.], the user – no?”¹⁷⁵ (P01_f03: 191)

Although in the quote a slight hint of insecurity about her role seems to be expressed in talking to us she quite clearly articulates her understanding of her position in the project. Throughout the interview she describes her role using a model in which she is the recipient of pre-fabricated knowledge. She also talks about learning things that she has imagined *totally different* before, which led to *aha experiences*:

Well, exchange, enrichment, stimulations, thought-provoking impulses and... and also aha experiences, no? I often had this in this project, that I thought: wow, I imagined this to be totally different – no? Well. Also the numbers and facts that they brought – no? – about meat consumption and... and also content wise – yes? – I learned quite a lot – yes? – and it also was very interesting”¹⁷⁶ (P01_f03: 709)

¹⁷⁵ “ich dann (...) dann der User bin, der Anwender – nicht?” (P01_f03: 191)

¹⁷⁶ “Ja, Austausch, Bereicherung, Anregungen, Denkanstöße und... und schon so Aha-Erlebnisse – nicht? Das habe ich bei dem Projekt schon oft gehabt, dass ich mir gedacht habe: wow, ich habe mir das eigentlich ganz anders vorgestellt – nicht? So. Auch die Zahlen und Fakten die sie gebracht haben – nicht? - über... über Fleischkonsum und... und also auch inhaltlich – ja? – da habe ich einiges gelernt – ja? – und war auch sehr interessant“ (P01_f03: 709)

Exchange, enrichment, stimulations, thought-provoking impulses are the main models of interaction this teacher talks about. She puts herself clearly in the receiving position, as it is her views that are overturned on the basis of *numbers and facts*.

Additionally, this teacher also rehearses the imagination of a PP as a reality-checker. Using a slightly different metaphor she talks about being a *food taster*. As such her role is to ensure that researchers don't *cook their own soup*¹⁷⁷ [Verbatim translation. The equivalent would be to 'go their own way'; T.V.]. This picture of course again puts her in a mostly passive role as a recipient and also relates to the feedback model of science-society relations. What she is mainly interested in is *packages* she can use for her daily practice of teaching:

"No, I mean it's ok in a way for me, because as a teacher I am glad when I get the package. They gave me all the materials – you would otherwise have to look for elsewhere and pay for it, no? And I also have a say in the development of these materials und steer it a little bit, that's also quite appealing, no?"¹⁷⁸ (P01_f03: 294)

To her the cooperation is a good opportunity to get new material. She describes this as a rare opportunity and additionally highlights that she did not have to pay for the *documents*. A further gain she describes is get to know persons that might be useful concerning possible *field trips*¹⁷⁹ with her students.

Based on this understanding of herself within the project context she also directly contributes to a stabilization of the idea of *breaking down complex relations*:

"Well I... I find the process exciting – yes? – of the project, like... like... like I thought, testing working materials, and then these neat materials come, which are very extensive. Uni is just unlike school – that's why it is a difference – they tried to do it on school level, really very nice and decent, but nonetheless I had to break it down a little – no? – and... but to adjust it to the pupils in the classes and grades and [] what interests them what does not, and therefore have to read and busy myself with it and this is a very extensive

¹⁷⁷ "Hat sicher einen Einfluss. Weil... weil dann... dann sehen sie... dann... dann können sie nicht so ihr eigenes Süppchen kochen – nicht? – sondern es muss was sein, was man dann... was dann auch schmeckt – nicht? [lacht] – sozusagen. Und ich wäre der Vorkoster – nicht? [Lachen] – in dem Bild." (P01_f03: 800)

¹⁷⁸ "Nein, ich meine es passt eh auf eine gewisse Art für mich, weil als Lehrer freut man sich dann wenn man das Paket kriegt. Sie haben mir diese ganzen Unterlagen gegeben – da muss man ja dann auch irgendwie schauen, wo man das sonst her kriegt und was bezahlt dafür – nicht? Und ich kann auch mitreden bei der Entwicklung dieser Unterlagen und das ein bisschen steuern, das hat auch einen gewissen Reiz – nicht?" (p01_f03: 294)

¹⁷⁹ "habe ich einen Kontakt wo ich das vielleicht dann einmal für eine Exkursion oder sonst was nutzen kann." (P01_f03: 556)

package, so this is a relatively huge amount of work – yes – additionally.”¹⁸⁰ (P01_f03: 89)

She describes her expertise of knowing the right level of complexity that fits her students’ current knowledge and abilities. In this sense, she needs to simplify the knowledge provided by the researchers. In doing so she rehearses an imagination of scientists as producers of *comprehensive* knowledge that she needs to adjust for the needs of her students. Knowledge in this narration is a set of established and stable facts with the ability to move from one context to the other.

Next to collaborations with educational institutions proVISION-funded projects also work together with NGOs as their PPs. In an interview with a member of such an NGO we are told that one of the most important things to gain for NGOs are also contacts to scientific institutions:

“Puh, well I think, the contact with science altogether is important for us. This means, that is... I can not rate this, but it is always important to us to hold contact and to get up to date dat...to get it firsthand.”¹⁸¹ (P01_f04: 332)

This contact and its maintenance are important in order to keep up knowledge transfer. It is *up-to-date data* that this PP is interested in. Collaborations with researchers ensure that it is *first hand* data as she calls it. Thus, she is interested in pre-fabricated data ready for further use. To get this data directly from researchers adds to its value, because it enables her to better understand it:

“The project maybe is a bit thankless, because you have crazy lots of work and the result is maybe for us two pages, but two important pages. Because I don’t need the process for getting the community [I2 and I: Yes] further. So that means in this [I2: Yes] case it is really... it is the message: yes, now it is getting towards the statements in the direction of Austria could nourish itself if... if it... they... if Austria could nourish itself in a healthy

¹⁸⁰ “Also ich... ich finde den Prozess einfach auch spannend – ja? – von dem Projekt, wie... wie... wie ich mir gedacht habe, Arbeitsmaterialien testen und dann kommen tolle Materialien die aber sehr umfangreich sind. Uni ist halt anders als Schule - deswegen ist es vielleicht auch ein Unterschied – und sie haben sich zwar bemüht auf Schulniveau das zu machen, also wirklich sehr schön und sehr fein, aber ich muss trotzdem noch einmal ein bisschen runterbrechen – nicht? – und... aber da in den Klassen und die Schulstufen und [] das ein bisschen anpassen an die Schüler, was [] interessiert und was nicht, und muss mich dadurch auch selber sehr einlesen und dem beschäftigen und das ist ein umfangreiches Paket, also das ist relativ viel Arbeit auch – ja – zusätzlich.“ (P01_f03: 89)

¹⁸¹ “Puh, also ich denke mir, überhaupt der Kontakt mit der Wissenschaft ist uns wichtig. Also das heißt, das ist jetzt... ich kann das jetzt gar nicht werten, aber es ist uns schon immer wichtig, dass man auch immer Kontakt dazu hält und auch wieder aktuelle Daten zu kommen... zu bekommen aus erste Hand.“ (P01_f04: 332)

way and so forth. These... these statements, but to know, that behind it everything is scientifically valid, this is maybe interesting for us.”¹⁸² (P01_f04: 408)

Being part of the project thus allows her to assess the validity of the data; she can tell what is *behind it*, which she describes as being *interesting*. Thus, while she is interested in data as a stabilized and mobile form of knowledge at the same time she also acknowledges the merits of being part of its production and thus adheres to a more process-oriented idea of knowledge as knowing. However, this PP describes the process as *thankless* and a *crazy lot of work* that is not essential for her work with the regional actors in municipalities or schools. Thus, she draws a clear distinction between the NGOs part of the work and the scientific part and thus, deliberately refuses to buy into the imaginary of proVISION. Instead, she rehearses an imagination of herself (as the representative of an NGO) being a recipient and multiplier of scientific knowledge. The main criterion for judging this knowledge is its ‘up-to-dateness’. Being able to sort of look behind the scenes is mainly described as a neat add-on experience.

What we can see in these accounts of PPs is that they do not necessarily share the imaginary that is guiding the proVISION program documents. They rather mobilize a more traditional idea of extra-scientific actors that at times resembles the figure of the layperson that is enlightened by science. Instead of a need to participate and contribute to knowledge production these actors often seem content in their role as recipients of knowledge. Some actors even refuse to fit into the role ascribed to them by proVISION. They are merely interested in *facts* and *data* they can use as means for their (political) goals and see no extra gain in being able to participate in the process of its production.

Both our interviewee’s accounts follow a traditional deficit model and its liner idea of how knowledge becomes relevant over time: science produces knowledge about future effects of current actions. Society needs to be informed and made aware about the consequences of their actions in order to change their behavior accordingly. However, it is not science that does the communication but specialized experts such as actors with occupations in education or NGOs. In this way – so the imagination goes – an open future

¹⁸² “Das ist halt vielleicht ein bisschen undankbar das Projekt, weil man hat irrsinnig viel Arbeit und das Ergebnis wird vielleicht für uns zwei Seiten sein, aber zwei wichtige Seiten halt einfach. Weil ich brauch nicht den ganzen Prozess für die Gemeinde weiter [I2 und I: Ja.] bringen. Also das heißt, in dem [I2: Ja.] Fall ist es wirklich... es ist die Aussage: ja, jetzt kommt es ja schon langsam zu Aussagen so in die Richtung, Österreich könnte sich selbst ernähren wenn... wenn es... sie sich... wenn Österreich sich gesund ernähren könnte und so. Diese... diese Aussagen, aber zu wissen, dass dahinter eh alles wissenschaftlich fundiert ist, das ist dann vielleicht für uns dann interessant.” (P01_f04: 408)

can be shaped and attainable futures can be actualized. The underlying assumption of this social organization in the circulation of knowledge is that knowledge will become relevant after projects end sometime in the future. When exactly this will be can't be known with certainty. Therefore, researchers can't be expected to just sit around and wait for this to happen. This conception allows for the researchers to hand over the responsibility for the knowledge produced to the actual actors for whom it might become relevant.

This mobilization of a traditional socio-scientific imaginary is also related to the modes and temporalities of the PPs' involvement in the projects. Mostly, researchers contact PPs after the proposal is written. Some of them do not get any money. Therefore, they are not actually confronted with the proVISION imaginary and hence have to draw on different imaginative resources for making sense of their position within the respective projects. As a consequence, they mainly draw on more broadly established imaginations of science-society relations.

Referring to traditional imaginative resources to make sense of science-society relations in some cases also takes the form of an unwillingness to participate more actively in problem articulation and knowledge production. This unwillingness of actors to be the active and engaged PP imagined by proVISION sometimes tends to take researchers by surprise. Especially researchers in early career phases can be taken aback by the deliberate passiveness of their supposed-to-be partners as this quite cynical account of a doctoral student nicely shows:

“And, and also, well the imagination is, at least that's how it was communicated to us, that so to say outside in the life-world, there are [laughs] thousands of problems. You only have to go there, ask the man on the street what his problem is, he tells you and you solve it so to say, yes? [laughter] And the reality is, at least it was like that for me, I also did that, I went to actors from the Praxis and they didn't have that many problems actually [laughter], that would have been treatable for me in any form.”¹⁸³ (FG_DS: 557)

This points to tensions that arise when actors are supposed to collaborate, who draw on different imaginative resources for making sense of their practices and their positions

¹⁸³ “Und, und auch die, also die Vorstellung ist ja, oder so haben's wir auch am Anfang vermittelt bekommen, dass da sozusagen draußen in der Lebenswelt, da sind [Lachen] 1000e von Problemen. Man muss nur hingehen, den Mann auf der Straße fragen, was sein Problem ist, er sagt's und du löst das sozusagen, ja? [Lachen] Und in Wirklichkeit, also bei mir war's so, ich habe das auch gemacht, ich bin zu Praxisakteuren gegangen und die haben eigentlich gar nicht so viele Probleme gehabt jetzt [Lachen], die für mich in irgendeiner Form behandelbar gewesen wären.” (FG_DS: 557)

within a particular collective. He challenges the idea of problems that are out there in the *life-world* and at the same time *treatable* for him. There might be problems, but they are not interesting from the perspective of an early stage researcher.

6.3.4. Stabilizing uncertain futures and the importance of trust

Researchers as well as their partners from social reality are mostly aware of the **uncertainty of the knowledge** produced in scenarios or modeling approaches. This fragility of knowledge claims is especially visible in practices of producing anticipatory knowledge, which makes it a nice case for exploring how researchers manage to produce knowledge about the future that is stable enough to be accepted as basis for further action in the regions. As scientific certainty hardly works as a factor in stabilizing anticipatory knowledge other concepts need to be found. The **'plausibility'**¹⁸⁴ of scenarios is thus an important issue in researchers' narrations. Futures, so the argument goes, need to be plausible in order to have a chance of leading to action. In this sense, local actors in one project were asked to depict "a plausible situation at a future date" (Prop_R: 16). Another researcher talks about a practice of dealing with knowledge gaps in their models and also refers to the criterion of *plausibility*:

"And this generates in part need for research and in the frame of the project itself you have to find some, I called it bridge solutions (Brückenlösungen), edge in little part-models, which seem plausible on the basis of literature and other knowledge until you got something better."¹⁸⁵ (P08_m01: 202)

In his practice of producing anticipatory knowledge he draws on a variety of different sources. The difficulty according to him lies in combining such data. For doing so, he uses *literature* and *other knowledge*. The guiding principle in this practice according to him is that everything needs to be *plausible*.

Another strategy for managing the inherent uncertainty of the knowledge is the integration of PPs in the process of developing the models itself:

"In the, if you ask yourself the question, what concretely, what happens there now, it is of course sobering, but I think that the process, the learning process is an intense one on

¹⁸⁴ Issues regarding plausibility are also discussed in STS. Selin (2011) uses the concept to negotiate expectations concerning the development of NANO-technologies together with scientists. Establishing plausible futures for her is "a crucial element of future-oriented deliberative practices." (ibid.: 736)

¹⁸⁵ "Und das erzeugt zum Teil Forschungsbedarf und im Rahmen des Projektes selber muss man halt irgendwelche, ich habe es genannt Brückenlösungen, finden, also so quasi kleine Teilmodelle dazwischen schieben, die halt aufgrund von Literatur und sonstigen Wissen wenigstens plausibel wirken bis man was besseres hat." (P08_m01: 202)

both sides, also because, because there are frequent meetings, because a common product is produced. So it happened that in the end the model wasn't criticized in any way, instead it was completely accepted as a collaboratively developed product. We had a workshop in the end, to which we invited people who did not participate in the process. It is interesting of course how the ones who did participate stand by the model and explain and say, of course it reveals what adds up to our future, because, yes? So there is kind of an identifications with the whole process and with the product as such."¹⁸⁶ (P10_f01: 767)

This researcher talks about a little episode at the end of their project, in which PPs that were part of the research process tended to *explain* the model to actors not directly involved in the course of a closing event. Apparently, there were discussions about the futures produced in this project as this researcher talks about her partners adhering to the model and *identifying* with the process. Thus, in this episode we can see a procedural way of dealing with the uncertainty of anticipatory knowledge in which the involvement of actors supports the *acceptance* of the project outcome that is framed as a *common product* here. This imagination is also part of official publications as e.g. project reports. The report of this project also describes the model as a "common product of the Praxispartner and the researchers"¹⁸⁷ (Rep_Q: 6), which led to its "high acceptance"¹⁸⁸ (ibid.) with the local actors. This identification beyond the project group is important in two ways. First, researchers assume that in this way the chance for the knowledge being used after the project is increased. In this view the idea is expressed, that the acceptability of knowledge claims automatically leads to respective action. This assumption has been criticized for focusing too much on the features of the knowledge produced and neglecting the complex dynamics in the ways in which knowledge and action relate to each other (Barben, 2010; Grundmann & Stehr, 2011). Second, the identification and the resulting actions are important, as in the model visible in this quote, all our local futures 'add up' to our common future. This model suggests that the

¹⁸⁶ "In der, wenn man dann sich die Frage stellt, was ist jetzt konkret, was passiert da jetzt, ist es natürlich ernüchternd, aber ich glaube, dass der Prozess, der Lernprozess schon auf beiden Seiten ein sehr intensiver ist, auch weil, weil es häufig zu Treffen kommt, weil so an einem gemeinsamen Produkt gearbeitet wird. Also es war auch so, dass am Ende dieses Modell ja in keinsten Weise kritisiert wurde, sondern es war ja voll akzeptiert als ein gemeinsames, entwickeltes Produkt. Wir haben am Ende einen Workshop gehabt, wo wir dann auch Leute, die nicht an dem Prozess beteiligt waren, eingeladen haben. Da ist es dann interessant wie die, die beteiligt sind, zu diesem Modell stehen und das erklären und sagen, natürlich ergibt es das, was unsere Zukunft ausmacht, weil, ja? Also das ist schon eine Form von Identifikation mit dem gesamten Prozess und mit dem Produkt an sich." (P10_f01: 767)

¹⁸⁷ "gemeinsames Produkt der PraxispartnerInnen und der WissenschaftlerInnen" (Rep_Q: 6)

¹⁸⁸ "hohe Akzeptanz" (Rep_Q: 6)

more positive local futures we produce, the better the overall future will be. Or put differently, the greater are the chances to prevent dystopian futures from becoming reality.

A way of dealing with the uncertainty of anticipatory knowledge that focuses not so much on the knowledge produced or on the process of producing it has to do with the notion '**credibility**'. Credibility mainly refers to characteristics of actors, which can contribute in mitigating the uncertainty of knowledge. This is visible e.g. in stories about the so-called *Landmanager*, which I will describe in more detail in the next chapter. Put shortly the landmanager is an actor who has scientific as well as local credibility and is therefore described as a perfect mediator or broker of knowledge produced in the projects. This kind of actor is ascribed the ability to ensure that knowledge is transferred into action in the long run. An issue that often comes up in such stories is *trust*. Researchers talk about the importance of building a trustful relationship with their PPs. This is something that takes time to build and that is constantly fragile. Sometimes the establishment of such a relationship takes place before projects even start:

"They had trust in us. They got completely involved in the experiment with us. So that... we made that beforehand... in one, two talks we made that clear, that there is competence, that they can have trust and that we would not get up to nonsense and a... make a fuss in a bad way – not at all. This was absolutely clear"¹⁸⁹ (P10_m02: 1839)

This researcher talks about the process of establishing a trustful relation to local actors in a region. He mentions two aspects that are of importance: to make clear that the researchers have a particular *competence* and that on basis of this competence it is ok to *get involved* in the project which he describes as an *experiment*. The other aspect is that researchers also possess a sort of social competence, which allows them not to *make a fuss*. Other researchers talk about relationships to their PPs that already were established in a former project and last after the actual project has ended:

"well, I always can come back, that remained, and huge trust also in the direction of research, yes, also to the effect that others are marginalized, which is not in my interest,

¹⁸⁹ "Die haben zu uns ein großes Vertrauen gehabt. Die haben sich auf das Experiment mit uns total einlassen. Also das... das haben wir im Vorfeld... in ein, zwei Gesprächen haben wir das klar gestellt gehabt, dass die Kompetenz da ist, dass sie Vertrauen haben können und dass wir nicht dort einen Blödsinn anfangen und einen... und einen Wirbel machen unguterweise – überhaupt nicht. Das war absolut hergestellt." (P10_m02: 1839)

but all these consequences, where you say, you trust each other, you can come back anytime and so on.”¹⁹⁰ (P07_f01: 1043)

This researcher explains that her partners gained *trust* in research in general but are especially fond of the connection to her and her colleagues. She describes this as a relation of giving and taking. While she is able to give them knowledge they need, her PPs enable her to *come back anytime* when she needs partners for another project call for example. These narrations can be regarded as instances in which researchers clearly rehearse the imagination guiding the proVISION program documents: an imagination of science-society relations that are characterized by mutual respect and trust. This resonates with the proVISION idea in which transdisciplinary work is described as a relation of ‘responsible care’¹⁹¹ focusing on long-term engagement and the establishment of lasting relations between science and society.

In the practices I briefly looked at particular futures are rehearsed and stabilized among heterogeneous groups of actors in the production and dissemination of anticipatory knowledge. Researchers produce anticipatory knowledge thus more or less stable visions of certain futures, which are then distributed to schools, regional actors and communities. In doing so, the aim is to *transport* both stable scientific knowledge (or at least what is regarded as such) and a more normative vision about attainable futures. Put differently, researchers very openly state that they intend to influence the behavior of a wider public. Researchers thereby regard the intelligibility of the knowledge as key to changing the behavior of their addressees. However, PPs do not merely appear as passive recipients of the researchers output. While they are mostly not regarded as epistemic actors – meaning that they take part in modeling practices – they do have a say when it comes to ideas about futures that matter. They are expected to contribute their knowledge about particular regions and help the researchers build adequate representations of a region. In that sense, they are given voice in deciding what actually matters and what does not.

However, it is not only particular futures that are disseminated. Simultaneously and more subtly the very idea of multiple potential futures as consequences of our actions as

¹⁹⁰ “also man kann, da kann ich immer kommen, das ist eigentlich geblieben und ein riesiges Vertrauen auch in Richtung Forschung, ja, auch mit dahingehend, dass arme Andere ausgegrenzt werden, also was jetzt nicht in meinem Interesse ist, aber all diese Konsequenzen, wo man sagt, man vertraut sich, man kann jederzeit wieder kommen und so.” (P07_f01: 1043)

¹⁹¹ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

well as imaginations about the appropriate means for producing knowledge about them are rehearsed and stabilized in such practices of producing and disseminating anticipatory knowledge. This is neatly exemplified in this quote:

“much more we assume that understanding of the future consequences of today’s actions is an important precondition for local actors to rethink their goals and reorient themselves.”¹⁹² (Prop_Q: 28)

6.4. Responsible Production of Anticipatory Knowledge

An issue that was shimmering through the last pages in which I talked about the ways in which researchers translate proVISION imaginations about PPs and anticipatory knowledge is the issue of responsibility.¹⁹³ Social and epistemic re-orderings have a moral aspect that addresses questions about the longevity of partnerships, the temporalities of engagement and the ways in which researchers are supposed to intervene in social reality. The question of anticipatory knowledge thus comes up in a twofold way: first, how does the fact that we are dealing with anticipatory knowledge change ideas and practices related to issues of responsibility? And second, how are different actors engaged in the projects expected to be responsible for what is done with the knowledge produced, i.e. how is the responsibility for the future of anticipatory knowledge distributed?

Responsibility is a core issue in the proVISION documents: humankind is supposed to tackle anthropogenic climate change and its (local) consequences responsibly. To do so, scientists are supposed to leave the so-called *ivory tower* – a metaphor for a detached and unconcerned (basic) science – and *go out* into *social reality* and *engage* respectively become *politically active*. In this narration two distinct spheres are constructed that need to be related in order to grant a sustainable future. In the following chapter I explore how such ideas about engagement and responsibility are translated. To do so it is in a first step necessary to look at the distinctions that are drawn between different spheres and additionally ask how ideas of commuting between those different spheres

¹⁹² “vielmehr setzen wir darauf, dass Einsicht in die zukünftigen Folgen heutiger Handlungen eine wichtige Voraussetzung dafür ist, dass lokale Akteure ihre Ziele überdenken und sich neu orientieren können” (prop_Q: 28)

¹⁹³ As mentioned already in the previous chapter responsibility is currently a prominent issue in research policy concerned with ‘Responsible Research and Innovation’ (RRI). Amongst other concepts like participation and anticipation feature prominently in descriptions of RRI.

are translated. Building on that I will explore accounts of long-term partnerships and related concepts of responsibility.

6.4.1. Insides, outsides and modes of commuting

In the official descriptions of the projects the idea of two distinct spheres is stabilized for the most part. Science is differentiated from a “Praxis” characterized by “Praxis-interests”¹⁹⁴ for which knowledge needs to be produced. Also, the idea that researchers need to somehow go out into social reality is mobilized. What is interesting to note, however, is that the so-called Praxis – deviating from the proVISION imaginary – is translated in a quite differentiated way. In project proposals the term Praxis might apply at the same time to ‘areas of land’, ‘households’ or more abstract entities like ‘the agriculture’ or ‘tourism’. Accordingly, researchers draw from a broad variety of imaginative resources when they think of different ways of going out and engaging with the Praxis as I have already shown in the previous section. These complex conceptualizations of science-society relations are also present in the accounts of the researchers we talked to.

The idea of distinct spheres is a widely shared imagination throughout the different projects and the actors collaborating in these projects. One researcher who is responsible for developing material for workshops with PPs states that the main character of transdisciplinarity is to establish an *outbound* link.

“Well for me it is the trans-, the term transdisciplinarity, I do have the feeling, that it is associated with it, to bring in also those outside of science in a transdisciplinary process, outside of the science level and outside of the single departments, scientific departments, that there is an outwards connection.”¹⁹⁵ (P02_f05: 847)

This statement rehearses ideas expressed in the proVISION imaginary. Two spheres are differentiated, science and a somewhat undefined *outside*. Science has the obligation of establishing a link between those *levels*. These can be *outbound* or, as this interviewee states, entail *bring in* something or someone. The overall aim thereby is to improve living conditions in social reality as another researchers notes:

¹⁹⁴ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

¹⁹⁵ “Also es ist für mich der Trans-, also der Begriff Transdisziplinarität, ich habe schon das Gefühl, dass es immer damit verbunden wird, dass es eben auch außerhalb der Wissenschaft, also dass die, die mit hineingeholt werden sollen in einen transdisziplinären Prozess außerhalb der Wissenschaftsebene und außerhalb der einzelnen Fachbereiche, wissenschaftlichen Fachbereiche liegt, dass es da einfach so eine Verbindung nach außen gibt.” (P02_f05: 847)

“Of course to do a project and also to... to get money accordingly, but also with the spirit to further something outside, yes?”¹⁹⁶ (P10_m02: 45)

Transdisciplinary projects in this account serve the overall aim to intervene in social reality. This of course is a rehearsal of the proVISION imaginary and its particular idea of science-society relations. Scientists engage in social reality and contribute to the “better state”¹⁹⁷. Futuring here relates to the moral obligation to improve social reality outside of academia. In order to successfully intervene intimate knowledge is needed:

“Because there you get to know the land, you get to know the houses, you get to know the ways of behaving, what it is like outside. Quite nice at this one, at the other you almost get the seat of the pants torn apart by the dog [laughs] already before, before you look through the door. Yes, this is an extreme experience, which... if you make it... And out of it really implements applications to... to make a project conclusive – yes? – then this is something terrific.”¹⁹⁸ (P10_m02: 478)

Transdisciplinary projects are therefore also imagined as a means for scientists to *learn* about social reality. Social reality in this quote consists of *the land, the houses* or particular *ways of behaving*. Social reality therefore is a particular region and the actors of this region. In the quote above the idea of a fundamental difference between science and social reality is also mobilized. Knowledge about the outside cannot be taken for granted but instead needs to be acquired by the researchers. This process is described as a necessary precondition for making projects *conclusive*. The PPs in this way become at the same time research subjects and project partners in developing strategies to improve living conditions in a particular region.

In this distinction between science and social reality the distinction between active researchers and a somewhat passive and undefined outside is also stabilized. It is researchers that go out and learn about social reality in order to initiate change. They need to leave the ivory tower in order to *further something outside*. For doing so,

¹⁹⁶ “Sicherlich um ein Projekt zu machen auch um... um dementsprechend Geld auszustellen, aber natürlich auch mit dem Sinn draußen etwas weiter zu bringen, ja?” (P10_m02: 45)

¹⁹⁷ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

¹⁹⁸ “Weil, dadurch lernst du das Land kennen, da lernst du einmal die Häuser kennen, da lernst du die Umgangsformen kennen wie es draußen ist. Bei dem Einen ganz nett, beim Anderen, gerade dass dir der Hund nicht [I1 lacht] den Hosenboden herunter reißt vorher schon, bevor hinein schaut zur Tür. Ja. Das ist eine extreme Erfahrung, die man... wenn man die macht... Und dann daraus wirklich das Angewandte noch umsetzt um ein... ganz ein Projekt schlüssig zu machen – ja? – dann ist das was Tolles.” (P10_m02: 478)

however, it is necessary to “have knowledge about what’s going on outside all in all”¹⁹⁹ (P10_m02: 47). In such stories the idea of different spheres that need to be transcended by researchers is related to particular sets of knowledge. Distinctions between science and social reality are closely entwined with particular ideas of knowledge and the transfer of knowledge from one sphere to the other. One model of transfer is described as *translation* by one researcher:

“For us concretely it was about translating the insights elaborated in the scientific domain to the life praxis (Lebenspraxis) of farmers, but also of other people who are occupied by the issue of biodiversity.”²⁰⁰ (P02_m01, 235)

Insights in the account of this researcher are developed in the *scientific domain* and need to be *translated* into the *life praxis of farmers* and the people who are working on biodiversity. As we have already seen translation is done by specialized actors and often constitutes a special *work package* within the project. It is also sometimes referred to as *breaking down* (P01_f04 467) something, i.e. to simplify scientific knowledge. Researchers and actors who specialize in translation processes decide on how to actually translate the insights. Sometimes PPs are involved in this process by giving feedback. In a similar way another researcher talks about *transport* of scientific findings:

“I assumed, applied research – yes? – research that becomes active outside with all the authorities, associations, organizations, it needs to do networking; consulting on site also has to play a strong part, education, further training, apprenticeship is also a part of it; Institution X land... the... the... the rural... rural continued education institutions also play a role. And this becomes effective with the agricultural media, in this case with institution Y – this is a special constellation of the transport of... of knowledge – and with various activities this affects the Praxis, yes?”²⁰¹ (P10_m02: 436)

In this story institutional networks are central. Institutional actors such as *administrations, associations, organizations* are described as partners in social reality.

¹⁹⁹ “Kenntnis haben was heraußen insgesamt läuft“ (P10_m02: 47)

²⁰⁰ “Bei uns konkret geht’s darum, dass die in der wissenschaftlichen Domäne erarbeiteten Erkenntnisse in die Lebenspraxis von Bauern, aber auch von anderen Leuten, die sich mit dem Thema Biodiversität beschäftigen, übersetzt werden.“ (P02_m01: 235)

²⁰¹ “Ich bin einmal davon ausgegangen, die angewandte Forschung – ja? – die Forschung die draußen aktiv wird, mit allen Behörden, Verbänden, Organisationen, die muss ich da einmal vernetzen; die Beratung vor Ort muss natürlich auch sehr stark hinein spielen, Ausbildung, Weiterbildung, Lehre gehört natürlich da dazu; Institution X Land... die... die... die Ländliche... Ländliche Fortbildungsinstitution spielt auch eine Rolle. Und das wirkt dann mit den Agrarmedien, in dem Fall mit Institution Y – das ist eine besondere Konstellation des Transports von... von Wissen – und mit verschiedenen Aktivitäten wirkt dann auf die Praxis, ja?” (P10_m02: 436)

They are understood as multipliers that can bring pre-fabricated knowledge to the Praxis. A similar imagination frames the transfer between science and social reality as *returning* something to the Praxis:

“And then you can return the whole thing again, you can bring it to the Praxis again, you can give answers to sharpened questions, so I think this can some- this is in many cases the process. And ideally this also goes to the decision makers, so they have somehow concrete orientations in the whole thing and make their decisions accordingly. Of course a lot of possibilities yawn between reality and Praxis.”²⁰² (FG_05: 631)

This imagination additionally presents a model for the way in which problems are transferred from social reality to science. These problems are brought forward by actors from Praxis and then need to be *sharpened* in order to work out answers. Here we see a different model of *translation*. Problems that are posed need to be translated in order to be workable for researchers. Then they are *returned*. This is sort of a two way model of knowledge transfer.

These imaginations about knowledge transfer also relate to particular means. Often traditional ways of communicating knowledge are referred to such as e.g. talks and presentations:

“Talks and, I think, the last year, the last year and a a half, almost all of the bigger conventions that took place in the area of agriculture and forestry in Switzerland, Austria, Germany, I held talks virtually almost on every one with results also from proVISION slipping in, not only, but amongst other things, those are indeed areas, where you can do such things.”²⁰³ (P02_m03: 492)

While talks often tend to address mixed audiences of peers and PPs, giving *classes* is a means that especially addresses extra-scientific actors. They are then described as a “vehicle” (P02_m01: 246) for transferring knowledge. When talking about

²⁰² “Und dann kann man natürlich das ganze wieder zurückführen, dann kann man das wieder in die Praxis bringen, dann kann man also Antworten auf geschärfte Fragen geben, also ich glaub, so kann das irgend-, das ist vielleicht in vielen Fällen der Prozess. Und idealerweise natürlich geht das dann auch an die Entscheidungsträger, dass die dann auch irgendwie eine konkreter Orientierung haben in dem ganzen und danach ihre Entscheidungen treffen können. Da klafft es freilich zwischen Realität und Praxis dann einiges an, an Möglichkeiten. (FG_05: 631)

²⁰³ “Vorträge und, denk ich mal, das letzte Jahr, letzten anderthalben Jahr, so ziemlich alle größeren Tagungen, was im Bereich Land-Forstwirtschaft in Schweiz, Österreich, Deutschland stattgefunden haben, hab ich praktisch überall fast einen Vortrag gehalten, wo auch solche Ergebnisse von proVISION reingeflossen sind, nicht nur, aber halt unter anderem auch, das sind sicher durchaus Bereiche, wo man was machen kann.” (P02_m03: 492)

communicating knowledge the issue is to do it in a way that enables PPs to *understand* scientific findings:

“And that makes this public-... public relations work, to, even if it is also theoretical results, model results maybe, broker them in a good way so that people can act accordingly in Praxis.”²⁰⁴ (P02_f04: 1147)

Here we are back in classic PUS territory: extra scientific actors need to *understand* in order to be able to act accordingly. Sometimes extra scientific actors are depicted as more active agents.

In these stories about going out into the *social reality* and engaging in *Praxis* researchers draw on heterogeneous imaginative resources. They stay close to the proVISION imaginary of a necessity of applicable knowledge and a science that needs to be useful for non-scientific actors. At the same time, however, they mobilize a very different set of ideas concerning the relation between science and society. These imaginations are quite traditional ones concerned with knowledge transfer or knowledge communication. In a long-term perspective it is not the scientists who go out, rather our interviewees contemplate different ways in which knowledge is goes out.

As a consequence researchers stabilize imaginations of a *here* and *there* when it comes to the responsibility for the knowledge they made available in the projects as in this quote by one of our interviewees in which the researcher expresses his imagination of the adequate distribution of responsibility for the project results:

“This means, with the products of... of our... so to say the product that goes out, can it, should it happen – it happens – no? – through publications from our side and also through follow-up projects. Those happen. But this is then... or can be part. But it is not... not... at least not... not required. There is a... a... a responsibility there, no? Because there the decisions should find implementation.”²⁰⁵ (P06_m01: 693)

In this quote, we see a distinction between inside and outside. The interesting thing is that this distinction is related to the scientific *products* that *go out* in the form of

²⁰⁴ “Und das macht ja genau diese Öffentlichkeit-... Öffentlichkeitsarbeit, dass man, wenn es jetzt auch theoretische Ergebnisse sind, Modellergebnisse vielleicht, dass man die gut vermittelt und dass dann die Leute in der Praxis danach handeln können.“ (P02_f04: 1147)

²⁰⁵ “Das heißt, mit den Produkten von... von unserer... sozusagen dem Produkt das raus geht, kann das, soll das passieren – passiert es ja auch – nicht? – über Publikationen von unserer Seite und auch über sozusagen Nachfolgeprojekte. Die passieren. Aber da ist das dann... oder kann Teil sein. Aber von uns nicht... nicht... ist es zumindest nicht... nicht eingefordert. Das ist dann schon die... die... die Verantwortlichkeit da, nicht? Weil dort sollten ja die Entscheidungen eigentlich Umsetzung finden.“ (P06_m01: 693)

publications and follow-up projects. On the *outside* there is *implementations* and *decisions*. Thus, the proVISION imaginary is rehearsed and stabilized when it comes to drawing boundaries between the ivory tower and social reality as well as when it comes to the necessity of going out. In imagining the mode of going out, however, researchers mobilize different imaginative resources and clearly separate between actors responsible for delivering *products* and their *implementation*. One possible explanation for this might be that proVISION does explicitly and intentionally not offer concrete instructions for how to engage with society. Thus, in order to do so researchers in their processes of translation tend to refer to the imaginative resources they are already familiar with and combine them with the proVISION imaginary.

6.4.2. Temporal politics and the re-distribution of responsibility

While researchers seem quite comfortable with the way they translate the proVISION imaginary in regard to ideas of distinct spheres and *going out* they do struggle more with other ideas related to temporal aspects of a re-distribution of responsibility. Traditional imaginations of research provide clear ideas about temporalities of the knowledge production process: in a first step scientists produce knowledge, which is then in a second step presented to interested publics. Researchers are responsible for proper scientific conduct and for the validity of the knowledge produced. This means they are expected to choose the right methods for answering particular questions in regard to the problems to be dealt with. Furthermore, they are supposed to work according to the rules established in particular epistemic communities. ProVISION aims at establishing an alternative understanding of this temporal organization of research and the related distribution of responsibility that centers on ideas of “responsible care”²⁰⁶. This notion refers to the idea that researchers are supposed to develop more long-term modes of engagement with their extra-scientific partners. These different conceptualizations of the temporal organization of knowledge production create various tensions for the actors involved. Researchers come up with different strategies to deal with these tensions in their attempts of aligning these different ways of doing research.

A common strategy is to sort of **outsource** responsibility. As researchers feel unable to handle a long-term engagement in a region, while at the same time pursuing their other responsibilities related to academic careers such as research, teaching, project

²⁰⁶ ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

acquisition or administrative tasks they often hand over responsibility to particular actors. Often it is the PPs themselves who are regarded as the actors to assume responsibility:

“Once awareness is raised and a corresponding concept is on hand, it is on the stakeholders, hence the persons concerned, to implement it and the implementation processes are granular, no? It is about who is standing in the pavilion Saturday morning? Or how much is this and that product? Hence the really granular things – no? – the ones who really do the work, they need dedicated people and this is up to the people who are on site, no?”²⁰⁷ (P10_m02: 781)

This quote expresses a traditional imagination of science-society relations. Science provides data and thus *raises awareness*. This is where its responsibility ends; other actors take over, in this case its *stakeholders* and *persons concerned*. These people are supposed to be *dedicated* to the cause or at least they are present *on site*. This imagination is also nicely captured in a statement of another researcher who compares the project results that are given to the local actors as *yeast*:

“Well it is, I would say, like if you put yeast in somewhere and it bubbles away.”²⁰⁸ (P07_f01: 157)

In this model knowledge is left behind in the region and then develops a life of its own: it *bubbles* and eventually actors will take according decisions or actions. Another researcher, however, expands on this idea and states that this might not be enough and that a different strategy is necessary:

“Because they still don’t exist, or only isolated, a different form of organization is needed and this form of organization, this new form organization – I call it modern land-management – would need a manager, an external manager who works with the farmers und conversely to gastronomy, to the hotel business. A platform – yes? – in rural areas, this is what I wanted to establish there, yes? And they didn’t gather the money to install this manager who advances these activities on site afterwards. I saw this in the project, although the ideas were well received and the will for discussion was there, it would

²⁰⁷ “Wenn das Bewusstsein geschaffen ist und ein entsprechendes Konzept vorliegt, dann liegt es dann wirklich an den Stakeholdern, also an den Betroffenen, das dann umzusetzen und diese Umsetzungsvorgänge die sind ganz granular nicht? Da geht es darum: wer stellt sich am Samstag Vormittag in den Pavillon hinein? Oder wie viel kostet das und das Produkt? Also ganz die granularen Dinge – nicht? – die was dann wirklich dann die Arbeiten machen, die brauchen engagierte Leute und das hängt an den Personen die halt vor Ort sind, nicht?” (P10_m02: 781)

²⁰⁸ “Also das, ich würd einmal sagen, so ähnlich wie wenn Sie Gärhefe irgendwo reinstreuen und dann blubbert das so vor sich hin.” (P07_f01: 157)

need energy to implement these things on site. A landmanager is needed, trained people that are accepted there, who can implement these things on site. [...] a standout man who is accepted and he shall pursue the land-management there.”²⁰⁹ (P10_M02: 284)

The *landmanager* is sort of an intermediary who safeguards development in a region. He is on the one hand well trained and on the other hand also embedded in the region. Thus, this actor is able to deal with the data about possible future developments (maybe even to produce them) and to *implement* knowledge. The researcher above talks about being *recognized* and *accepted*, which indicates in relationship to local actors built on respect both on a cognitive level – the person needs to be a *standout man* – and on a social level. This cannot be accomplished by scientists let alone within the frame of a research project. Even if they are experts in their disciplines, they often lack the necessary knowledge about the particular region and the necessary temporal and financial resources. Projects end and so do the responsibility of science. Actors that are not part of the scientific system assure the long-term engagement or care for a region in this account.

A similar solution for this problem that comes up in several interviews is to work with **specialized institutions** that have experience in working with the regions. Thus, researchers do not regard it as their expertise or responsibility to work with their partners after the project has ended. Responsibility is passed on to other (institutional) actors as the following quote shows:

“but we are for sure not an institute that is good at actually implementing measures, different funding and institutes would be needed that have more experience in this, how to actually implement measures. Thus we need to stop at the level of recommendations, so this program was right for us, during the process this is a problem of course, because

²⁰⁹ “Nachdem es aber die weiterhin nicht gibt, oder nur mehr vereinzelt, gehört da eine andere Organisationsform und diese Organisationsform, diese neue Organisationsform – ich nenne es einmal Modernes Landmanagement – bräuchte auch einen Manager, einen externen Manager der hin zu den Bauern wirkt und umgekehrt hin zu der Gastronomie, Hotellerie wirkt. Eine Plattform – ja? – im ländlichen Raum, die wollte ich dort einrichten, ja? Und man nicht das Geld aufgestellt um diesen Manager zu installieren der also diese Aktivitäten vor Ort danach voran treibt. Das habe ich eindeutig gesehen bei dem Projekt, auch wenn die Ideen gut angekommen sind, wenn der Wille in der Diskussion da war, es bräuchte nachher unbedingt Energie um diese Dinge vor Ort umzusetzen. Es braucht einen Landmanager, ausgebildete Leute die dort anerkannt werden, die dann vor Ort diese Dinge dann wirklich umsetzen. [...] ein Spitzenmann, der wird akzeptiert und der soll das Landmanagement dort betreiben.“ (P10_M02: 284)

you start a process and stop it right in the middle, were science legitimately stops, but the actors think quite differently about it, that was my impression.”²¹⁰ (P10_f01: 337)

In this quote, the researcher talks about responsibilities of science and where they end. She draws clear boundaries between institutes that are responsible for providing recommendations based on sound scientific evidence and institutions whose expertise lies in implementing these recommendations. In this narration, the separation of responsibility is accompanied by a clear sequential temporal pattern: first knowledge is produced, which is then to be applied afterwards by actors different from those who produced the knowledge. These institutions – in contrast to figures such as the *landmanager* – do not need to be rooted or constantly present in the region. Their authority for performing this task lies in a particular expertise and experience ascribed to them mostly by the researchers responsible for the respective project design.

Whereas in the quote above the researcher talks about such institutions as a potential solution to the problem of responsibility, other proVISION-funded projects actually engaged in collaborations like that. This means that institutions specialized in knowledge transfer or science communication were part of the projects, mostly in separate *working packages*. Thus, the distinction worked mostly on a level of social distribution of responsibility during the project phase whereas the problem of long-term engagement in a region after the project end was not tackled or was tackled in other ways.

When it comes to long-term engagement or responsible care, however, it is not always actual personal actors that are supposed to assume responsibility. In some project this task is forwarded to **software tools**. As I showed above, PPs are often framed as users of the final product, anticipatory knowledge in the form of scenarios that are supposed to be used for decision-making. As such they have a say in the production of that knowledge (models, scenarios) and are invited to give feedback on several occasions throughout the projects. Additionally, they are also pictured as being in charge when it comes to the application of results. After the end of a project regional actors are

²¹⁰ “aber wir sind sicher kein Institut, das gut darin wäre, dann wirklich Maßnahmen umzusetzen, da bräuchte es andere Fördergelder und andere Institute, die weit mehr Erfahrung damit haben, wie man dann wirklich Maßnahmen setzt. Also wir können, wir können eigentlich nur an einer Empfehlungsebene auch aufhören, also insofern war das Programm schon das richtige für uns, im Prozess ist es natürlich ein Problem, weil, weil man einen Prozess beginnt und den dann irgendwo auch wieder aufhört, von Seiten der Wissenschaft legitimerweise auch aufhört, von, von den Akteuren wird das natürlich ganz anders wahrgenommen, war mein Eindruck.“ (p10_f01: 337)

expected to use the project results and - in the imagination of the researchers - act according to these results.

This imagination of the researchers builds on a particular conception of the materiality of the anticipatory knowledge produced. The projects of proVISION produce different representations of the future: written scenarios that are disseminated, models that could and should be used by the PPs and more of the like. Such material traces of the futuring practices are regarded as the solution of the problem that projects are temporally restricted while the work with the PPs could be, at least in theory, be infinite. A researcher from a project on regional development talks about the project's goal, which consisted in producing an interactive tool that could be handed over to the PPs at the end of the project:

“the other idea was to produce a model that is applicable for the actors, that is also interesting for the regional actors, that addresses questions they are interested in, developments that are interesting for the actors there and that is a model, that is not just being applied by science to produce results there, but also one that can be used directly by stakeholders and actors.”²¹¹ (P10_f01: 116)

Researchers are developing a model that is supposed to be applicable by the *regional actors*. In this sense, the model was supposed to be a substitute for the researchers after the project has ended. Local actors can then continually produce the knowledge they need; they can pose *questions* and simulate *developments*. In a certain manner this allows the researchers to stay in the region, while leaving at the same time. They do not withdraw completely but instead leave behind material traces in the form of the model. Still, this idea builds on a traditional linear model of innovation: science produces knowledge and this is where its responsibility ends. What is made of this knowledge lies in the hands of its users:

“Wood, new industrial branches or other alternatives – the local actors can shape the future of the region themselves.”²¹²

²¹¹ “die andere Idee war ein Modell daraus zu machen, dass für die regionalen Akteure anwendbar ist, das auch interessant ist für die regionalen Akteure, also Fragen adressiert, die, die, die sie interessieren, Entwicklungen adressiert, die interessant sind für die Akteure dort und dementsprechend ein Computermodell ist, das jetzt nicht nur von Seiten der Wissenschaft angewendet wird und hier Ergebnisse erzeugt werden, sondern eins, das direkt und interaktiv von Stakeholdern, von Akteuren einfach eingesetzt werden kann.“ (p10_f01: 116)

²¹² “Ob Wald, ob neue Industriezweige oder andere Alternativen – die lokalen Akteure können die Zukunft der Region selbst gestalten.” ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

At the time of our interviews, however, it had turned out that mostly the PPs did not fulfill the expectations of the researchers. The tool produced in this project had not been used since the project had ended. Other projects were making similar experiences and researchers provided us with several narrative strategies to make sense of this. In attempts of explaining it they talk about an unwillingness of the local actors to use the results worked out in the projects. One common narration - that I already described above - refers to the so-called *suffering* (Leidensdruck). Local actors don't use or implement the project results after the project has ended because the problems addressed there are not pressing enough:

“and I think it has to be a mixture of mentality, the problems and how actively one is affected, is it really necessary to find solutions right now or not, as long as the suffering is not big enough, yes, it's probably difficult to mobilize people.”²¹³ (P10_f01: 400)

What these different accounts have in common is a particular model of how knowledge leads to action in the future. This model is different from the one I described above. Still assuming a linear model of knowledge these actors, however, reflect on the problem that there is no guarantee that knowledge will lead to appropriate action. One of them explicitly states that some sort of *energy* is needed to keep things going. To sustain project work either tools are produced for the region - whose materiality is somehow supposed to compensate the lack of the researchers' presence - or specialized actors respectively institutions are taking over, at least in the imagination of the researchers. This is different from assuming that knowledge will become relevant automatically. Consequentially, they develop different approaches for establishing such an *energy* that keeps things going after the projects have ended.

Still there is a clear distinction between researchers and actors from social reality. The models, scenarios and the associated strategies produced in the projects together by researchers and their PPs are supposed to be carried on by the PPs. Thus, the re-drawing of boundaries between science and society as imagined in the program documents can also take the form of new actors that appear, specialized institutions for brokering knowledge (Lomas, 2007; Meyer, 2010). Furthermore, these struggles and the different attempts to solve them seems to indicate a structural problem, however, in

²¹³ “und ich denk mir, es wird schon, es wird eine Mischung sein aus, aus Mentalität, Problemlage, wie aktiv betrifft sie einen wirklich, ja, ist es jetzt wirklich notwendig sofort und auf der Stelle eine Lösung zu finden oder nicht, solange der Leidensdruck nicht groß genug ist, ja, ist, ist es wahrscheinlich schwierig, da wirklich Menschen zu mobilisieren.“ (p10_f01: 400)

bringing together participatory forms of research and the temporal implications of projectification: also transdisciplinary projects end (Torka, 2006).

There is a last practice of futuring that relates to the issue of responsibility in transdisciplinary sustainability research that I want to address. This practice differs from the ones I talked about beforehand and can be described as **'keeping the epistemic nose out'**. I want to illustrate this strategy using the example of a project funded by proVISION that deals with the relation of particular nutrition styles, agriculture and the environment. On the proVISION program website the heading of the project's short description says: "How we will nourish ourselves in 2020"²¹⁴. Thus, in this heading the project claims to provide relatively stable predictions about nutrition styles in the year 2020. The focus of the project is on the relation of changes in nutrition styles and agricultural practices. The question of the project therefore is: how will agriculture have to change if we start eating just what we should eat (according to the scientific state of the art in 2008)? The project is thus interested in the relation of "health, nutritional behavior, agricultural production, environmental burden and regional development"²¹⁵. For reaching their project goals and to show what we are all going to eat in the year 2020 the researchers used a particular kind of scenario that is not that uncommon in studies of this kind: to gain insights about possible consequences of changes in our current nutrition styles the researchers are not attempting to predict a future development. Instead, they modulate and analyze past developments. One researcher talks about this as "backwards-oriented scenarios" (p01_m01: 655) or as a "retrospecting scenario" (p01_m01: 675):

"Okay, we use some framework conditions as they were and just look at what would, or how the past would have been different, if society had acted differently, or the wider public. And that was sort of a long discussion."²¹⁶ (P01_m01: 604)

The researchers are interested in past developments that are altered by them. For doing so, in a first step the project team defined *framework conditions*. In a next step, they

²¹⁴ "Wie wir uns 2020 ernähren werden" ProVISION website: project description Z. Accessed August 8, 2013: <http://www.provision-research.at>

²¹⁵ "Gesundheit, Ernährungsverhalten, landwirtschaftlicher Produktion, Umweltbelastung und regionaler Entwicklung" ProVISION website: project description Z. Accessed August 8, 2013: <http://www.provision-research.at>

²¹⁶ "Okay, gewisse Rahmenbedingungen übernehmen wir so, wie sie waren, und schauen nur an, was würde sich unter, oder wie wäre die Vergangenheit anders gelaufen, wenn sich die Gesellschaft anders, anders verhalten hätte, oder die, die Bevölkerung andere. Und sozusagen das war eine lange Diskussion." (p01_m01: 604)

slightly changed certain variables in that model in order to study the consequences of these changes. In doing so, the researchers want to understand the “cause-effect-relation” (p01_m01: 633) concerning nutrition styles and agriculture. In that sense, the researcher speaks about the scenarios being *backwards-oriented*:

“Backwards-oriented insofar as we don’t make assumptions about the future, how climate is going to be, how demographic numbers or agricultural politics should be, instead we say: under this framework conditions this would have the following effects.”²¹⁷ (P01_m01: 636)

Backwards-oriented in this quote is described in terms of the researchers positioning in the process of knowledge production. They do not make *assumptions about the future* he is eager to emphasize. This means not speculating about contextual developments like climate change or demographic change. Instead, they use what is referred to as a *benchmark scenario*. This so-called *benchmark scenario* is created by gathering data from different sources:

“This is the benchmark scenario, so 2001 to 2006, data (...) data from 2001 to 2006 – yes, year wise – it is on the one hand about data gathering for (...) for a situation, agriculture, nutrition and also the (...) links between. There are supply balance sheets done by Statistik Austria, there is the Green Report meaning agricultural data, there is the nutrition report and building upon that you (...) you produce the connections.”²¹⁸ (P01_m02: 866)

Reports are gathered from sources such as *Statistik Austria*, which comprise data on nutrition, agriculture and so on. The task of the researcher then is to *produce the connections*. A major “challenge” (p01_m02: 901) for the researchers performing this task is to *harmonize* the different data. With the notion of *harmonizing* the researcher refers to the dangers of leaving important variables out or getting the relations between the different variables wrong. On the basis of the framework conditions and the related benchmark scenario different scenarios are calculated, which means changing particular

²¹⁷ “Also rückwärtsgewandt insofern, dass wir nicht Annahmen für die Zukunft, wie das Klima sein wird, wie die Bevölkerungszahl und wie die Landwirtschaftspolitik sein soll, sondern wir sagen: Unter diesen Rahmenbedingungen würde sich das so auswirken.” (p01_m01: 636)

²¹⁸ “Das ist das Referenzszenario, also 2001 bis 2006, also Datenlagen (...) Datenlage 2001 bis 2006 – ja, also jahresmäßig – da geht es einfach mal einerseits um Datenerhebung von (...) von (...) von dem Zustand, also Landwirtschaft, Ernährung und auch die... die ganzen Bindeglieder dazwischen. Da gibt es Versorgungsbilanzen bei der Statistik Austria, da gibt es im Grünen Bericht also landwirtschaftliche Daten, da gibt es den Ernährungsbericht, und auf dem aufbauend hat man (...) hat man (...) also stellt man dann die Zusammenhänge her. (p01_m02: 866)

variables and looking how that affects others. In this narration we can see they strive for discursively minimizing the researchers influence on the output of the calculations. It is not their own assumptions that guide the modeling; rather the aim is to depict a particular moment in history as accurately as possible. In this sense, for the researchers it is important

“The challenge is to somehow harmonize the (...) different data sources, yes. [n]ot to forget anything and to build up everything in a way (...) that you can change it without something essential (...) without having a bug creeping in. Because the it is also possible – especially concerning meat for example – I mean you got the livestock numbers und you have fodder und from the fodder to the agricultural area that is necessary for (...) for the fodder and (...) when you change something - reducing livestock numbers – you have to think: is the composition of fodder changing? And the like (...) very logical things that you nevertheless (...) that are often not that easy to solve, yes.”²¹⁹ (P01_m02: 901)

In this imagination the researchers represent the world outside. It is their job to do so accurately, i.e. not forgetting things and minimizing the chance for *bugs creeping in*. After this is done the researchers are still anxious to explain how minimal their influence is:

“You change as little as possible, just what is absolutely necessary, in order (...) in order not to bias the relative comparison.”²²⁰ (P01_m02: 881)

Changes in the *benchmark scenario* are made guided by the principle of *as little as possible* the ideal situation being to use the framework conditions “as they were” (p01_m01: 605). Thus, researchers describe the *alteration* of variables as a difficult process:

“And especially the question, how, how do the scenarios look like, or what are the, what are the things that we want to be unaltered, where we say, that is going to develop in that

²¹⁹ “Die Herausforderung ist, dass man die verschiedenen Datenquellen, die versch (...) irgendwie in Einklang bringt, ja. Und dass man nichts vergisst und dass man alles so aufbaut, dass man das auch (...) dass man es verändern kann ohne, dass sich irgendwas Wesentliches (...) dass da irgendein Fehler oder was sich einschleicht. Weil es geht dann natürlich auch – gerade beim Fleisch z.B. – ich mein dann hat man die Tierzahl und dann hat man das Futter und dann von Futter wieder auf die Flächen, also was notwendig sind für (...) für das Futter, und (...) und wenn man jetzt was verändert - die Tierzahlen verringert – dann muss man sich natürlich auch überlegen: ändert sich die Futterzusammensetzung? - und so (...) also so ganz logische, einfache Sachen, die man trotzdem (...) die halt oft nicht ganz so einfach sind, dass man sie löst, ja.“ (p01_m02: 901)

²²⁰ “Man ändert also möglichst wenig, nur das was unbedingt notwendig ist, damit (...) damit der (...) der relative Vergleich nicht ver (...) ver (...) nicht irgendwie verzerrt wird, ja.“ (p01_m02: 881)

way, which parameters do we change, so to speak what do we use as changes to look how other parameters change, that took a long time.”²²¹ (P01_m01: 589)

In this sequence the presence of the researcher in the process of knowledge production and is nicely expressed. The researcher talks about the long process on deciding about which *parameters* shall be changed and what needs to stay *unaltered*. In this quote, the caution with which the researchers describe their own interference is striking. The goal is to create an accurate representation of the development of certain variables over a particular time period without any *bias* caused by human interference. The validity of the framework conditions themselves, however, is hardly questioned. They appear as something that is known and therefore beyond doubt.

To develop a picture of reality that is as accurate as possible it is mainly framed in terms of *credibility* as a researcher explains:

“Well it was the position, one position that was especially brought forward by agriculture: If we don’t include all of that we are going to be non-credible, because everyone is going to say: ‘But you didn’t consider that and that.’ The other position, mainly brought forward by the energy sector: ‘Yes but if we include all this uncertain things, we can’t predict the future anyway, so we need to define clear framework conditions, to be able to illustrate the influence of certain behavior.’ We agreed on using the backwards-looking scenario whereupon we are flexible enough that we can still cover certain aspects – if we say, okay that is undoubtedly developing in this direction in the future.”²²² (P01_m01: 612)

Credibility is of course not an independent criterion for the quality of scientific knowledge. Results are *credible* for a particular audience; in this case the stakeholders i.e. the extra-scientific partners. Together the scientists and their partners mobilize a

²²¹ “Und gerade bei der Frage, wie, wie sehen wir Szenarien, oder was sind die, was sind die Dinge bei Szenarien, die wir unverändert lassen, wo wir sagen, das wird so weiterlaufen, und welche Parameter ändern wir, also sozusagen geben wir vor als Veränderungen, um dann zu schauen, wie sich andere Parameter ändern, das hat sehr lange gebraucht” (p01_m01: 589).

²²² “Naja, es war die Position, die eine Position, die vor allem vom Bereich Landwirtschaft gekommen ist: Wenn wir das nicht alles mit hinein nehmen, dann werden wir unglaubwürdig, weil dann wird jeder sagen: ‘Aber ihr habt das und das und das und das nicht berücksichtigt.’ Dann die andere Position, die vor allem von der Energiewirtschaft gekommen ist: ‘Ja, aber wenn wir so unsichere sozusagen Dinge mit hinein nehmen, dann, wir können die Zukunft sowieso nicht voraussagen, sondern wir müssen klare Rahmenbedingungen definieren, um den Einfluss gewisser Handlungsweisen darstellen zu können.’ Wobei wir jetzt sozusagen eigentlich uns geeinigt haben, mehr dieses rückschauende Szenario zu verwenden, wobei wir durchaus auch so flexibel noch sind, sein können, dass wir einzelne Aspekte, wenn man sagt, okay, ja, das ist eigentlich unzweifelhaft, dass das sich in der Zukunft zumindest in diese Richtung entwickeln wird, dann dass wir das auch noch versuchen mit abzudecken.” (p01_m01: 612)

classic imagination of the researchers as a potential cause of error as they are intervening in the representation of reality.

The decisions that need to be made concerning elements of the framework conditions and the changes in certain parameters for calculating scenarios are made in meetings between scientists and so-called 'Beiratsmeetings' in which PPs also participate. Thus, in situations in which interventions are necessary the researchers rely on their PPs in order to be able to hold their position. Therefore, there is a close relation between the knowledge produced in this project and the particular experimental setting as the stakeholders were repeatedly commenting on the scenarios in various meetings.

In stories like this we encounter a futuring-practice that draws a clear distinction between the scientific and the political. Researchers sort of withdraw from the futures they produce. In this way, they also opt out of being responsible for the knowledge they produce. The model that is created in this way can be thought of as a 'technology of correspondence' (Knorr Cetina, 1999). Knorr-Cetina uses the term to describe "a system of assurance through which correct correspondence with the world is monitored" (ibid.: 35). The main aim of the model is to correspond to a real development; deviation from reality shall be minimized respectively deviation is supposed to be completely controllable by the researchers. The critical point in this technology of correspondence is that it relates at the same time to ideas of non-intervention and intervention, i.e. the idea that reality is being represented, while at the same time a clear boundary is drawn between actors who are responsible for intervening and those who are not.

Researchers in this way draw on imaginative resources that are associated with the figure of the 'modest witness' (D. J. Haraway, 1997; Shapin & Schaffer, 1985). This notion refers to a detached actor attempting to minimize influence on the knowledge production process in order not to bias the results in any way. They merely represent reality and produce futures that might actually have happened. This practice is described as distinct from making assumptions about the future. There is, of course, an important difference to the laboratories that are described by Knorr-Cetina and the experimental settings the researchers here operate in. Researchers are eager to state that they do not produce anticipatory knowledge in a strict sense. However, the results are used for making decisions and steering actual developments. Therefore, they are used as a means for governing futures in agriculture. The researchers take part in this to some degree, as political actors are members of the project's advisory committee but

still manage not to feel responsible. In this sense, one can also understand discussions in meetings at the end of the project in which further actions were discussed. The actors involved in the project all agreed that it was necessary to *carry further* and *communicate* the *results* (PM_04_P01). At the same time there was a shared understanding that this is not the responsibility of the researchers. Their duties were clearly demarcated from those of the political actors that were part of the project as stakeholders. In this way, the researchers actually manage to assume an explicitly non-interventionist position within an explicitly interventionist funding scheme.

To sum up, when it comes to imaginations about a distinction in science and social reality researchers mostly rehearse the socio-scientific imaginary guiding proVISION. However, when it comes the tensions that arise due to differing logics of academic research and ideas of transdisciplinary collaboration expressed in questions of the responsibility of science, other imaginative resources are mobilized. Especially in regard to long-term engagements in particular regions stories about limits of scientific responsibility become more common.

What is also nicely visible – especially in the example of epistemic opting-out – is how particular ontologies and imaginations about the re-distribution of responsibility are co-produced. Researchers assume a reality out-there that needs to be represented as accurately as possible and therefore attempt to intervene as little as possible mobilizing the idea of the researcher as a ‘modest witnesses’. This ontology relates to the social organization of knowledge production as it is actors that belong to the world outside of the ivory tower that are supposed to assume responsibility. In moments where decisions need to be made – developing scenarios or acting on the basis of results – PPs as actors form social reality are put in charge.

6.5. What’s at Stake?

In the program documents the issue of risks and threats is often framed in relation to concepts of ‘future-ability’. Through this notion at the same time stakes and particular collectives are constituted. The stakes are quite high in the proVISION documents: at the very least it is Austria’s scientific and economic competitiveness that is at stake. It might as well be Austria’s extraordinarily green landscapes and at worst even the survival of mankind that depends on the right decisions and accordingly on the adequate knowledge. While the stakes are articulated in a quite straightforward manner through

the notion 'Zukunftsfähigkeit' in proVISION related policy documents, the issue becomes more complex in the projects when heterogeneous actors collaborate and are forced to negotiate different futures and different stakes. Against the background of these severe stakes I want to ask now how the actors involved in proVISION projects translate this framing of risks and threats. How do researchers and the PPs describe the risks they face, respectively, what is at stake for them? What are the futures that are negotiated in this regard?

Futuring here directs attention to practices in which different futures are negotiated and balanced. This involves the enactment of futures on various different levels and with different scales simultaneously. Personal futures are mutually shaped with institutional futures, research agendas and potential developments of particular strands of inquiry.

As I have already argued in the chapter on translations of ideas related of particular problems that need to be dealt with global developments are not so much at the core of the projects as problems of particular regions and on the national level of Austria. In framing problems this way – I argued – these regions as well as Austria are enacted in particular ways. In a similar way also the translation of risks that need to be dealt with can be understood as a process in which particular collectives are enacted.

Researchers often talk about particular **regions** when it comes to what is at stake in their projects. One researcher e.g. talks about a region that needs to deal with decreasing income from agricultural production:

"We don't get money from somewhere to do the things – yes – to get the data, to deliver first beginnings: how could it go on? – because to wait... We have a community C in there in D where we have an agricultural quote of 0,5% and not a single cow in the whole community area, so this is really finished there. In E – yes there we have 43 farmers, but going on – as they say – four, five. So also there the area is going down."²²³ (P10_m02: 321)

He describes an *area* that is *going down* and that there is no more time to *wait* any longer in his opinion. The knowledge produced in this project shall produce *data* and

²²³ "wir kriegen also nirgends ein Geld her um also da die Dinge einmal – ja – einmal die Daten zu kriegen, einmal Ansätze zu liefern: wie könnte es weitergehen? – weil zu warten... Wir haben da drinnen schon eine Gemeinde C in D wo wir eine Agrarquote haben von 0,5% und im gesamten Gemeindegebiet keine Kuh mehr, also das ist wirklich dann dort Ende. In Gosau – ja, da haben wir zwar noch 43 Bauern, aber wirklich weiter tun – wenn man so redet – vier, fünf. Also auch dort geht das Gebiet nieder." (P10_m02: 321)

first beginnings for further action. The area thereby includes representatives from agriculture and local authorities. The region is thus enacted as an agricultural entity of quotes and livestock whose future is at stake. Another researcher does not tackle the future of a particular region but addresses communities. She uses the data gathered in a project as a basis for decision-making on particular issues in different communities:

“Well more like... we come from a different branch: so, what do the communities need? What do they want to know? Who can give us the... the info on that? So in this case – nutrition, agriculture... So there is the issue of procurement e.g.: how can I... how shall the community e.g. do the kindergarten catering?”²²⁴ (P01_f04: 460)

She talks about *communities* on a more general level. The towns she works with are not single entities in this sense. Rather, they are enacted as sub-entities that add up to larger collectives. And because of that the data gathered does not apply merely to one case but is rather imagined as mobile in a Latourian sense (Latour, 1988). The data can travel from one site to another and therefore can also be used for different cases her NGO is engaged in. In the long run she aims at using the project results for having a “positive influence on [...] the world [laughs]”²²⁵ (P01_f04: 468). In this sense, also the different local futures do add up in the form of such a *positive influence*. In a similar way some of the projects deal with the possible future development of (mainly winter) tourism in particular regions. Especially regions with lower altitude need to develop strategies for their tourism sectors as a consequence of rising average temperatures. These projects also deal with particular regions as cases for Austria as visible for example in media coverage entitled “When snow is cancelled. Winter season without future?”²²⁶ or “Is winter tourism still going to be possible some decades from now?”²²⁷ (ibid.) Adaption to climate change in the translation of the researchers thus means the preservation of the status quo in particular regions. This refers also to a level of wealth or quality of life. Without incomes from tourism particular regions in Austria would change dramatically.

²²⁴ “Also eher, wir... wir kommen von der anderen Schiene: na, was brauchen die Gemeinden? Was wollen sie wissen? Wer kann uns das... die Info dazu geben? Also in dem Fall - Ernährung Landwirtschaft... Also es gibt eben das Thema Beschaffung z.B.: wie kann ich... wie soll Gemeinde halt jetzt z.B. die Kindergartenverpflegung machen?” (P01_f04: 460)

²²⁵ “Also das heißt, das ist dann ganz auf die Praxis runter gebrochen: weil das und das einen positiven Einfluss auf das und das hat – nicht nur auf die Gesundheit sondern eben auch – ja – die Welt. [lacht]” (P01_f04: 468)

²²⁶ “Wenn der Schnee ausfällt. Wintersaison ohne Zukunft?” ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

²²⁷ “Wird Wintertourismus in einigen Jahrzehnten noch möglich sein?” ProVISION Website. Accessed August 8, 2013: <http://www.provision-research.at>

Sustainability in this sense refers to living standards. Other aspects of this concept are often absent in the projects. For example, the degree to which (winter) tourism in its current form is environmentally desirable is a question that is not in the scope of these projects.

These projects thus stabilize the idea of **Austria** as a green country as it is expressed in the proVISION documents: a country that is mainly defined by its landscapes and its green agriculture. Landscapes are framed as a basis for agriculture and tourism. Thus, while a lot of projects primarily deal with particular regions also Austrian futures are at stake. This is nicely visible e.g. in the so-called “index of naturalness” (Natürlichkeitsindex) (P02_m03: 467):

“Okay. Anyhow it is a scale from one to seven, one means natural, two means close to natural, also going in the direction of natural and then made such a grading, if the ecosystem was changed aboveground, then there are two more, three and four, if it was aboveground and underground e.g. ploughed and then there were grade five to six and sealed is finally surface. And that means flied area has an indiv- a grade of five, six, depending on which kind of field it is, pastureland has a grade of three, four depending on the intensity. And a glacier of course has one, city has seven. I.e. the indicator gives information on how the naturalness of the habitat in which I am, and additionally it includes a measure, how far am I from the point, where I stand, I say, to the next natural object, in a landscape, e.g. a forest.”²²⁸ (P02_m03: 308)

In this quote a researcher describes this index that he is developing together with his colleagues. They basically aim to quantify the degree of human intervention in natural landscapes. This is equaled with a deviation from its *naturalness*. Building on that they go on to produce a map of Austria that depicts the different degrees of naturalness. The outcome of this is an enactment of Austria as a spatial area defined by differing degrees of human intervention into its natural landscapes. The basic assumption in this is that Austria’s landscape, in this case translated as the countries *naturalness*, is a precious

²²⁸ “Okay. Jedenfalls ist eine Skala von Eins bis Sieben, Eins bedeutet Natürlich, Zwei bedeutet Naturnah, also sehr in Richtung Natürlich gehend und dann haben so Abstufung gemacht, wenn's Ökosystem oberirdisch verändert worden ist, dann hat's zwei weitere, Drei und Vier gegeben, wenn's oberirdisch und unterirdisch, also umgepflügt zum Beispiel auch noch worden ist, dann hat's dann Stufen von Fünf bis Sechs gegeben, und Versiegelt ist schlussendlich Fläche. Und das heißt, ein Ackerfläche hat ein indivi-, ein Wert von Fünf, Sechs, je nachdem, welcher Acker dass es ist, ein Grünland hat ein Wert von Drei, Vier, je nachdem welche Intensität. Und ein Gletscher hat natürlich Eins, Stadt hat Sieben. Das heißt, dieser Indikator gibt die Information wieder, wie schaut die Natürlichkeit des Lebensraums, wo ich mich befinde, aus, und zusätzlich hat der noch eine weitere Größe drinnen, wie weit bin ich von dem Punkt, wo ich stehe, entfernt bis zum nächsten natürlichen Objekt, sag ich jetzt einmal, in der Landschaft, zum Beispiel ein Wald.” (P02_m03: 308)

property.²²⁹ This assumption also carries with it a temporal dimension: naturalness is not something static, much rather is something constantly fragile that is in danger of being lost and needs to be preserved. A collaborator from the same project brings this idea nicely to the point when she talks about the projects dissemination strategy:

“I don’t need some systematically correct and scientifically hierarchically correct papers produced, but I need to be able to say with it, I asked a lot about that at institution X, I said, well, do we want that Austria has a high degree of naturalness or do we not want that? Yes? That was for and that was a huge discussion, because if Austria has a high degree of naturalness, if it is well provided with plants and animal species, this would mean, great, we are that good, we don’t need to do anything. That’s nonsense. Or should we say it is badly equipped, because then political framework conditions would be invoked and that something needs to be changed. Because otherwise Austria will someday not have a huge biodiversity. Yes?”²³⁰ (P02_f02: 1491)

While she talks a lot about negotiations concerning which attainable futures shall be the basis for the project’s dissemination strategy, right at the end of this episode she talks about the stakes for Austria, which is the supposedly dystopian future of a decrease in biodiversity. This future needs to be prevented and the strategy of dissemination is oriented towards this goal. Another researcher translates the idea of Austria as a country defined by its landscapes in a slightly nuanced way. For him it is not so much the nativeness of Austria’s landscapes but the future of cultivated landscapes, which is at stake:

“we don’t have tourism and that, so we hang in the air completely, why don’t you try to start something for us? There were some – yes? – who came, more out of X – yes? – B,

²²⁹ The development of such indices also stabilizes the entities respectively communities described. Through producing (anticipatory) knowledge about regions such as particular communities or Austria these entities are stabilized. In the quote above e.g. a particular vision of Austria is enacted through the methods applied. This is the productive side of collectively imagined futures or in Law’s terms this can be described as a process of enactment.

²³⁰ “Ich brauche jetzt nicht irgendwelche systematisch korrekten und wissenschaftlich hierarchisch korrekten papers erstellt werden, sondern ich muss damit sagen können, ich habe sehr viel auch die Institution X gefragt, habe ich gesagt, na, wollen wir jetzt eigentlich, dass Österreich eine hohe Natürlichkeitsrate hat oder will ma’s nicht? Ja? Das war für und das war eine hohe Diskussion, weil wenn Österreich eine hohe Natürlichkeitsrate hat, dass es gut ausgestattet ist mit vielen Pflanzen und Tierarten, würde es bedeuten, super, wir sind eh so leiwand, wir brauchen nichts machen. Ist eigentlich ein Schmarrn. Oder sollen wir sagen, es ist eigentlich viel minder ausgestattet, weil dann würde sozusagen politische Rahmenbedingungen ins Treffen geführt werden, dass man etwas ändern muss. Weil sonst wird Österreich einmal (.) keine so große Artenvielfalt haben. Ja?” (P02_f02: 1491)

and so forth – there are a lot of communities... that don't have anything but forests and meadows.”²³¹ (P10_M02: 1871)

Not engaging in sustainability projects in this quote means abandoning cultivated landscapes. What's left then is *forests and meadows*. This in turn is negative for tourism. What we see in these two stories is that the idea of preserving Austria's landscapes is rehearsed by the researchers and their PPs. However, it is translated in slightly nuanced ways and thus different futures of Austria are enacted. Preserving landscape and minimizing human intrusion is something different to preserving cultivated landscapes for tourism.

In exploring what is at stake for the **different actors involved** in proVISION it is also important to keep in mind that transdisciplinary projects bring together a very heterogeneous set of actors. These actors assume very different positions in regard to their relation to academia, their (potential) careers that lead to different framings of risks and stakes in their particular futuring practices.

It comes as no surprise that early stage researchers e.g. tend to focus on their potential careers much more than actors already established in their respective fields. These actors especially struggle with the uncertainty of what they might gain working in transdisciplinary projects.²³² In this sense, their futures are fragile and obscure. One early stage researcher frames this as a decision between becoming a specialist and working in various different fields without being a specialist in any of them:

“In my case it was... it is not very specialized, but I'm more like... in more areas somehow, in which I engage, which... which I do like as a matter of fact, because it is... because it is now... yes, because I'm totally interested in relations and... and... and – yes – as a matter of fact enjoy when something looks more complex. But – yes – for me it is not a problem and I mean it has... it can be an advantage for later or a disadvantage – you never know,

²³¹ “wir haben keinen Tourismus und das nicht, also wir hängen völlig in der Luft, warum probiert ihr nicht bei uns was anzustarten? Da waren etliche – ja? – die gekommen sind noch mehr von... von der Eisenwurzen heraus – ja? – X, usw. – da gibt es ja etliche Gemeinden die... die außer Wald und Wiesen gar nichts haben, ja?” (P10_M02: 1871)

²³² In a paper on early stage researchers engaged in an doctoral school that explicitly focused on transdisciplinarity my colleagues and I (Felt, Igelsböck, et al., 2013) elaborated on that in more detail and showed how especially such researchers struggled with finding their place in academia and imagining a future as transdisciplinary researchers. PhD candidates working in other proVISION projects were able to rely on a more stable disciplinary basis and didn't face similar struggles.

but you have to look what you are interested in now what you make of it now, yes.”²³³
(P01_m02: 655)

In the interviews they also often relate the methods they use or the questions they tackle to their positioning within an institution or in a field. The production of anticipatory knowledge is in this sense entwined with the personal futures respectively envisioned career trajectories of the researchers involved. In working on projects junior scientists strive for acquiring particular knowledge and various skills, which they consider important for their future careers. They also regard the technical knowledge about creating and working with models and simulations as an important resource for their future careers. Additionally, they talk about abilities like managing projects or working in academic environments. In this sense, one early stage researcher talks about the model she is developing in a project as a way of shaping her personal identity as a researcher and at the same time creating her own space both within academia and also within a particular institution:

“In the time when the project was running, one of my main task was, whereas we have the structure at this department, that everybody works on many projects at once, but this was for sure one of my, my main projects in the two years, as I said, the goal was two finish my dissertation out of this project, to open up a new topic and to occupy it further, those were all outcomes for me personally, that came out of the project, I also wrote further project proposals building on what we gained in the project and partly got the projects, partly submitted them again, I presented it a lot on conferences, got two publications out of it that were also known at the conferences or were registered, so for me personally it was a crucial project for going on with exactly this topic, I go on working with such models, I work with similar questions, but always in other project contexts.”²³⁴
(P10_f01: 1085)

²³³ “In meinem Fall war... ist halt dann nicht so sehr spezialisiert, sondern bin ich halt eher wieder... wieder eher in mehrten Bereichen irgendwie, wo ich mich dann beschäftige damit, was... was mir eigentlich schon eigentlich gefällt, weil es einfach... weil es jetzt... ja, weil ich Zusammenhänge total interessant finde und... und... und – ja - eigentlich auch manchmal einen Spaß dran habe wenn irgendwas komplexer aussieht. Aber – ja – von dem her denke ich mir ist es nicht das Problem und ich mein es hat... für später kann es ein Vorteil oder ein Nachteil sein – das weiß man nie, aber man muss immer schauen denke ich, was einen jetzt interessiert und was man jetzt draus macht, ja.“ (P01_m02: 655)

²³⁴ “In der Zeit, wo das Projekt gelaufen ist, war es einer meiner Hauptprojekte, wobei wir hier am Institut die Struktur haben, dass jeder an vielen Projekten zugleich arbeitet, aber das war sicher einer meiner, meiner Hauptprojekte in den zwei Jahren, wie gesagt, das Ziel war meine Dissertation aus dem heraus auch abzuschließen, ein neues Thema hier aufzumachen und das auch weiter zu besetzen, das waren schon alles auch Ergebnisse, ganz für mich persönlich, die aus dem Projekt herausgekommen sind, ich hab auch auf Basis dieses Projektes dann weitere Förderanträge geschrieben und zum Teil bekommen, zum Teil halt wieder neu eingereicht jetzt, die genau auf dem aufbauen, was wir in dem Projekt heraus erzielt

She talks about her PhD-thesis as a formal stepping-stone for becoming a scientist. Besides describing this formal requirement necessary for working in academia she also talks about *opening up* a new topic and about *occupying* this topic. Occupying can only be successful if the institution has a need for the issues that are opened up, i.e. if additional funding can be allocated. Personal goals thus need to be harmonized with the goals of an institution.

It is important to note the role of the materiality of the knowledge produced in this episode. As a software tool, the model she developed gains certain stability and is able to be used in different projects. The model becomes an entity independent from the project context. As such it can be adapted to different projects and becomes part of the researcher. In this way, it serves as a means for carving out the researchers distinct position in the institution and maybe even in a particular field. However, it has to be *similar issues* whereas it is not clear what the criteria for similarity are. Thus, the adaptability of the model is regarded as somehow limited. This shows how the particular institutional background together with the position of a researcher in this institution and in his or her career is mutually shaped with the particular methods used for producing anticipatory knowledge. A more established researcher might have chosen different methods for looking into the future and thereby might have enacted different futures.

Quite similarly senior researchers talk about the models' ability to function as what Merz calls a 'Zukunftsgenerator' (Merz, 2007) or what Rheinberger quoting Francois Jacob refers to as "machines for making the future" (F. Jacob, 1988; cited in Rheinberger, 19997: 28). This means that the models themselves create possible issues for future research:

"The interesting thing is – and this was actually... that was confirmed – that with this implementations, if you try to... to knit a Gesamtmodell from partial models, that you learn a lot scientifically, [] because when you realize – in the narrow area of studies –

haben, ich hab's viel präsentiert auf Konferenzen, eben zwei Publikationen aus dem rausgeholt, die, die auch auf diesen Konferenzen bekannt oder halt dann auch wahrgenommen wurden, also für mich persönlich war das schon ganz ein wesentlichen Projekt um genau an diesem Thema weiterzumachen, ich arbeite mit solchen Modellen weiter, ich arbeite mit ähnlichen Fragestellungen weiter, aber halt immer in anderen Projektkontexten." (P10_f01: 1085)

that this and that is missing respectively the junction from one model to another don't work neatly. And this partly creates need for research"²³⁵ (P08_m01: 198)

This researcher talks about models that create *demand for research* in that they reveal gaps of actual knowledge and highlight relations between different models that do not work accurately. Thus the model itself becomes the object of interest. Another researcher talks about her proVISION project as a *starting project*:

"Well it has, on a scientific level it has, or for us as a department it has, it was a bit like a starting project, for something new that we do, it has, concerning the method it differs from what we normally apply concerning methods, i.e. both method development and direct practical experiences, both took place in the project and on department level for sure a, a good starting point for something new that we pursue."²³⁶ (P10_f01: 1244)

She and the research institute she works for use this project for gaining knowledge concerning *method development* as well as *practical experience*, which can become a resource for the institute in potential future project calls. Single projects are in some cases parts of broader research trajectories or so called *umbrella-projects* as one interviewee tells us:

"That a project report needs to be written within three years, nothing else. We have a lot of projects, which are always part of a big project, I'll put it like that. We have a lot of umbrella projects [incomprehensible]. ProVISION is part of an umbrella project and as soon as proVISION is finished, there comes a checkmark behind it, but we further work with the data and with the results, create new projects, it doesn't have a real consequence."²³⁷ (P02_m03: 722)

²³⁵ "Das Interessante ist – und das war durchaus... hat sich auch bestätigt – dass bei diesen Umsetzungen, wenn man dann versucht so quasi ein... aus Teilmodellen ein Gesamtmodell zu stricken, dass man auch wissenschaftlich sehr viel lernt, [] weil wenn man drauf kommt - also im engen Fachbereich – dass das und das fehlt bzw. die Übergänge von einem Modell zum anderen nicht wirklich sauber funktionieren. Und das erzeugt zum Teil Forschungsbedarf" (P08_m01: 198)

²³⁶ "Also es hat, es hat jetzt auf wissenschaftlicher, oder für uns als Institut hat's, ist es sicher so ein bisschen ein Startprojekt auch gewesen, für etwas Neues, was wir machen, es hat sich, es unterscheidet sich in der Methode von dem, was wir sonst in den Methoden anwenden, das heißt, sowohl Methodenentwicklung, wie auch direkte praktische Erfahrungen, haben beides in dem Projekt stattgefunden und auf Institutsebenen sicher ein, ja, ein guter Startpunkt für etwas Neues gewesen, was wir weiter verfolgen." (P10_f01: 1244)

²³⁷ "Dass in drei Jahren ein Projektbericht geschrieben sein muss, sonst gar nichts. Wir haben sehr viele Projekte, die sind ein Teil immer eines großen Projektes, sag ich jetzt einmal. Wir haben sehr viele so umbrella Projekt [unv.]. ProVISION ist ein Teil eines Umbrella-Projekts, bei uns an der eurac, des [unv.] landuse change läuft, ist ein Teil darin und sobald das Projekt ProVISION abgeschlossen ist, kommt zwar ein Hak-, ein Häklein dahinter, aber wir arbeiten mit den Daten und mit den Ergebnissen einfach weiter, kreieren ein neues Projekt, hat an sich nicht wirklich Auswirkung." (P02_m03: 722)

Projects end but *data* and *results* are used for further projects. This idea of course opposes an imagination in which the locality of knowledge is highlighted; knowledge that is produced in a particular case for particular actors. In this story knowledge is understood as data that can be transferred from one project to the other. Future projects in this case also play a role in the generation of data, as it needs to be usable in such potential projects. In this account, futuring is not only the generation of a demand for research but additionally refers already to the production of data for the next project adding another layer to the idea of ‘Zukunftsgeneratoren’.

In a similar manner, also some of the PPs don’t even regard the project results as the main gain of their involvement in the projects. What is more important to them is to be in contact with universities in order to have constant access to up-to-date knowledge:

Yes I think we know each other face-to-face, so for them X is now a term and if, if one has another idea or... I think, if they again... if they again start a project like this, they will probably think about us: oh yes – and we roughly know what they do and have a picture of it and are able to approach them.”²³⁸ (P01_f04: 695)

The PP in this quote talks about the value of being known *face-to-face*. She has in mind the future of the NGO she works for and the possibility to use her contacts to academic and thus highly credible producers of knowledge to pursue their own political agendas.

Summing up futuring is not only about producing anticipatory knowledge. It is about establishing and stabilizing a series of interrelated ideas about where to go personally, institutionally and on a societal level in the form of attainable futures or dystopian scenarios; a complex assemblage of different stakes. To choose a particular way of producing forward looking knowledge thus can not be understood as an isolated choice of actors. Instead, it must be analyzed as a situated material practice that is embedded in a set of connected expectations and trajectories.

²³⁸ “Ja, ich denke mir, man kennt sich jetzt einmal face-to-face, also ihnen ist vielleicht auch jetzt X ein Begriff worden und wenn... wenn man wieder eine Idee hat oder... ich denke mir, wenn sie wieder was... wenn sie wieder so ein Projekt starten, werden sie wahrscheinlich auch an uns denken und wir werden denken: aja – und wissen jetzt was ungefähr sie machen und haben jetzt auch eher ein Bild davon bekommen und können dann auch wieder an sie herantreten” (P01_f04: 695)

6.6. Discussion

6.6.1. Practices of futuring – More than a case of ‘grazing’?

Concluding this chapter I want to summarize and reflect on the various **futuring practices** I described and also think about how they relate to the translations of the socio-scientific imaginary visible in proVISION and more generally speaking in a particular branch of Austrian sustainability research. What practices of futuring could I observe and how are ideas about actualizing attainable futures related to different visions of how knowledge production ought to be done?

In the first part of this chapter, I described how researchers talk about practices of *grazing the research landscapes* for funding possibilities. I showed how they engage in an economy of promise (Felt, 2007) in their practices of developing and submitting projects for funding. Through articulating promises about what they are going to do their research ideas are shaped by program requirements. At the same time, however, they also *interpret* and thus translate these requirements and in this way also the program is re-shaped through the projects. This poses the question whether the future as a research topic is yet another part of the landscape that makes for good *grazing* right now in a time of collective fascination for the future. I argued that articulating promises always comes with particular requirements and that in this sense we can assume that the focus on anticipatory knowledge influences the researchers’ practices of producing knowledge.

Following that, I explored how research problems get defined in the projects. The interesting question thereby was how the requirement of finding solutions for problems together with so-called extra-scientific actors or Praxispartners influenced this process. Articulating problems in the case of transdisciplinary sustainability research refers to a practice in which global developments are related to local problems. This is mostly done through notions like ‘impact’ or ‘effects’. Global developments are understood as having effects on particular regions in the future. These effects need to be made manageable through anticipatory knowledge and actions that correspond to that knowledge. Problems so constructed are inevitable. There is no doubt the effects of global developments will hit the different regions. The only question is how to deal with them. This conception bears resemblance to concepts like destiny or fate. The difference, however, is that local actors together with the researchers construct themselves and get constructed as able to influence their destinies, respectively ‘adapt’ to or ‘mitigate’ them.

This concept is visible in strategies like increasing the resilience of particular regions or in attempting to establish procedures of ‘adaptive management’. In these accounts, actions in the present are oriented towards the future.

This leads to particular ways of conceptualizing the role of anticipatory knowledge in solving problems and the role of PPs. Knowledge about the future becomes key to shaping a region’s future successfully. Anticipatory knowledge is mainly understood as a way of aiding decision-making and of raising the awareness of actors that their actions always have particular consequences. As a consequence, also PPs are constituted in particular ways: either as holders of particular experience and thus well equipped for giving feedback on models and scenarios, or as actors that need to be informed about the consequences of their actions. This relates to a particular idea of how we make our future that I called ‘crowdsourcing’ the future. The idea underlying this model is that local futures add up to a broader global future. According to this model we can actualize attainable futures on a global level through adapting our everyday practices. In this way, everybody can participate in creating the futures we want and need through practices as little as e.g. boiling just the right amount of water for our tea (Marres, 2012). This approach favors the production of contextualized and situated futures that actually matter to the actors involved. In this sense, the program and the projects funded by it can be described as a success. However, this focus on particular regions and local futures has important limitations that need to be kept in mind. Mostly the projects do not deal with the relations of local and more global futures, i.e. questions of scale are not an issue. In this sense a program like proVISION necessarily fails to direct attention to futures that can’t be so easily shaped through locally situated everyday practices. There are a lot of problems that can’t be solved through another regional development project as e.g. carbon trading activities on the level of nation states and globally acting corporations. Hence, the question is whether Austria’s extraordinarily green landscapes can actually be preserved by focusing mainly on local futures.

These issues direct attention to questions concerning responsibility in transdisciplinary collaborations. Who is responsible for the knowledge produced? What happens after projects end and what is the role of scientific actors then? These questions are closely tied to ideas about the future relevance of knowledge and how knowledge is supposed to lead to action. Stories about the responsibilities of researchers often build on the presumption of a linear model of innovation in which knowledge is produced by science

and then is taken up by extra-scientific actors. Underlying this model we find a particular concept about the temporality of the relevance of knowledge, which assumes that knowledge will become relevant in the future more or less automatically. Therefore, all scientists can and ought to do is produce knowledge in the best way they can. In a slightly more complex version of this model difficulties in the relation of knowledge and action are acknowledged. These difficulties are often explained with the notion 'Leidensdruck'. Roughly translated as 'degree of suffering' this term basically refers to different opinions concerning the futures that (should) matter. Researchers are interested in more long-term effects of global changes, while PPs often focus on futures that are perceived as being 'closer' to the present. Such diverging assessments of which futures actually matter might lead, in the narrations of the researchers, to a lack of interest in the knowledge produced on the side of their partners. To enhance the chance of the knowledge being applied particular actors or institutions are integrated in the projects or asked to take over after the projects have ended. Responsibility is outsourced, so to say.

What we see in such instances are tensions that arise when different logics of integrating science and society meet. In a recent report of the European Science Foundation Felt, Barben, et al. (2013) distinguish attempts of integrating science and society that follow a logic of choice from such that operate within a logic of care. Whereas the former are "based on the assumption that there are clear cut options to choose from" (ibid.: 4), a logic of care considers "the contextuality, the complexity and the continuous development of science-society issues" (ibid.). This distinction is also useful for understanding how issues of responsibility are handled in proVISION projects. While researchers engaged in proVISION-funded projects often tend to make sense of their practices in terms of a logic of choice, i.e. through providing knowledge that shall guide decision-making processes, engagement that operates according to principles of care is often outsourced to other actors. Long-term engagement and processuality thus seems to be difficult to align with the ways responsibility is collectively imagined in contemporary knowledge production and futuring practices.

Finally, futuring practices are also visible in regard to issues that do not necessarily relate to the actual research problem of the different projects. This becomes visible when asking for the stakes. Actors engaged in the projects need to balance various futures in their practices. Early stage researchers need to think about their career

trajectories and what the skills they are able to acquire in a particular project means in terms of potential future jobs. More experienced researchers regard projects as “machines for making the future” (F. Jacob, 1988; cited in Rheinberger, 19997: 28) and always have potential follow-up projects in mind.

What becomes visible here is that the practices of researchers and their collaborators are clearly more than merely *grazing* the future as a funding possibility. Much rather, ideas about how the future and the present relate and how we are able to actualize particular futures, while preventing others are closely connected to social and scientific orderings in the futuring practices I explored. They relate to ideas about how to produce knowledge and how to integrate a heterogeneous set of actors into practices of knowledge production. And what is important: in these practices also ideas about why to do so are collectively stabilized. Therefore, in these practices particular science-society relations are also stabilized, which is how they relate to socio-scientific imaginaries.

6.6.2. Translating a socio-scientific imaginary in the making

This leads us directly to the issue of imaginaries that provided the second thread of this chapter. The translation of this socio-scientific imaginary in the making proved to be a complex process in which researchers as well as their extra scientific partners draw on a broad variety of different imaginative resources. This cannot be understood as simply adopting or contesting the alternative socio-scientific imaginary that is guiding proVISION. Much rather, this translation is a process in which actors embrace particular elements while neglecting, adapting or in some cases openly contesting others.

The idea of global problems that have an effect on local communities that call for more inclusive ways of solving them is stabilized within the proVISION funded projects. However, it is mainly the effect-side of the problems that is addressed in the projects. Different localities are enacted in the projects while the relation to global developments mainly builds the premise. In this sense, the stakes are also mostly framed in terms of a particular region. It is the survival of a particular region’s agricultural system or a particular winter tourism area rather than the global survival of humankind that is at stake here. This translation thus is closely related to the production of localized futures. Their relation to global futures is mostly implicit in the idea that working on multiple local futures will eventually bring about an attainable future on a mostly unspecified broader level.

The multiple ways in which the idea of transdisciplinary collaboration is translated is especially visible in practices of integrating heterogeneous actors. These actors appear in multiple roles from 'reality checkers' to actors who need to be merely made aware of the consequences of their actions in order to change their behavior accordingly. These different translations also impinge on the organization of the research process, i.e. when and how different actors are participating and thus how transdisciplinarity is lived in the practices of the project collaborators. What becomes especially visible in these translation practices are tensions that arise when the requirement to integrate extra-scientific actors clashes with scientific project logics. In designing research projects researchers tend to assign their partners to particular 'work packages' that are the responsibility of specialized (institutional) actors. When they are expected to contribute to scientific work, they assume the task to give feedback, which also happens at in temporally restricted formats as e.g. meetings of workshops. Thus, collaboration is mostly translated in terms of restricted events rather than as a continuous process. In this way researchers can do both integrate actors and solve their problems and make sure that the project outputs are deemed acceptable within the scientific community.

This practice of separating different tasks in the production of anticipatory knowledge with respect for local communities becomes especially apparent in the translation of ideas concerning responsibility. The partitioning of different work packages as well as the establishment of temporally restricted events of transdisciplinary participation also allows for particular distribution of responsibility: mostly researchers hand over responsibility to specialized actors or institutions. It is the responsibility of these actors that the knowledge produced leads to corresponding actions. In some cases material versions of the knowledge produced are supposed to fulfill that role: software tools that Praxispartners are supposed to use to guide their decisions. These translations of the issue of responsibility allow for a stabilization of traditional demarcations between science and society. Researchers are responsible for producing knowledge in accordance with the requirements of the respective scientific communities.

As we can see translating a socio-scientific imaginary is indeed quite complex. It is a messy process in which particular elements remain stable, while others are contested or modified in multiple different ways. The socio-scientific imaginary of an alternative way of producing knowledge thus becomes a complex arrangement of ideas of integration and collaboration and seemingly opposed practices of drawing boundaries.

I will reflect on what this means for this particular imaginary in the making in the conclusion of this thesis.

7. Conclusions

Throughout this thesis I argued that debates about changing modes of knowledge production are closely tied to the assemblage, stabilization and contestation of collectively imagined futures of science and society. These debates simultaneously diagnose and postulate an ever closer relation of science of society, which is deemed necessary for dealing with contemporary problems. Practices of producing and circulating knowledge are supposed to be re-organized in order to actualize or prevent particular futures. Thus, futures of society and futures of science are negotiated simultaneously.

A sustainability research funding scheme such as proVISION proved to be an excellent choice for exploring practices in which scientific and societal orderings are negotiated as debates on sustainability issues are especially concerned with the future. I argued that looking especially at **practices of futuring** provides a promising analytical focus for understanding the multiple re-orderings going on when heterogeneous sets of actors such as researchers, local actors, community representatives, but also members of NGOs or program representatives and collaborate in order to solve problems related to sustainability issues. The notion highlights the multiple activities in which actors work out solutions for problems and create spaces for decisions and actions and to the futures made and unmade in the process. At the same time, the future becomes conceivable as an object through which contemporary scientific and societal orderings are constantly negotiated. Practices of futuring in the case of transdisciplinary sustainability research are closely related to knowledge about the future and anticipatory knowledge, which becomes key in attempts of managing both the future and the present.

What follows from this is that the future is not an abstract temporal realm open to our shaping. We rather need to be attentive to the performativity of the future (N. Brown & Michael, 2003; Lente & Rip, 1998) as well as to the multiple 'latent futures' (Adam & Groves, 2007) or the 'collateral futures'²³⁹ that are the outcome of our practices in the present. For understanding contemporary re-orderings of science-society relations it is thus crucial to empirically explore how futures are constantly made and unmade in multiple practices.

²³⁹ Felt, Ulrike: "Kollaterale Zukünfte: Zu den (An)Ordnungen von Morgen" Talk held at the conference "Zukunftsexpertise. Zur Generierung, Legitimierung, Verwendung und Anerkennung von Zukunftswissen" at the Center for Interdisciplinary Research of Bielefeld University in January 2013

In this sense, the thesis relates to debates regarding the multiple interdependencies of science and society that have been central to research in Science and Technology Studies (STS) from its beginnings. Scholars have directed attention to the complex dynamics in which (scientific) knowledge influences societal orderings, while practices of knowledge production need to be understood in regard to particular socio-historic configurations (e.g. Jasanoff, 2004). From an STS perspective science and society cannot be regarded and treated as clearly separated entities. Instead, the instances in which scientific and societal orderings are mutually constitutive need to be highlighted and explored. This in turn means that also debates about changing modes of knowledge production cannot be understood merely as an academic issue but need to be analyzed in relation to the increasing importance of knowledge in contemporary societies. Terms like 'knowledge society' or 'knowledge economy' direct attention to both a growing importance of knowledge as a productive force in terms of techno-scientific innovation and as notions that highlight the multiple interdependent relations between scientific and societal orderings (Felt & Wynne 2007; Knorr Cetina, 2007; Maasen & Lieven, 2006).

And this is where we come full circle as this focus on knowledge coincides with an increasing importance of 'anticipatory regimes' (Adams et al., 2009), i.e. the normative urge of contemporary societies to orient actions towards the future. We live in a society that thinks of the future as shapeable by actions in the present (Hölscher, 1999; Luhmann, 1976) and considers it imperative to constantly integrate potential futures into our practices. Knowledge in such accounts becomes the key in shaping our future (Stehr, 2005); knowledge about potential developments and consequences of our decisions and actions in the present. In this sense, we are invited to constantly work on our collective futures both in our everyday practices as well as in processes of knowledge production as knowledge about the future is no longer supposed to be produced by scientists in their so-called ivory towers alone. Especially when it comes to dealing with complex environmental problems it is supposed to be opened up for participatory practices and thus to become a field of 'collective experimentation' (Felt & Wynne 2007). Hence, an ever-closer relation of science and society coincides with new forms of engaging with the future (Adam & Groves, 2007).

ProVISION and its focus on transdisciplinary sustainability research is a case in which these different threads nicely come together as knowledge is considered the central

element for “securing better futures”²⁴⁰ for society. This idea is perfectly expressed in the program’s main goal of “making knowledge available for solving the most urgent problems in provision for nature and society”²⁴¹. In this account our well-being in the future is not dependent on technological innovation, but rather hinges on the knowledge we produce and how it is circulated. Particular futures thus are co-constitutive with ideas of how and by whom knowledge is supposed to be produced. The participation of a heterogeneous set of actors is one of the core features in this understanding.

This raises a set of important questions that I will address in this conclusion. My main research questions provides the starting point: **What practices of futuring can we observe in transdisciplinary sustainability research?** Related to that main question I want use this concluding section of my thesis to ask how the rather particular experimental setting of transdisciplinary collaboration influences the knowledge production practices and the knowledge produced. What are the futures that are produced? Whose futures get to be dealt with and whose futures are left out?

Socio-scientific imaginaries will be at the center of the last section, which is organized around the question of **how imagined futures of science and society are articulated and re-shaped in futuring practices**. And finally, I want to address the issue of how this alternative imaginary of science-society relations relates to more established and traditional ideas about science as well as to current policy discourses concerned with re-thinking the role of science in society.

²⁴⁰ proVISION website. Accessed August 8, 2013: <http://www.provision-research.at>

²⁴¹ Ibid.

7.1. Negotiating Epistemic Things and the Question of Representation

Practices of futuring can be observed throughout the projects in activities like the collaborative articulation of problems, the circulation of results and also in realizing follow-up activities or decision-making processes. The results of this thesis suggest that through such practices of futuring and the construction of particular epistemic things already established boundaries between science and society tend to be stabilized. The futures that are made in such practices are futures in which transdisciplinary collaborations are hard to maintain after the projects have ended and mostly Praxispartners carry the responsibility for 'using' the knowledge produced in the projects.

Furthermore it is noteworthy that questions concerning ideas of representation are hardly addressed within the research projects I looked at: questions like who is allowed to participate in knowledge production practices that are supposed to be 'opened up' and thus who is able to take part in practices of futuring.

For thinking about these questions and the particular relation of futuring practices and anticipatory knowledge in transdisciplinary sustainability research it is worthwhile to abstract for a moment from the narrations of the researchers and their PPs and instead use the notion of '**epistemic things**' (Rheinberger, 1997). In the glossary of his book 'Toward a History of Epistemic Things' (ibid.) Rheinberger defines an epistemic thing as a "[s]cientific object, that is, an entity whose unknown characteristics are the target of an experimental inquiry." (ibid.: 238). They are produced in relation to an experimental system, i.e. a "basic unit of experimental activity combining local, technical, instrumental, institutional, social, and epistemic aspects" (ibid.). The concept emphasizes the processuality and materiality of knowledge production and thereby focuses on how things are co-constitutive with the experimental conditions of their making. Additionally, it highlights the materiality of the experimental systems and the epistemic things. This materiality, Rheinberger argues, "lies in their resistance, their capacity to turn around the (im)precisions of our foresight and understanding." (ibid.: 23). It is exactly this relation of the unknown characteristics and the experimental inquiry in Rheinberger's definition that is appealing to me as it directs attention to the particular experimental settings of futuring practices of the proVISION-funded projects, while at the same time

highlighting the contested character of epistemic things. As Latour puts it: “Thus, long before designating an object thrown out of the political sphere and standing there objectively and independently, the Ding or Thing has for many centuries meant the issue that brings people together because it divides them.” (2005: 13)

Now what exactly are the epistemic things that are produced in transdisciplinary sustainability research? Before I can actually address this question it is important to note that the experimental systems of the projects funded by proVISION are of course different from the ones described by Rheinberger. While Rheinberger explores experimental settings in laboratories, my case study bears more resemblance to what has been described as ‘collective experimentation’ (Felt & Wynne 2007), a notion that describes new forms of interaction between scientists and other actors in innovation processes, or ‘Realexperimente’ (Groß, Hoffmann-Riem, & Krohn, 2005; Gross & Krohn, 2005; Mückenberger & Timpf, 2006) in which society becomes the field of experimentation. As a consequence, the experimental settings I focus on have two main features that are important for my analysis: first, they are research settings that focus on **participation** of heterogeneous actors; and second, the epistemic focus in such settings is the **future**, which means that we are talking about anticipatory knowledge produced mainly by means of various scenarios or modeling techniques.

At the beginning of the projects researchers and their PPs engaged in the production of anticipatory knowledge need to set up their ‘experimental system’, i.e. ways of producing knowledge in heterogeneous collaborations. In this process indeed the starting question is often: what actually is the epistemic thing we want to look at? The collaborators thus need to find a research problem that matters for all participants. This means negotiating which futures they want to anticipate as well as the procedure that is fit to do so. Narrations about defining ‘the problem’ feature prominently in the stories of our interviewees in the context of model-development. Different actors are invited to express their ideas about what needs to be considered and what can be left out. In refining the research problem that is initially sketched out by researchers in their proposals mostly two different yet closely connected aspects are negotiated: what the actual problem is, i.e. which aspects need to be considered, and when the problem is, i.e. which future is actually relevant for the actors involved. These concerns are expressed in notions like “upcoming problems” (P10_f01 373) or their “acuteness” (P09_m01: 1049). In this sense, the epistemic things in transdisciplinary sustainability projects are

the problems to come and the solutions to be elaborated. Establishing epistemic things also relates to particular practices of futuring. By collaboratively establishing particular problems actors engaged in proVISION-funded projects create very specific futures: mostly localized futures were made by producing and circulating knowledge about potential developments in a particular region and by promoting certain decisions or even initiating actions. Global futures are present only as abstract threats like global warming or scarcity of resources that need to be dealt with locally. In a similar manner, negotiating problems also sets the temporal scale of the future. 'Acute' futures that are close by need to be balanced against potential futures that are regarded as being still far away.

It is important to note that the epistemic things created are open to change throughout the projects, which can lead to considerable tensions. Researchers e.g. mention the need to "massage" (FG_05: 368) the questions of their PPs in order to transform them into epistemic things. Otherwise these things might be things but not necessarily epistemic in the eyes of the researchers. Early stage researchers often talked about their confusion when their supposed-to-be Praxispartners did not have any problems that were interesting in terms of a PhD-thesis or when they were just interested in results instead of participating in a transdisciplinary process. Throughout the projects epistemic things tend to be re-shaped constantly. They are e.g. dissected into different things that can be dealt with in particular work-packages by the respective actors. Things that researchers can publish articles about and things a 'Landmanager' needs to deal with in a particular region. This points us to another issue concerning futuring practices. The different futures researchers and their partners strive for can create tensions and at times even contradict each other. Getting publishable results - i.e. results that meet criteria of scientific excellence, which is necessary for building a career - is not always easy to reconcile with attempts of solving problems in a particular region. While the former calls for more short-term engagement and a retreat from the region after the end of a project, the latter is associated with forms of long-term engagement. Additionally, the scientific quality of anticipatory knowledge is often difficult to assess. So while Barthes states that the goal of heterogeneous collaborations (he is talking especially about interdisciplinarity) is to create new objects that do not belong to a single discipline (Barthes, 1972: 3), what we see here is the creation of multiple epistemic things with changing ownership-relations throughout the projects.

When we think about the collaborative production of epistemic things in transdisciplinary sustainability research it is of course important to ask **who is allowed to participate** in the process of knowledge production as the futures that are made and imagined are closely related to ideas about the actors that participate in practices of futuring. Futuring practices in this sense are always co-constitutive with particular communities. As I said above ideas about collective experimentation, i.e. the integration of extra-scientific actors into knowledge production processes, has been a central issue in transdisciplinary sustainability research. This social re-organization of knowledge production is expected to contribute to a so-called 'democratization of expertise' (Nowotny, 2003). Epistemic things are produced in a collaborative effort by heterogeneous actors who contribute their particular kinds of expertise as e.g. intimate knowledge about a particular region. When thinking about democratization issues of representation also become important. Representation basically, but by no means comprehensively, describes a process in which something that is not actually present is in some way made present. Brown (2009) argues that representation means different things in scientific and political arenas. When it comes to science representation is mostly understood as 'standing for' something. Scientific facts represent the world outside in the sense that they correspond to respectively stand for it. As a political term and related to democratic ideas representation means 'to act for' someone else. Elected representatives are supposed to act for a particular community. Representation therefore is a crucial concept in science as well as in democratic theory. For the proVISION projects both meanings of the term are relevant. Through the integration of extra-scientific actors, so the argument goes, experiences as well as *hopes* and *fears* of a particular region or collective can become part of knowledge production. How exactly, one might ask, does this work? How can social reality be represented in participatory research projects? Of course no set of actors can represent region or community as a whole. So how is this issue addressed in projects with the goal to create epistemic things that matter for a particular region?

The short answer to this question is: not really. Within the program discourse the world is divided roughly into the 'ivory tower' of science and the 'social reality' outside the ivory tower. The gap between those two realms, so the story goes, needs to be overcome through transdisciplinary research in order to provide knowledge for shaping our future. Social reality appears as a coherent entity, which is nicely captured with the term 'extra-

scientific actor' that encompasses all actors that are, well, not scientists. The ability of single members of the social reality to represent a particular region is not questioned. This in turn means that representation is not a question. Also on the level of creating experimental settings traditional demarcations set in when it comes to the question of representation. While the problems to be tackled are open for discussion to different degrees it is mostly the researchers who decide which PPs they want to integrate into their projects. Whom they represent and on what basis is hardly ever discussed. Mostly, it is simply assumed that the actors chosen by the researchers represent a particular region. In some cases the mere fact of previous acquaintance with a researcher is sufficient for becoming a representative of a region. In others the researchers rely on administrative structures and collaborate with local researchers and politicians. These actors are considered to represent the region and are thus suitable to negotiate the epistemic things and therefore the futures that matter.

When we agree on the importance of more integrative modes of knowledge production for dealing with contemporary challenges, it is also important to reflect on who is able to participate in the production of epistemic things. The case of transdisciplinary sustainability research and the question of representation shows us that it is crucial to reflect on our ideas about who is allowed to participate in futuring and on what grounds and thus whose futures are taken into account and whose futures are left out.

7.2. Epistemic Things and the Confinement of Futures

My work shows that researchers who set up transdisciplinary projects struggle to create spaces in which a heterogeneous set of actors is able to contribute to the futures produced in transdisciplinary research projects. Current frameworks tend to privilege the production of narrow futures of local problems and template solutions. While this is on the one hand a good thing as it indicates locally situated practices of articulating and solving problems on the other hand the capacity of such problem/solutions to aid in dealing with more unusual futures or the oft-cited ‘grand challenges of our time’ needs to be questioned.

If we take this goal seriously it is key to move beyond framings of PPs as ‘users’ or ‘reality checkers’ and beyond narrow project-logics and their inherent temporalities in order to enable the creation of spaces for exchange between diverse actors. Extending early project phases or funding or different kinds of pre-project financing for this particular kind of research might be worth consideration.

Additionally, to directing our attention to questions concerning participation and representation in practices of knowledge production, focusing on epistemic things also highlights the particular experimental settings of their production. As I showed in the empirical chapters of this thesis researchers frame epistemic things in terms of credibility and plausibility as well as concerning their potential consecutive application after the end of the respective projects. They not only need to be produced according to scientific rationales, it is also local actors’ ideas about which futures matter that enter the production of anticipatory knowledge.

This is visible already in the social and epistemic re-orderings that go into the set-up of transdisciplinary projects. For example, when researchers talk about their partners as ‘reality-checkers’, a term that describes practices in which PPs are supposed to grant the relevance and consequentially the **applicability or usability** of results. Stories about ‘reality checks’ also are used to make sense of feedback practices in the further development of the models. Researchers talk about the importance of getting the model right and the danger of leaving things out. This is often also framed as a question of the **credibility of the models**, which means that additionally to being scientifically sound the models need to be regarded by the PPs as credible models of their regions. In the

later stages of the projects the **usability and relevance** are ‘checked’ by the PPs. Materialized versions of the futures produced together are left with the extra-scientific partners. These can be e.g. sets of recommendations for actions or software-tools that are supposed to enable the local actors to produce scenarios themselves. Consequentially, the manufacturing of these materialized futures is guided by principles of easy and direct usability or applicability for the local actors. One researcher states: “we really tried to give them very practical things to the point we can do that” (P10_f01: 373). Ideas about how and by whom project outputs are going to be used are thus deeply inscribed into practices of producing and circulating anticipatory knowledge.

This is neatly expressed in a project about winter tourism, in which the researchers’ initial idea was to produce anticipatory knowledge about likelihoods of snowfall in a particular region. However, the local actors were not interested in snowfall per se. What they were interested in was the development of nighttime temperatures on an hourly basis. This future was a matter of concern for them as nighttime temperatures are crucial for artificial snowmaking. Additionally, in contrast to the more long-term aspirations of the researchers the local actors wanted to gain knowledge about a specific date, the date on which a big event was supposed to take place. On researcher comments on this:

“so we don’t do the research we are interested in, we would not have been interested in this silly event X”²⁴² (P07_f01: 1089)

This episode shows how the particular socio-material organization of knowledge production – i.e. the experimental setting – is closely related to the epistemic thing that is produced. In this sense, one could argue, the goal articulated in proVISION to go out into the real world and produce knowledge together with PPs seems to be accomplished. Researchers and their PPs agree on a problem that needs to be solved in a common effort and in further consequence develop strategies to do so.

However, I would like to direct attention to tensions in the futuring practices of researchers and their PPs that arise from the simultaneous articulation of different possibly contradictory goals in the proVISION program documents. While focusing on collaborative problem-solving activities, proVISION additionally highlights the necessity

²⁴² “also wir forschen nicht das, was wir Lust haben, uns hätte nämlich das mit dem blöden Winter-Event X gar nicht interessiert” (P07_f01: 1089)

to produce anticipatory knowledge in order to be prepared to meet contemporary 'grand challenges' and adapt to consequences of anthropogenic climate change.

As Rheinberger reminds us, experimental settings as well as particular models need to be regarded as materialized versions of theories. We have seen a range of heterogeneous actors such as researchers, NGOs or local actors contribute their ideas about what the situation – often described as 'social reality' – is and how particular problems need to be dealt with. Thus, it is theories of researchers of their PPs that enter to different extents) the set-up as well as the modeling processes in the various projects. The anticipatory knowledge produced in the participatory settings I observed are in this sense deeply entwined with local settings and problems. As we have seen anticipatory knowledge needs to be plausible and credible. Additionally, it needs to be applicable for the PPs. While these features of anticipatory knowledge are indeed worthwhile, this also means that more experimental or unusual futures are mostly out of the picture. Applicability and relevance thus bear the danger of leading to a narrowing down of the variety of problems that can be envisioned and thus the futures that can potentially be 'enacted' (Law, 2009; Law & Urry, 2004). As a consequence, local actors and decision-makers can only be prepared to 'adapt' to and 'care' for a limited scope of problems to come. This is especially true of attempts to produce what is often referred to as 'tools' for decision-making: these can be models that allow for producing scenarios after the projects have ended. These sort of 'ready-made futures' are supposed to be used by the PPs for decision-making purposes and are often framed as a material compensation for the absence of the researchers; material objects for long-term engagement. The future relevance of the knowledge produced is regarded as a responsibility of the local actors and their ability or willingness to use these tools.

So if we take the claim seriously that it is necessary to produce epistemic things that are relevant to the problem solving activities of local actors it is important to be sensitive also to their potential limitations. This means trying to keep in mind the tendency of participatory research settings to counteract the production of a broader variety of epistemic things and the possibility to move beyond e.g. futures of thriving tourism and increasing sales figures of regionally produced organic products as well as beyond narrow scientific modeling practices mainly interested in eliminating potential bias. In this sense, I agree with Miller and Bennett (2008) in their observation that it is important – and this holds especially true for participatory research settings – to think

about ways of fostering the creation of more creative epistemic things. This also means trying to go beyond the constitution of PPs mainly as potential ‘users’ or ‘reality checkers’ who ‘merely’ grant the social robustness of the knowledge produced by scientific actors. Put differently, there still seems to be potential for a more intense and inclusive debate about the futures that matter and the problems that need to be tackled. This potential is visible in the remarks of researchers about early stages of their projects, in which they addressed the lack of time for getting to know each other properly and discuss at length what the projects should be about. These comments indicate the difficulty and struggle of creating spaces for debate in the beginning of projects. Spaces that seem to be especially important in projects that bring together quite heterogeneous sets of actors. A way of creating such spaces might be to depart from established project temporalities in which research questions (and increasingly also outcomes) need to be fixed before projects start. Instead one could think about creating framework conditions in which early project phases can be extended. This would allow for a heterogeneous set of actors to actually engage and participate more actively in practices of problem articulation. Futures debated in transdisciplinary sustainability research in this sense could be understood more like the ‘Thing’ Latour is talking about, an “issue that brings people together because it divides them” (2005: 13), i.e. things that are open to negotiation for a diverse set of actors; things that are constantly vague and uncertain; instead of definite objects developed on the basis of scientific investigation and expertise; things that are not treated according to a logic of choice, but more along the lines of a logic of care, i.e. through highlighting processuality, long-term engagement and contextuality. (Felt, Barben, et al., 2013)

7.3. The Difficulty of Stabilizing an Alternative Imaginary of Science-Society Relations

In this thesis I argued that the research funding scheme proVISION is one moment in which the broader attempt of assembling and stabilizing a particular socio-scientific imaginary becomes visible. My research shows that this imaginary, although it is somewhat coherent on a program level, becomes a messy and complex assemblage of very different imaginative resources in the translations of the researchers and their collaborators. Whereas program representatives rehearse an alternative idea of science-society relations in the proVISION documents and at public events, both researchers and their partners draw on a broader variety of imaginative resources in their practices. Ideas about new ways of producing and circulating knowledge are combined with quite 'traditional' ideas. Transdisciplinarity often becomes what researchers refer to as an 'add-on' to their projects instead of being a core idea.

Against this background it is important to be attentive to the fact that certain ideas about the relation of science and society are very deeply inscribed into different actors' envisionings about how science works and what desirable futures of society should look like. Additionally these ideas are institutionally stabilized e.g. in assessment criteria for scientific work, project logics, desirable career trajectories and so on.

FG_03: *Say, a, a, saw a problem, that transdisciplinarity was merely one, one on a long list of principles to orient oneself. There also was, what do I know, educational cooperations, 'gender mainstreaming' [English orig.; T.V.], I have the whole, whole list.*

FG_08: *Scientific excellence, sustainability.*

FG_03: *Regional location.*

FG_07: *We couldn't and didn't have to accomplish all of them in equal measure. We also saw it like that.*

Moderator: *But transdisciplinarity was so to say the, to a certain extent the core idea of it*

FG_08: *Well.*

M: *Well at least if you look at the documents, as commonly stated*

FG_03: *But the others were, the others were, well I didn't see a, a possible ordering; rather all of it, and that was maybe a bit 'overambitious' [English orig.; T.V.], well you can't deliver all of it.*

FG_07: *Not in this framework.*

*FG_03: And then, there is simply the danger that there is a bit of a ticking off in the proposal: I have to fulfill this, I have to fulfill that, I have to fulfill that instead of a, a serious, how to put it, desire to put it in to practice accordingly.*²⁴³

The funding scheme proVISION was established with the explicit goal to foster transdisciplinary sustainability research for “securing a better future”²⁴⁴. To achieve this goal a particular mode of producing and circulating knowledge – a new ‘science culture’²⁴⁵ – was considered necessary. Therefore, the funding scheme was conceptualized as an alternative to what is commonly understood as traditional modes of knowledge production on an institutional as well as on a symbolic level. The idea was to establish new (knowledge-)relations between science and society in order to meet contemporary challenges related to global warming respectively climate change. It might be too rash a conclusion that the program failed altogether as the different projects produced interesting and valuable outcomes. However, the program was ended after its second call and the intended “long-term cooperation[s]”²⁴⁶ between researchers and their PPs were mostly not established. So what to make of this?

In the empirical chapters **I asked how desirable futures of society are imagined together with particular ways of producing and circulating knowledge and how these visions are re-shaped through practices of futuring.** I argued that in their projects researchers and their partners create complex assemblages of different imaginative resources. Concluding this thesis I now want to use the little sequence above - it is taken from one of our focus group discussions - to suggest that exploring the

²⁴³ *FG_03: Sagt, ein, ein Problem gesehen hab, dass ja die Transdisziplinarität nur einer, eine auf einer langen Liste von Prinzipien gewesen ist, nach denen man sich orientieren hätte sollen. Da war noch, was weiß ich, Forschungsbildungskoooperation, gender mainstreaming, ich hab die ganze, ganze Liste.*

FG_08: Wissenschaftliche Exzellenz, Nachhaltigkeit.

FG_03: Regionale Verortung.

FG_07: Haben wir nicht alle gleichermaßen erfüllen können oder müssen. Das haben wir auch so gesehen.

Moderator: Aber Transdisziplinarität war schon sozusagen diese, ein Stück weit diese Kernidee, die drinnen gesteckt ist.

FG_08: Also.

M: also wenn man sich die Dokumente zumindestens ansieht, behauptetermaßen.

FG_03: Aber die anderen war, die anderen war, also ich hab jetzt da nicht eine, eine mögliche Reihung; sondern eigentlich alles und das war vielleicht ein bisschen overambitious, also das kann man nicht alles liefern.

FG_07: Nicht in dem Rahmen.

FG_03: Und da, da ist eben dann die Gefahr, dass es halt ein bisschen zu einem Abhakeln im Antrag: das muss ich erfüllen, das muss ich erfüllen, das muss ich erfüllen, kommt und nicht zu einem, zu einem ernsthaften, wie soll man sagen, Bedürfnis, das auch, das auch entsprechend umzusetzen.

²⁴⁴ proVISION website. Accessed August 8, 2013: <http://www.provision-research.at>

²⁴⁵ Ibid.

²⁴⁶ Ibid.

collectively held imaginative resources that are mobilized by researchers and their partners can help to understand why proVISION was not able to establish and stabilize an alternative culture of producing knowledge, a goal implied e.g. in one of the questions articulated in the program's mission statement: "What kind of science culture does a sustainable society need?"²⁴⁷

ProVISION needs to be regarded as one element in the attempt of assembling and stabilizing an alternative imaginary of science-society relations: a **socio-scientific imaginary of preserving and preventing** emphasizing the need to produce and circulate knowledge in order to prevent particular futures from their actualization respectively to realize desirable futures. In this way Austria is constituted as extraordinarily 'green' country characterized by its beautiful landscapes that need to be preserved. Its direct predecessor funding scheme 'Kulturlandschaftsforschung'²⁴⁸ and related policy programs like e.g. 'Research for Sustainable Development'²⁴⁹ or broader programs like Austria's 'National Environmental Plan'²⁵⁰ are other instances in which this attempt is visible on a policy level. ProVISION in this sense cannot simply be equaled with the imaginary I described. Rather, it is one moment in a historical formation process of assembling and stabilizing this particular imaginary. It enacts similar imaginative resources as its predecessor programs and thus rehearsed ideas like e.g. the need for interdisciplinary and transdisciplinary collaboration and with that particular ideas about responsibilities of science, while at the same time also slightly adopting these ideas. Ulrike Felt described a similar formation process of imaginaries for the case of nuclear energy in Austria in which an imaginary of Austria 'being free of' particular technologies' is assembled and publicly rehearsed in multiple instances over a long period of time (Felt, forthcoming). Imaginaries, Felt states, are "the outcome of a gradual, long-term, bottom-up formation, always in need of rehearsal and (re)stabilization." (Felt, forthcoming).

Whereas proVISION on a program level clearly inscribes itself into a pre-existing imaginary of an alternative way of producing knowledge in sustainability research, the

²⁴⁷ Ibid.

²⁴⁸ BMWFW website. Accessed May 26, 2014:

<http://wissenschaft.bmwfw.gv.at/bmwfw/forschung/national/programme-schwerpunkte/kulturlandschaftsforschung/>

²⁴⁹ FORNE program description. Accessed May 26, 2014: http://www.forne.at/pdf/programme_en.pdf

²⁵⁰ Index of the Austrian National Environmental Plan. Accessed August 24, 2014:

<http://www.cedar.at/data/nup/nup-english/index.html>

picture becomes way messier when looking at the practices of researchers. Actors involved in projects funded by proVISION, however, **translate** this imaginary in multiple ways: they draw on a broad variety of different imaginative resources. Thus, what on a program level appears as a somewhat coherent imagination becomes a messy assemblage of different ideas and futures when talking to researchers and their partners from 'social reality', attending project meetings and when looking at project proposals, websites and reports.

This is nicely visible in the sequence above. The interesting thing here is that the researchers frame transdisciplinarity as an *additional requirement*. Even when the moderator argues that transdisciplinarity was a *core idea* of the whole program they insist on talking about different but equally important requirements that need to be *ticked off*. Framing transdisciplinary knowledge production as an additional requirement and talking about a "transdisciplinary element" (P03_m01: 1246) expresses a profoundly different idea than trying to establish an alternative altogether. The idea of an addition assumes that there is already an entity that merely needs to be complemented; something already existing or established. Thus, researchers tend to translate transdisciplinarity as an add-on to conventional ways of producing knowledge. Put into pejorative terms they would also talk about transdisciplinarity as a "label" (P04_m06: 389), something that is attached as a denominator on the outside, but does not actually match the thing it is attached to. Another instance that relates to this idea of transdisciplinarity as an add-on is the practice of weighting and sequencing different tasks. One example is the simultaneous requirement of producing scientifically excellent outputs and applicable products for the 'Praxis'. Researchers deal with the tension arising from demands like these in defining different work-packages and assigning different groups of actors to these tasks. In this way, traditional boundaries are reproduced and transdisciplinarity as a research principle is constantly in danger of becoming a tick box amongst others instead of an alternative 'science culture'.

This means that in situations where they are not sure how to make sense of particular demands actors involved in proVISION-funded projects deliberately draw on imaginative resources they know and feel comfortable with. They refer to what Rheinberger calls the "ageworn framework that has become so deeply entrenched in our minds" (1997: 18). The practices of translation I described, however, are not to be confused with deliberate acts of contesting the science-society relations envisioned by

proVISION. Much rather, actors draw on imaginative resources they are familiar with and which are institutionally more stabilized in order to make sense of particular requirements articulated within the program documents.

In this way, while proVISION clearly imagines transdisciplinarity as an alternative to traditional modes of knowledge production, researchers and their partners draw on a broad range of heterogeneous imaginative resources to create particular assemblages; their very own 'transdisciplinarity'. For the most part researchers did not question the imaginative resources they draw on for making sense of their daily research practices. However, when actors attempted to set up transdisciplinary collaborations 'by the book' and deliberately avoided more established imaginations of doing science they struggled hard with the tensions that arose. This became especially visible when students in a doctoral program explicitly focused on transdisciplinarity. Engaged in this thematically focused program they were expected to become transdisciplinary researchers. Thus, transdisciplinarity in this case was indeed a core element and could not be framed as an element among others. This means that these early stage researchers had to engage in the alternative imaginary of doing science and were not able to articulate their own assemblages. In the interviews they talked a lot about their problems aligning those different imaginaries: on the one hand to produce scientifically excellent science, while on the other engaging with PPs in intense and preferably long-term partnerships.

Here we can clearly see how imagining is not an act of an individual mind, but of how our collectively shared ideas about attainable futures solidified through institutional configurations like universities and NGOs with their ideas about who is an legitimate epistemic actor, in peer review procedures of particular journals or in program committees is co-constitutive with practices of knowledge production. It is also embodied in actors who have clear ideas about what their position in a research project is and what can be expected of them. This holds true for both researchers and their PPs from social reality. This 'ageworn framework' of science-society relations that Rheinberger refers to or what I call socio-scientific imaginary is stabilized in institutionally grounded ideas about what counts as scientific achievement, how scientific performance and the quality of scientific knowledge can be measured or assessed, what are publishable scientific results and so on and so forth. However, these collectively held ideas are by no means bound to particular institutions. They are deeply

entrenched in the ways science is conducted and evaluated and thus also extremely stable.

What can we take from this? What does it mean to establish a program like proVISION and where does it reach its limits in our contemporary system of science and research? The attempt to assemble and stabilize an alternative socio-scientific imaginary – this should have become clear – is a challenging task and thus difficult to achieve by (a succession of) single research funding schemes or research strategies. No matter how ambitious and enthusiastic they might be, they often remain in the mode of top-down initiatives. This is because, as Jasanoff rightfully points out, “[m]ultiple imaginaries can coexist within a society in friction or in productive dialectical relationship.” (Jasanoff, forthcoming) The socio-scientific imaginary in the making I described based on the case of proVISION finds itself facing a very powerful imaginary of science-society relations that is deeply entrenched in our society. In this sense, proVISION can only be regarded as one step in the process of assembling and stabilizing such a shared socio-scientific imaginary that is distinct from more traditional ideas of science and its place in and its relation to society. The program coordinators seem to have underestimated the stability of already established socio-scientific imaginaries or maybe even the importance of the imaginative resources through which researchers organize and make sense of their day-to-day practices. In this sense, institutional frameworks are a necessary precondition for establishing a particular mode of knowledge production. They do not, however, suffice unless they relate to commonly shared and institutionally stabilized socio-scientific imaginaries.

I think it is also worthwhile to briefly consider the broader implications of this case study. Alternative visions of science-society relations are not only visible in Austrian research policy, but also gain momentum in current policy discourse on an EU-level. Notions like ‘Responsible Research and Innovation’²⁵¹ or calls for an approach to science and research that highlights a ‘logic of care’ (Felt, Barben, et al., 2013) point to different ideas of how to integrate science and society. Such ideas also feature prominently in the current EU Framework Programme for Research and Innovation ‘Horizon 2020’ under the heading ‘Science with and for Society’²⁵². What can be learned from my research on

²⁵¹ See e.g. the ‘Science in Society portal’. Accessed August 26, 2014.

<http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1401>

²⁵² Horizon 2020 website. Accessed August 26, 2014.

<http://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society>

transdisciplinary sustainability research in Austria is that one needs to be attentive to the fact that such alternative envisionings of science-society relations are being assembled against the background of powerful other collectively held imaginations of doing research that are institutionally stabilized in research policy, but also in contemporary ideas of assessing the quality of scientific knowledge and in ideas of excellence and relevance. Navigating these different imaginaries proved to be a difficult task for the actors engaged in proVISION who struggled to carve out spaces for collaboration and engagement of science and society. Traditional boundaries tended to be stabilized and long-term relations between science and society proved hard to maintain. If we take claims to position science in society or to do research for society seriously and – coming back to Nick Cave’s ‘Higgs Boson Blues’ one last time – if we want a more heterogeneous set of actors to care for our future it is crucial to be sensitive to the different imaginaries woven into scientific and societal orderings and to create spaces in which multiple and diverse science-society relations can co-exist.

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Annexes

Annex I: Illustrations

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Abstracts

English Abstract

Transdisciplinarity as a way of producing knowledge gained some momentum over the last years and is increasingly referred to in research programs as well as by funding agencies. Related to that there is an ongoing debate about the chances and obstacles concerning this particular way of producing knowledge. The notion of transdisciplinarity is used especially in the area of sustainability research and refers to the idea that through the integration of extra-scientific actors into the process of knowledge production the growing complexity of problems in contexts where facts tend to become more and more uncertain (as e.g. climate change and other environmental problems) can be treated more accurately.

Visions of particular threats as well as possibilities that await us in 'the future' lie at the very core of narratives in sustainability research. Such narrations include future consequences of climate change or a potential scarcity of resources and how we can anticipate such problems and get prepared. Thus, it is not surprising that there is an emphasis on producing knowledge about these possible future developments. For producing anticipatory knowledge, a broad array of methods is applied. Calculations of models and simulations is equally common as producing multiple futures in so-called scenario workshops. Imaginations of the future of our society and its relation to science are thus crucial in shaping the discourse about transdisciplinary sustainability research as well as the choice of methods and day-to-day research practices.

In my PhD-thesis I will empirically analyze practices of transdisciplinary sustainability research and especially look at 'futuring' practices through which imaginations of futures are constructed, stabilized, rehearsed and contested. Thereby, I assume that futuring plays an important role in establishing transdisciplinarity as a mode of knowledge production and thus for the co-production of science and society.

Three analytical dimensions will be considered: (1) imaginations of societal futures that shall be achieved or prevented by employing transdisciplinary research, (2) imaginations of the future of transdisciplinarity itself as a mode of knowledge production and (3) how imaginations of futures are translated in practices of futuring.

In doing, so I look at different dimensions or materializations of knowledge production such as research programs and debates within the scientific community as well as the working practices of researchers (e.g. in project meetings) and researcher's narrative reconstruction of these practices (interviews and focus group discussions).

With my PhD-project I aim to contribute to an empirically grounded understanding of how anticipatory knowledge is produced and circulated at the interface of science, politics and different publics. In further consequence, I'd like to stimulate a critical reflection of the implicit assumptions guiding the production and thus also the possibilities and limits of circulating and using 'knowledge about the future'. In doing so, I aim to direct attention to the central role of 'the future' in ongoing scientific and societal re-orderings.

German Abstract

Transdisziplinarität als eine Form der Wissensproduktion erlangte in den letzten Jahrzehnten zunehmende Bedeutung in unterschiedlichen Forschungsprogrammen. Darüber hinaus gibt es auch eine anhaltende akademische Debatte zu Änderungen in der Art und Weise wie 'wissenschaftliches' Wissen produziert wird und produziert werden soll. Der Begriff 'Transdisziplinarität' wird dabei vorwiegend im Bereich der Nachhaltigkeitsforschung verwendet und bezeichnet die Idee, das sogenannte 'außerwissenschaftliche Akteure' in den Prozess der Wissensproduktion einbezogen werden müssen. Auf diese Weise, so das Argument, könne der zunehmenden Komplexität von Problemstellungen in Kontexten erhöhter Unsicherheit des Wissens (z.B. Klimawandel) Rechnung getragen werden.

Bedrohungsszenarien wie auch Möglichkeiten die uns 'in der Zukunft' erwarten befinden sich im Zentrum von Narrationen in der Nachhaltigkeitsforschung. Solche Narrationen beinhalten mögliche zukünftige Konsequenzen des Klimawandels oder die Knappheit von Ressourcen und wie wir derartige Probleme antizipieren und uns auf sie vorbereiten können. Die zunehmende Bedeutung von Wissen über potentielle zukünftige Entwicklungen kaum überraschend. Für die Erzeugung derartigen antizipatorischen Wissens steht eine große Anzahl unterschiedlicher Methoden bereit. Modellkalkulationen und verschiedene Formen der Szenarioentwicklung sind in der Nachhaltigkeitsforschung weit verbreitet. Kollektive Vorstellungen der Zukunft unsere Gesellschaft und ihrer Verbindung zu Wissenschaft werden auf diese Weise zentrale Elemente im Diskurs über transdisziplinäre Nachhaltigkeitsforschung wie ich in der Methodenwahl in der Forschungspraxis.

Meine Dissertation stellt eine empirische Untersuchung transdisziplinärer Nachhaltigkeitsforschung mit einem speziellen Fokus auf 'futuring'-Praxen von der involvierten Akteure dar. 'Futuring' verstehe ich dabei als eine Praxis, in der kollektive Vorstellungen von Zukünften konstruiert, stabilisiert, eingeübt, aber auch angefochten werden. 'Futuring', so die forschungsleitende theoretische Annahme, spielt eine wichtige Rolle in der Etablierung von Transdisziplinarität als einen Modus von Wissensproduktion und damit auch für die Ko-Produktion von Wissenschaft und Gesellschaft.

Drei unterschiedliche analytische Ebenen werden untersucht: (1) Vorstellungen gesellschaftlicher Zukünfte die mittels transdisziplinärer Forschung aktualisiert oder vermieden werden sollen, (2) Vorstellungen über die Zukunft von Transdisziplinarität als Form der Wissensproduktion und (3) die Übersetzung dieser Vorstellungen in 'futuring'-Praxen.

Die Fallstudie für meine Dissertation ist das österreichische Forschungsförderprogramm proVISION und ein Sample der in diesem Programm geförderten Projekte. Analysiert werden unterschiedliche Materialien wie Programmdokumente und Spuren der Debatte innerhalb der wissenschaftlichen Gemeinschaft. Darüber hinaus beziehe ich mich auf die Forschungspraxis von in den Projekten involvierten Akteur*innen (Beobachtungen von Teammeetings und öffentlichen Veranstaltungen) und auf ex-post Rekonstruktionen der Projektpraxis (narrative Interviews und Fokusgruppen).

Mit meiner Dissertation möchte ich zu einem empirisch fundierten Verständnis der Produktion und Zirkulation von antizipatorischen Wissen im Spannungsfeld von Wissenschaft, Politik und diversen Öffentlichkeiten. In weitere Konsequenz möchte ich mit dieser Arbeit eine kritische Diskussion der impliziten Annahmen in der Produktion sowie der Möglichkeiten und Grenzen in der Zirkulation und Verwendung von 'Wissen über die Zukunft' anregen. Damit möchte ich außerdem Aufmerksamkeit auf die Rolle von 'Zukunft' in der fortwährenden Aushandlung wissenschaftlicher und gesellschaftlicher Ordnungen lenken.

Curriculum Vitae



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Education

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