Tensions in Transdisciplinary Research

A study of a climate research group

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Abstract
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In a time of sustainability predicaments and 'grand challenges', transdisciplinarity has been put forward as an approach through which researchers can engage with societal transformation for a better world. This study examines tensions that arise in the on-the-ground efforts of researchers to establish and manage a transdisciplinary research group within a Norwegian university. Tensions have been of interest in both studies of science and studies of organizations, pointing to ways in which tensions between interrelated, divergent demands influence work of scientific knowledge production and organizational life. Transdisciplinary research groups, centers and institutes are proliferating, yet studies of the tensions and challenges they face at the micro-level remain nascent. Drawing on intermittent fieldwork over a two-year period, this dissertation analyses a local case in which climate and energy researchers took a transdisciplinary approach in establishing a "societally engaged" research group and research center in a social sciences department. Key questions are: which tensions do they encounter? How do they respond to them?

The study makes use of concepts on tensions and paradox developed in organization and management studies to inform discussions on challenges in inter- and trans-disciplinary research in practice. The case study identifies, illustrates, and analyses several tensions salient for researchers: between the need for both consolidation and interrelation; between the need to grow and formalise the group while also maintaining its closeness and values; between ideas of researchers' relationship to societal change as both distant and engaged; and between the need to maintain academic autonomy while providing usefulness to non-academic actors. Various responses to these tensions are identified and explored, including defending against, and actively embracing them. The findings allow for rethinking transdiscipclinary research in practice, with implications for research managers, practitioners, and policy makers.

Keywords: Transdisciplinary Research, Tension, Paradox, Organization, Science Work, Sustainability, Research Groups

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HELP

is strangely something we want to do without, as if the very idea disturbs and blurs the boundaries of our individual endeavours, as if we cannot face how much we need in order to go on. We are born with an absolute necessity for help, grow well only with a continuous succession of extended hands, and as adults depend upon others for our further successes and possibilities in life even as competent individuals. Even the most solitary writer needs a reader, the most Machiavellian mobster a trusted lieutenant, the most independent candidate a voter.

Not only does the need for help never leave us alone, but we must apprentice ourselves to its different, necessary forms at each particular threshold of our lives. At every stage we are dependent on our ability to ask for specific forms of help at very specific times and in very specific ways. […] The need for help, our greatest vulnerability, may be the very door through which we must pass in order to open the next horizon of our lives.

- David Whyte (2021)

There are many people who I would like to thank for the help they have offered in various forms throughout the long process of completing this work. As the above quote points out, we all rely on building an ability of looking for and finding help of the right kind at the right moments. In a good learning environment, others can give that help to us even before we know what we need to ask for. They have the patience to accept that it is only in retrospect we will understand what kind of help we needed at the time.

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Bergshamra, Stockholm, April 2023

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Launch

The unusually bright October sunlight gives the impression of a summer morning as people accumulate in the foyer of the Media Cluster building. We've been moving around the city for days, shifting between the various university and privately owned venues of Fossil Free Futures, an academic conference about getting to a society beyond fossil fuels. It's now time for the final event on the schedule, an unusual one for a conference–the launch of a new research center.

The conference was Organized by the Climate Laboratory, a small group that two years ago initiated the first dedicated research on climate & energy in the social sciences faculty of Norwegian U. With this event we're about to witness, the Climate Center will be officially launched, and the Climate Laboratory will be absorbed into it.

I spent each morning before the conference walking through the rain, trekking from our accommodation near the top of the mountain which frames the city along its northern edge, to an art and literature venue in the center of town where the conference was based. It was the same venue to which, a few months earlier, the Climate Laboratory invited 100 people from government, industry and civil society for a 'Climathon', a group dialogue about policy and practical action on climate change. The trip down the mountain each morning took about half an hour, my casual leather shoes getting soaked through within 10 minutes despite my umbrella. I spent nearly the entire conference with wet feet.

A few of us visiting from Sweden were staying high on the mountainside with a PhD Fellow at the Climate Laboratory. His home, like many others in Norway, is built on the rock left behind by receding glaciers. The same mountain's rock faces are visible from all the windows of the new Climate Center's offices in the social sciences faculty building. Earlier in the day, as I walked by the faculty on the way to the launch, it was impossible to miss the view of the cold edge of the mountain ending and falling abruptly in the brilliant early-morning light.

Here, as in much of Norway, the thin layer of human affairs plays out on top of a striking geological base that moves imperceptibly in its own, stretched-out time. A short distance out in the Norwegian Sea, these layers meet. Just beyond the horizon sit some of the oil rigs that have made Norway richer per capita than any other country.

The venue for today's launch is a 'knowledge cluster'. A self-described "cradle of innovation and global knowledge hub within media technology", inside it is a buzzing mixture of commercial media companies, news organizations, and Norwegian U's Department of Information and Media.

The building's steel, glass and dark-stone construction opens out into a wide central foyer with white marble floors. The interior space continues up through the center of the building, breaking every one of the buildings' floors and ending in a glass-panelled roof. Visible through interior glass walls, students, journalists and office workers on various floors busy themselves in offices and tech-heavy media rooms. From this distance it's hard to tell who is a student or teacher, media researcher or client, journalist or advertising manager–where the university ends and the rest begins.

At ground level, three oversized stone tiers offer the seating for a small amphitheatre in the center of the foyer where people are gathering. Professors, civil society advocates, various researchers, politicians, students, administrators, oil executives, energy industry representatives, members of civil society organizations and assorted members of the public. On its surface this launch event is a performative ritual for a common phenomenon at universities–formalising an organizational home for a new research theme. However, as the launch day moves on, tensions emerge.

As the event proceeds and a series of speakers takes the floor, it's not long before their messages to the audience diverge, even contradict each other, offering a plurality of viewpoints. They include the dean of the social science and humanities faculty, the rector of the university, the Secretary for the Ministry of Climate and Environment, two visiting climate professors from prominent UK and German universities, a Climate Laboratory affiliated researcher who is also a local politician, and the Director of the Climate Center. The final panel discussion features the head of innovation from the State-owned oil company Equinor, the head of a wind energy company, and a rep. from a public-private organization focused on green climate projects.

They offer diagnoses on the future of climate and society. Visions for what the future of climate & energy policy and practice would and should look like. Research programs of international quality. According to this varied group, climate and energy are technical challenges, questions of behaviour change,

a matter of carbon budgets and sticking to them, a task of global governance, a question of business cases and innovation, a matter of benchmarking and transparency, a grand mission, and a deep structural problem. And in all this, university researchers were implicated. They needed to provide knowledge, value, solutions, in the hope of transforming society.

The speakers list off their wishes, dreams and assessments. The climate scientists show dire climate scenarios with sharply bending curves, shrinking possibilities and growing necessitates for rapid reduction of CO2 emissions to the atmosphere. For the secretary of the Environmental Ministry, climate change offers great technical challenges and opportunities for growth. The panel discussion of 'key challenges for the rapid transformation of society' and 'what is needed from researchers' diverges from the professors' messages, moving into technology development, benchmarking, industry outlooks.

Rounding off the talks, the Climate Center' new Director, also a member of the Climate Laboratory research group, speaks about what the center aspires to. Produce excellent research in internationally leading publications, and actionable knowledge to help solve the climate crisis. Expand upon its base in Geography and its focus on climate and energy in cities, to work across other disciplines and themes. It will be critical and independent, yet work closely with stakeholders. Contribute to the transformation of society to meet the climate challenge.

In the audience, the Climate Laboratory group and some of their close colleagues that have stayed for the extra day, join the applause as the Director finishes his keynote, and the program is done. Speaking with them later I would learn the event had not gone quite as expected. This was a very different discussion to the one we'd been having within the confines of the Fossil Free Futures conference, which aspired to offer radical rethinking of climate and energy futures. The futures on offer in the panel discussion hardly looked different to today, let alone beyond fossil fuel societies. Carbon capture and storage? Benchmarking? Surely these were not what critical, socially impactful researchers need to produce? And the speakers and panel were all men, a few members of the group worried.

There had been little space for debate in this public forum despite it being organized by new members of their center. The purpose, meaning and direction of their work and their future center was already being contested. And there was no way to respond within the design of the formal proceedings.

The speaking program over, a carefully-arranged buffet lunch waits in a reserved section of the building's open-space restaurant area nearby. To the embarrassment of the carbon-conscious Climate Laboratory group, it largely

consists of meat-based dishes. Amidst a low buzz of conversation, some guests have already started taking food, keynote speakers among them. The Climate Laboratory members hesitate, then go in, selectively filling their plates as the mingling gets underway.

Chapter 1
Introduction

This study centers on a small group; members of a new climate research center afloat in the vast ocean of academic knowledge production that spans the globe. They are not those scientists at the top of the global hierarchy of scientific prestige and commercial success that are often the focus of sociological studies of science. They ride electric bikes to work and bring their lunch with them. But they are in a hot zone for research funding and attention at the time I write this, two decades into the twentieth century, at a geological moment just before it is likely too late to mitigate the dangerous effects of human-induced climate change (IPCC, 2018a).

They study, think about, and involve themselves in research and education on climate change and energy and the links between these. But they do not match the stereotypical image of scientists that inhabit the public imaginary of 'climate science'–those mostly natural and technical scientists creating the climate models that are the backbone of Intergovernmental Panel on Climate Change (IPPC) reports, or being photographed against a blue Arctic sky drilling ice cores. Instead, they are interested in the human, the social and the interlinkages between the environment, policy and politics. Many of this group's research projects focus on cities and landscapes, owing to the Geography backgrounds of the two initiators and most of the initial research group they assembled. Thus, while they are climate scientists and energy researchers, they are distinct from and perhaps less institutionally established than those scientists in other parts of the research system and indeed their own university, who fit the 'climate scientist' stereotype. In this thesis, we follow their journey in developing their research group from an idea, later a research center, and moving towards what they imagine comes next.

They, like many others in today's higher education system, are driven at least in part by the idea that their research should be societally valuable, even help to solve great predicaments of social and ecological sustainability–what some have labelled 'grand challenges'(George et al., 2016; Kuhlmann and Rip,

2018). Figuring out how to do that in practice is difficult. The bringing together of research and society is hardly a straightforward, linear enterprise and there is no consensus on how best to achieve the complex and multi-level task of aligning the direction of academic/scientific research with the needs and problems salient in today's society. This is particularly so on sustainability issues as urgent as human-induced climate change and the energy systems with which it is intertwined–the set of issues with which the people we meet in this thesis are professionally occupied. Yet ultimately it falls in large part to research managers and research practitioners to make sense of and make progress on this task from where they are, in local settings. One way of achieving this that has been put forward is *transdisciplinary research*, that seeks to integrate knowledge across disciplines and academic and non-academic actors from various sectors. The opening vignette that tells the story of the launch event for the Climate Center shows researchers with ambitions for societal enagement through transdisciplinary research meeting with the realities of practice. As the landscape of divergent demands, expectations and values upon them expands, the challenges of transdisciplinary research rise to the surface.

Transdisciplinary research

The first point of departure for this study is looking empirically at transdisciplinary research in practice. Like many emerging groups and centres today, the case under focus in this study has transdisciplinary ambitions, recruiting from staff and projects from across knowledge disciplines, and seeking 'partnerships' with non-academic actors. They seek to produce "actionable knowledge" and engage in "societal transformation" for sustainability. They aim to make their research relevant and useful to particular users of it, making efforts to work directly with people from multiple disciplines and non-academics while aiming to contribute to fundamental change in society. Such research is often described as transdisciplinary.

Transdisciplinary research integrates actors and knowledge both from across scientific/academic disciplines and beyond the academy in various other domains (Nowotny, Scott and Gibbons, 2001; Jahn, Bergmann and Keil, 2012). Research that is transdisciplinary and sustainability-oriented has become more common across university environments in the last few decades, often done alongside establishing new groups, centers and institutes that reach out beyond the university in their missions, research projects, epistemic aims and practices. In particular, groups that do sustainability-oriented research can take a particularly active stance in wanting to bring about the transformation of societies. In addition, the trend, both in scholarship (Lövbrand et al., 2015; Sörlin, 2018; Wright et al., 2018) and in research and innovation policy (e.g. Research Council of Norway, 2011; Norwegian Ministry for Education and Research, 2014) is towards bringing more fields (beyond the traditionally

dominant natural and engineering sciences) such as social sciences and humanities onboard in the push to make a societal contribution towards sustainability. Thus, they are recruited into transdisciplinary, societally engaged research projects.

Yet, the promise of transdisciplinary research has proved hard to realise. I agree with Schkowitz's (2020) assessment of recent empirical studies on transdisciplinarity: they have shown that the "opening up of research to society seems to remain limited to either the level of aims and claims, or to elaborating narrow problems" (p218). In line with this, authors such as Hackett and Rhoten (2009), Polk (2014), Felt et al. (2016), and Müller and Kaltenbrunner (2019) have shown that inter- and trans-disciplinary research in practice needs scrutiny. Our normative ideas and models of it may not capture the reality of transdisciplinarity in science work. Thus, we should look at how it is put into practice locally, and *which* and *how* tensions and challenges are encountered and responded to by researchers in their efforts to do so (for similar approaches see Turner et al., 2015; Müller and Kaltenbrunner, 2019; Schikowitz, 2020).

Transdisciplinary research is partly an epistemic endeavour, with different purposes (Lotrecchiano and Misra, 2018), ontological assumptions (Funtowicz and Ravetz, 1993) and philosophical underpinnings (Nicolescu, 2002; Max-Neef, 2005) to disciplinary research. It is seen as an approach in service of achieving certain desirable ends that are important for the relation of science and society (Nowotny et al, 1994; 2001); addressing social and ecological sustainability problems (Russell, Wickson and Carew, 2008; Jahn, Bergmann and Keil, 2012; Lawrence et al., 2022); and thus needed in order to support the transition of society towards sustainability (Oliver et al 2021). It is a project that aims at societal engagement of research (Hadorn et al., 2007), but this means it is also a question of (re)organizing to allow for that. It is claimed we need more generally to 'improve our knowledge architecture' by reorganizing at universities to support societal transformation in the direction of sustainability, and one tool for this project is transdisciplinary research (Klein et al., 2001; Maasen and Lieven, 2006; Schneidewind et al., 2016; Fazey et al., 2020; Lawrence et al., 2022). However, questions remain about what at the micro-scale this actually entails for research practitioners and managers, and what challenges and tensions they encounter.

That makes for an important area of inquiry for several reasons. First, implementing transdisciplinary research it is a process that is more and more common in university contexts, and is increasingly incentivised by research councils and university management. Better understanding transdisciplinary research in practice is thus relevant to scholars interested in the organizations of science and to research practitioners engaging in it. Second, in

transdisciplinary research a lot of responsibility is placed on individual researchers and groups to make the research system accountable to societal needs and bring about sustainability (Maasen & Lieven, 2006). Further, a lot is (apparently) riding on the success or failure of transdisciplinary research to produce outcomes commensurate with the severity of the problems it is said to address. Thus, the efforts of researchers at this level are important to study in order to gain insight into the *how* of transdisciplinary research in practice.

Tensions in the organization of research

A second point of departure for the study is that being sensitive to organizational aspects of transdisciplinary sustainability-oriented research can offer valuable insight, both into understanding such research at the micro-level and to research managers and practitioners in higher education contexts seeking to societally engage through research. The growing population of transdisciplinary research groups, centers and institutes that aim to engage in societal transformation towards sustainability can be productively seen as *organizational* contexts in which the management of contradictory and paradoxical tensions is central to work. Organizations are sites where *tensions* are found, as organizations are rife with competing demands, divergent goals and values, and the paradoxes and contradictions generated amongst these. In the organization and management literature this is well accepted, and a rich literature has developed to explain tensions and their management. In this literature, tensions are viewed as push-pull forces generated by competing demands (Gaim et al., 2018) that draw actors in divergent directions and can be felt acutely (Clegg, da Cunha and e Cunha, 2002).

Some previous studies have utilised the concept of tensions in studying the work of research. This literature has shown that the work of scientific and academic knowledge production across the disciplines found in universities (hereafter referred to simply as 'research') is characterized by tensions, divergent forces generated by contradictory elements that exist simultaneously. At the macro level, Kuhn, for example, saw convergence and divergence as inherent to science itself; embedded in the very fabric of scientific knowledge production (Kuhn, 1996/1962). Hackett (2005) looked at the level of research groups and showed us that managing and working in research is a tension-filled endeavour, as researchers face the ambiguities, competing demands, and paradoxes of managing risk, pursuing identity and seeking knowledge.

More recently, some studies have looked at inter- and transdisciplinary research contexts. Turner et al (2015) identified epistemic, structural and affective tensions in interdisciplinary research. Others have looked at salient tensions in sustainability research that is interdisciplinary (e.g. Cairns, Hielscher and Light, 2020) and/or engage with local environmental politics and policy (e.g. Müller and Kaltenbrunner, 2019). Some studies have also

looked at tensions in sustainability-oriented and transdisciplinary research; for example, Parker and Crona's (2012) in-depth study of a case of a university-based, environmental research center that bridged science/policy, and the navigation of tensions central to its work. Another example is Turner et al.'s (2015) study of structural, epistemic and affective tensions in "environment-society" research centers. Finally, Ashby and co-authors (2019) analysed tensions and paradox encountered by scientists in a government-funded science organization with a mandate combining commercial, public and sustainability goals.

However, studies of research settings, and even less so transdisciplinary research have not often drawn on the literature on tensions and paradox that has developed over some time in the organization and management field literature (e.g. Quinn and Cameron, 1988; Smith and Berg, 1997; Clegg, da Cunha and e Cunha, 2002; Smith and Lewis, 2011). Some notable exceptions are (Zabusky and Barley, 1997; Turner et al., 2015; Bednarek, Paroutis and Sillince, 2017; Ashby, Riad and Davenport, 2019). In this study, I join these latter authors by drawing on conceptual tools from this literature in studying tensions in research settings. The present study aims to expand and enrich knowledge of the role tensions play in the work of scientific/academic research, by identifying and analysing tensions and exploring different types of responses present in transdisciplinary sustainability-oriented research contexts specifically. The present study identifies four local tensions and multiple defensive and active responses to them. These findings extend existing literature on tensions in science, and specifically in transdisciplinary research, by both identifying new tensions, and by identifying types of responses that play out in practice. Such findings offer insight to scholars of, and research managers and practitioners within, transdisciplinary, sustainability-oriented research contexts.

Further, we know little about tensions in nascent transdisciplinary research groups/organizations that are emerging. The literature referred to above tends to look at well-established organizations. Yet from an empirical standpoint little is known about tensions in transdisciplinary research organizations go through the process of emerging from bottom-up efforts. This is a concerning gap in knowledge because moving into societally engaged sustainability research is a growing trend, and much (according to policy makers at least) is riding on their successful organization and effective management. Building on the existing literature, then, a specific key area of inquiry for this thesis is looking into the tensions experienced by researchers in their efforts to establish an emerging transdisciplinary, sustainability-oriented research group and center. The in-depth look at a nascent, early-stage research organization contrasts to other studies that look at larger and/or well-developed organizations, contrasting with other studies in terms of scale (size of group) and temporality

(how developed it is). This study responds to the call to look into the establishment stages of transdisciplinary, sustainability-oriented research groups and projects, such as from Thompson et al., (2017) who advocate studying "fledgling" centers and their members, and Soini et al. (2018) who call for examining the establishment journeys of such research organizations' local university settings

The study

In seeking to address the above-mentioned issues and deficits, I have looked at an ongoing local change process, in which the group of researchers we have been introduced to established a transdisciplinary research organization. The thesis focuses on a local setting at a large Norwegian research university, looking at tensions encountered by actors, and how they are responded to. The thesis traces the story of the development of a climate research group and then a university center. The story offered in this thesis begins with a meeting between two researchers who wanted to make their research more "societally relevant" and engage with societal problems beyond the walls of their university department, and ends as I left the field, soon after their newly-established university center made an attempt to expand dramatically. Looking at the trajectory of this organization undergoing change allows focusing on moments and events within it, examining which tensions were salient, the changing conditions in which they arose, and some responses to them. In this thesis I inquire into the following questions

> *Which tensions are encountered by a research group in initiating and carrying out transdisciplinary sustainability research? How do members respond to these tensions?*

The in-depth study of a single case draws on fieldwork that includes materials gathered from interviews, observations, member-authored texts and official documents, taken intermittently over a two-year period. The analysis identifies specific tensions that arise locally in this transdisciplinary, sustainability-oriented research setting, and the ways in which people respond to them.

The empirical study itself thus approaches *transdisciplinary research* as an empirical phenomenon in three ways: 1) looking specifically at tensions in a research organization that engages with society through transdisciplinary research; an attempt at bringing-together university research and societal challenges, 2) by offering a rich-case study of a nascent (early stage) climate research organization, allowing a focus on a local shift towards transdisciplinary research, and 3) using a richer conceptual view of tensions than has commonly been considered in previous studies, that not only sees tensions as present and having an impact on outcomes, but includes their becoming salient in changing conditions and being responded to in various ways.

The study develops findings that offer contributions and implications in several areas. The findings offer insight into transdisciplinary research in practice, and allow making some modest suggestions for nuancing specific concepts in the tensions and paradox literature. They also offer empirical insights into the life of early, establishment phase research groups, pointing to findings showing tensions and responses that may not be visible in well-established groups. Further, they add to the discussion on tensions in research groups, indicating that 'societally engaged' groups may face different tensions relative to those more focused on disciplinary engagements. Finally, I suggest some theoretical reframings of transdisciplinary research that may be useful for scholars and practitioners.

1.1 Thesis overview

The structure and contents of the thesis from here on in are outlined below.

Chapter 2 delineates the theoretical frame for the study, using the literature the thesis draws on and aims to be in dialogue with. Key literature discussed is on transdisciplinary research, sustainability-oriented research contexts, outlining a need to extend our understanding of this phenomenon. In addition, literature on the use of tensions as an analytical concept in studies of similar research contexts–outlining the phenomenon of study, how tensions are conceptualised and what has been found. It outlines how the study draws on the literature on tensions in the organizational literature, specifically how it draws on some conceptual "tools" from this literature.

Chapter 3 outlines the study's methodology. It covers decisions about the research approach and how these relate to the overall aims of the inquiry and research questions. It also covers the gathering of the empirical materials in the field, the subsequent process of writing and analysis at the desk, and some reflexive, reflective discussion of the researchers' background and moments in fieldwork.

Chapter 4 gives a descriptive introduction to the setting and the group under focus. It aims to give the reader bearings in terms of descriptive factual information, and how the organization describes and promotes itself. This shows central, animating ideas for the group, its purpose and thematics, its structural position in academia, and the kind of epistemic and practical work it does. It also suggests that there are multiple aspects to the setting and the group that may not be visible at first glance.

Chapter 5 traces the establishment of the center through the idea phase, to the formation of a research group, to the eventual addition of a research center. Through this process we look at changes that occurred over time and some of the tensions people encountered along the way. This allows us a look at a research center as a place that has a history that goes through changes over time. The processual narrative shows changing organizational conditions and members' perceptions of and sense-making about these. It provides an empirical underpinning for the analysis that identifies some key tensions that become salient for members, and how they are managed in this transdisciplinary sustainability-oriented research context. This establishment story is also offered to show that there was a transition from a standard disciplinary department to a transdisciplinary center with a sustainability-oriented focus and engagement in activities on climate and energy issues outside the academy.

Chapter 6 looks more closely at the center, its central research group, and the work it does. This chapter gives a description of conditions, ideas and practices at the center, which are later drawn on in the analysis and discussion. This chapter draws on interviews with members in the field setting, observation notes, and texts co-written by members, and official documents. The chapter also aims to give an impression of the place, the group/organization and ethos of its members to the reader.

Chapter 7 contains analysis of the field material, relating to the theoretical frame, informed and motivated by the research question. Taking the various empirical materials gathered and teasing apart elements of it, the analysis develops findings that show conditions that led to tensions arising, analyses specific tensions arising locally and that are visible in the empirical material at different levels, and explores various ways in which people respond to them.

Chapter 8 offers a discussion of the findings and the overall study. This covers findings from the analysis and how they relate to literature. It also discusses the how the use of concepts from the organizational literature on tensions and paradox offer value in looking at transdisciplinary research contexts in general and this one in particular. This includes extending our understanding of the organizational and management aspects of transdisciplinary research.

Chapter 9 offers conclusions, implications of the study, and ideas for future research.

Chapter 2
Theoretical Frame: Tensions in transdisciplinary research

2.1 Chapter overview

This chapter delineates the theoretical background and conceptual frame for the study. First, the chapter points to recent calls for organization and management studies to turn towards phenomena of interest to sustainability challenges. Second, it covers transdisciplinary research and its relation to sustainability problems and grand challenges. Third, the chapter presents and considers previous literature on tensions in research and more specifically tensions in inter- and transdisciplinary research. Fourth, the ways in which the study draws on the literature on tensions in the organizational and management field is outlined. And specifically, how the study draws on some conceptual tools from this literature to give some analytical traction. Finally, a short summary synthesis is provided.

2.2 Turning towards sustainability in organization and management scholarship

There have been calls within organization and management studies for scholars to work on areas relevant to social and ecological sustainability. George et al. (2016) argue that broadly, scholarship should take up this focus because management can be turned towards addressing grand challenges, and that grand challenges impact organizations and institutions. For them, Grand Challenges (which they abbreviate to GCs), for which they use the UN sustainable development goals as an example,

> by their very nature, require coordinated and sustained effort from multiple and diverse stakeholders toward a clearly articulated problem or goal. Solutions to

> GCs typically involve changes in individual and societal behaviours, changes to how actions are organized and implemented, and progress in technologies and tools to solve these problems. Thus, the tackling of GCs could be fundamentally characterized as a managerial (organizational) and scientific problem. Natural and physical scientists and engineers have readily adopted such a lens and GC language in their definition of global problems, with social scientists recently joining this coordinated effort. (George et al., 2016, p. 881)

More specifically, George et al. (2016) identify many areas in which organization and management scholarship can be of use developing knowledge to help 'remove barriers' to meeting grand challenges. This includes the study of 'organizational constraints', 'institutional environments', and 'coordinating architectures', all of which are crucial in addressing grand challenges and which are relevant in studying the research and higher education system.

Others have suggested that we are moving into an era in which organization and management literature should (if not will) turn urgently towards considering how best to Organize in the Anthropocene (Wright et al., 2018), the geological era in which human activity is the driving force of environmental change on the planet (Steffen et al., 2018). Taking a more urgent tone, Wright et al. (2018) argue that the Anthropocene

> is the crucial issue for organizational scholars to engage with in order to not only understand on-going anthropogenic problems but also help create alternative forms of organizing based on realistic Earth–human relations. (p. 455)

Rethinking, repurposing and/or refocusing various strands of organization and management theory (e.g. Hahn et al., 2015; Hoffman and Jennings, 2015) is one important area of work for organization scholars here. Critically assessing and perhaps transcending fundamental assumptions about the link between organizations and the natural world is another (Gladwin, Kennelly and Krause, 1995; Ergene, Banerjee and Hoffman, 2020). Critical analysis and constructive rethinking of the activities of business and corporations is another, in light of the sustainability problems and crises they are a driving force within, and potential agents in remedying (e.g. Upward and Jones, 2016; Wright and Nyberg, 2017).

Beyond business/corporate contexts, employing organization theory to explore and analyse phenomena of particular relevance to achieving social and ecological sustainability, and seek progress on grand challenges offers many important avenues for organization and management scholarship (Hoffman and Jennings, 2015; George et al., 2016). Organizational scholarship that looks at the intersections of science, public good, business and sustainability is an example of such empirical research (e.g. Bednarek, Paroutis and Sillince,

2017; Ashby, Riad and Davenport, 2019; Müller and Kaltenbrunner, 2019). Transdisciplinary research, and the life of research groups and organizations that do sustainability-oriented research with a transdisciplinary approach (Kates, 2011; Lawrence et al., 2022), need to be examined. Transdisciplinary, sustainability-oriented research groups and centers are proliferating, and high emphasis is being placed on the projects they house as contributing to progress on growing social and ecological sustainability problems (Soini et al., 2018).

2.3 Research, sustainability and grand challenges

The notion that research system is to be directed towards 'grand challenges', and researchers be seen as participants in them is a policy idea now central to research and higher education in the EU and internationally (Mazzucato, 2018). Grand challenges have been mentioned in the United Nations Sustainable Development Goals (United Nations, 2015), and are often associated with sustainability. Some have suggested grand challenges is a discourse bringing about a shift towards new animating ideas for research policy in the 21st century (Flink and Kaldewey, 2021). In this research policy paradigm, the purpose of research is participation in grand challenges. Researchers in natural, technical and social sciences and the humanities, and a diversity of actors across societal sectors work alongside each other on large-scale missions or sets of missions to improve society for the good of all (Kaldewey, 2018), making epistemological progress and generating economic growth.

This policy idea is built upon many others, and while it can be said to be new, it is continuous with what came before it. For the last few decades, we have seen the emergence of new ideas about the role of scientific research and the academy in society. Nowotny, Scott and Gibbons (2001) gave us the idea of a 'Mode 2' society, in which 'science speaks to society and society speaks back'. Knowledge needed to be 'socially robust', not only scientifically valid. Expertise and credibility would no longer be legitimated by the traditional institutions of science and the university. Instead, knowledge and expertise would be distributed across heterogeneous networks of actors in different domains of society, and scientific researchers' work and the knowledge produced would be legitimated and validated through its participation in and integration with these societal contexts. It was through this mode of operation that science to be 're-thought' for the 21st century (Gibbons et al., 1994; Nowotny, Scott and Gibbons, 2001). Scientific benefit to society was to be seen as not only occurring not only through the drive towards the "endless frontier" of science as it eternally pushed into new territory for knowledge production (Bush, 1945). It would also happen through myriad interactions between the domains of the academy, industry and government, constituting

a system that would produce innovation in an 'endless transition' of change and improvement (Etzkowitz and Leydesdorff, 2000), a system that would be the engine of progress in the era of the knowledge economy (Slaughter and Leslie, 2001).

'Grand challenges' as a policy discourse builds upon these and other policy ideas, but places new emphasis on participation of researchers in sports-like 'challenges' that researchers participate in together for the common good (Kaldewey, 2018). In this way of seeing and working within research, distinguishing the kind of specialty expertise and knowledge one is actually doing is not the main question–more important is being seen to legitimately participate in the mission, the grand challenge. Scientific and scholarly research of all kinds are but a mode of work among others recruited to the 'all-hands-on-deck' efforts to solve the challenges of global humanity. As Flink and Kaldewey (2021) argue, in the era of grand challenges, 'boundary work'–the ongoing symbolic and rhetorical efforts made to delineate the boundaries of the unique place of science within the wider culture (Gieryn, 1999)–is no longer politically correct. We must put away our squabbles and work together. Instead, it is 'identity work' that is asked for (Flink and Kaldewey, 2021). We researchers are to redefine our work and our working selves in the image of the grand missions we are all called to. Such identity work is potentially highly valuable in today's research system as researchers seek resources to pursue their strategic ends.

These and other changes to the research-society relation broadly, are manifestations of the "evolving epistemic and social patterns of scientific work" which entail "principles of scientific governance that bring power in all its forms to bear on the institution of science" (Hackett et al., 2016, p. 735). These changes make salient "the essential ambiguity in the ever-tightening coupling of scientific inquiry to societal purposes" (*ibid.*). It is this fundamental ambiguity in some of its local manifestations into which this study inquires.

2.4 Transdisciplinary research

Transdisciplinary research has been put forward as a way in which the research system and researchers can address the need to solve grand challenges, such as climate and energy challenges (Hadorn et al., 2007). However, it has been difficult to realise its potential in practice (Felt et al., 2016; Schikowitz, 2020; Lawrence et al., 2022).

As seen in Table 1, in contrast to single-discipline focused research, interdisciplinary research integrates contributions from multiple areas of disciplinary

expertise. Integration could potentially occur across academic-scientific disciplines from the natural and social sciences and the humanities. Transdisciplinary research includes that of non-academic, or rather extra-academic knowledge and/or concrete problems and actors that are located outside of the university. This latter feature of collaborating with actors out in society in knowledge production processes is often be termed 'co-production' of knowledge (Bremer and Meisch, 2017; Miller and Wyborn, 2018).

Table 1. Contrasting different research approaches

Disciplinary	Interdisciplinary	Transdisciplinary
Single discipline	Integrates multiple academic disciplines' knowledge and/or actors	Integrates a single or multiple academic disciplines with non-academic knowledge(s) and/or actors

Lawrence et al. (2022) delineate two strands of thinking in scholarship on transdisciplinary research that rest on two different definitions of transdisciplinarity. On the one hand, there are those who see transdisciplinary research's main project as unifying knowledge (Jantsch, 1972; Wilson, 1999; Nicolescu, 2002; Max-Neef, 2005). In 'unity of knowledge transdisciplinarity', the focus is on transcending disciplinary/knowledge boundaries in order to reach a comprehensive and higher level knowledge of the world, that is appropriate to addressing complex 'wicked problems' (Rittel, 1972). While non-academic knowledge is seen as part of the project, this does not necessarily mean inclusion of extra-academic actors like industry, indigenous groups or government is needed. Knowledge may be taken from multiple existing sources by the academic researcher/scientist and integrated. On the other hand, Lawrence et al. (2022) argue, there is a strand of thinking that sees the main project of transdisciplinary as *engaging with society* (Gibbons et al., 1994; Nowotny, Scott and Gibbons, 2001; Russell, Wickson and Carew, 2008; Jahn, Bergmann and Keil, 2012; Thompson et al., 2017). In 'social engagement transdisciplinarity', the focus is on *collaboration and joint problem solving* which does not exclude knowledge integration, but it is not the focus. For the most part, this thesis is in dialogue with the latter category–literature that defines transdisciplinary research as a project of finding ways in which research and researchers can be societally engaged. Teams of transdisciplinary researchers engage in 'complex problem solving', attempting to work on so called wicked problems (Rittel, 1972), seeking to bridge both "scientific inquiry and pragmatic, real world outcomes" (Lotrecchiano and Misra, 2018, p. 60) in their work. As Walter et al., (2007) point out, this means making simultaneous impacts on the academic and social worlds, as

> transdisciplinary research projects rely on the joint process of joint problem definition, problem-solving, and implementation that involves temporary cooperation between researchers and practitioners. Effects are intended and caused both in the scientific sphere and in practice—the societal sphere. (Walter et al., 2007, p. 326)

Transdisciplinarity is commonly seen as suited to addressing the problems of sustainable development. Jahn et al. (2012, p. 9) argue, along with their thorough treatment of the literature on transdisciplinarity, that it is not merely a research method, but an approach to research that "fundamentally addresses the relationship between science and society". It does so through its integration of science and social problems while being reflexively aware of the knowledge processes and actors which produce those. For them,

> transdisciplinarity is a critical and self-reflexive research approach that relates societal with scientific problems; it produces new knowledge by integrating different scientific and extra-scientific insights; its aim is to contribute to both societal and scientific progress; integration is the cognitive operation of establishing a novel, hitherto non-existent connection between the distinct epistemic, social–organizational, and communicative entities that make up the given problem context. (Jahn, Bergmann and Keil, 2012, p. 9)

It is unclear whether transdisciplinarity should be considered a distinctly new mode of research as it is heterogeneous and there is not a decided-upon set of techniques (Fam et al., 2020). There is also debate over whether it can be seen to produce joint research or merely learning between actors (Maasen and Lieven, 2006). Jahn et al. (2012) point to an enduring tension over whether it should be seen as an academic activity–and a genuinely new mode of knowledge production–or something that is in fact located outside the university. If outside, this presents problems in convincing universities to put resources towards establishing it further, and managing the expectations of non-academic actors that want to be assured what they are being asked to participate in can deliver "societal and scientific progress in working on a concrete societal problem" (*ibid.*, p. 9). At the same time, for legitimacy, transdisciplinarity research depends on its being seen as an activity anchored in the academy.

A final point the authors make is that transdisciplinarity is "interventionist in that methodically frames, structures and Organizes the societal discourse about the problematic of an issue at stake" (*ibid.,* p. 9). Here, the role of the researcher goes beyond knowledge production and into actually assembling problems themselves, not only as research problems, but as they show up in society. And then further, intervening in them in concrete ways. There is no one commonly agreed-upon set of techniques that constitute doing transdisciplinary research (Hadorn et al., 2007; Jahn, Bergmann and Keil, 2012;

Lawrence et al., 2022), and it is often pioneering and/or cause-driven researchers who take this type of research on. This places a lot of responsibility to complete a set of tasks, that are apparently essential for society's capacity to solve its problems, on the shoulders of the researcher. The question of how that apparent responsibility is worked out in practice becomes salient, making inquiry into the changing roles and responsibilities of scientists in a system governed by these ideas a potentially fruitful avenue for research (Maasen and Lieven, 2006; Jahn, Bergmann and Keil, 2012; Augsburg, 2014).

Producing 'socially robust knowledge' in this way is often described as a way of extending science into society and 'widening the horizon' of social accountability for that science. Maasen and Lieven (2006) argue that it renders science/knowledge production in such a way as to be amenable to the knowledge economy by encouraging performances of participation between the university, industry, government and other actors (see also Widmalm, 2013). It also individualises responsibility for creating socially accountable research, shifting it down to the level of researchers, 'bridging the gap' between science and society on the basis of individual scientists who need to produce both 'epistemically and socially robust knowledge' (Maasen and Lieven, 2006, p. 47).

As I have been discussing, individual researchers and research groups, centers and institutes are increasingly expected to participate in solving societal challenges like climate change through their university-based academic/scientific organizations, in transdisciplinary research. Individual researchers are expected to, through their own enterprising efforts, make research accountable to society and its needs (Maasen and Lieven, 2006). In the case of sustainability problems, they are expected to help save humanity from its global sustainability challenges and crises. The authors argue that this is in line with a broader cultural shift towards seeing citizens as enterprising individuals responsible for themselves (the neo-liberal subject). It is the individual scientists that is called upon to carry out the disciplinary integration and 'procedures' of accountability of transdisciplinarity through their creative enterprise. Thus, the relationship to society in and of scientific research now are now worked out at the micro level through transdisciplinary research projects (*ibid.*).

As I have mentioned, these profound changes leave us with questions, echoed by Jahn et al., (2012) about the shifting roles and responsibilities of researchers doing such transdisciplinary work. Particularly in fields like sustainability science that see adopting transdisciplinarity as a normative choice that offers the possibility for catalysing change on issues, for example those of ecological and social justice.

But perhaps more importantly, studies have shown that the promise of transdisciplinary research–its transcending of disciplinary boundaries, addressing wicked problems, producing knowledge that is useful while being scientifically rigorous, and helping move societal change in the direction of suitability, has not been easy to realise in practice. As Schikowitz (2020) points out, transdisciplinarity has been shown to not necessarily have passed the level of stated 'aims and claims', and often remains stuck in 'narrow problem formulations' that fall short of its broad, integrative ambitions. Some have suggested this is because our institutions are structurally resistant to transdisciplinarity, are failing to incentivise it correctly, and have strong disciplinary cultures that need updating from the old to the new research paradigm (Fam et al., 2020). A number of empirical studies have aimed to illuminate challenges and tensons in inter- and trans-disciplinary research, by looking not at the conceptual level, but at practice. These aim at a better theoretical understanding of these and other difficulties of realising transdisciplinary research.

Further, studies have identified and analysed tensions (and paradoxes) in transdisciplinary research, and responses to them, in showing how transdisciplinarity in practice unfolds. The next sections focus on previous studies that have looked at tensions in the work of academic/scientific research, and in particular inter-and transdisciplinary research, and on the way in which the concept of tension is used in this study.

2.5 Tensions and responses in transdisciplinary research

Tensions in the work of scientific research

Before moving on to discussing tensions in transdisciplinary research and the groups and settings in which it happens, it is worth noting that the study of the work of scientific knowledge production more generally has also benefitted from examining the role of tensions. Scholars interested in the workings of science, research and the university have used the tensions concept to help gain insight into a range of questions. Perhaps the most widely influential example is the 'essential tension' that has been shown by Thomas Kuhn (1970) to exist in the structure of science, generated between the adherence to tradition and on the other, the pursuit of novelty (leading sometimes to disruption; Kuhn's 'paradigm shifts'). As Turner et al. (2015) point out, Kuhn saw convergence and divergence as two sides of the same coin. Both are essential to science, "processes of convergence, through which knowledge is refined and processes of divergence, through which convention is challenged and opportunities opened" (*ibid.*, p. 654). These processes are elements of science itself,

'essential' to it. They are in tension–contradictory, interdependent, complimentary and persistent. Yet, at least conceptually, the fact that they are in tension is not seen as a problem to be solved, but rather drive the 'movement' or pattern of science itself.

Building upon the notion of essential tension in science, Hackett (1990; 2005) has looked into tensions across a broad range of research fields, specifically the work of research groups, and offers a deep dive into the world of scientific research work and the many tensions, organizational and otherwise, that characterise it. His analysis shows the fundamental 'ambiguity and oscillation' going on at the micro level in the organization of knowledge production so important to our modern societies. Members of research groups "work face-to-face, sharing work space, materials, technologies, objectives, hypotheses and, to a significant degree, a professional reputation and fate" (Hackett, 2005, p. 816). Throughout the course of their work, research groups encounter what Hackett, following Kuhn, has called 'essential tensions'–tensions inherent in the work of scientific research.

For Hackett (2005), tensions are intrinsic to research and help explain variety within seemingly similar contexts. Here he also follows after Merton (1976), who identified tensions in the unavoidable ambivalence built into roles and structures of the system of scientific research, and indeed those of Modern society in generally. Tensions present researchers with persistent and often contradictory demands which cannot ultimately be resolved and over time generate difference, creating various patterns, such as oscillations between poles of a tension. For example, between on the one hand moving between empowering individuals in a team to go their own way, and on the other taking control of the direction of the collective and setting a clear strategy–what he labels a tension between autonomy and control. Others include tensions between various risks–e.g. of adhering to existing knowledge pathways vs. the risks of seeking breakthroughs; role conflicts such as leaders needing to do both articulation work to various external audiences vs. work "at the bench" in the lab; between secrecy vs. openness in relating to other teams of researchers, and in managing continuity vs. change in for example the constant turnover of team members due to the structures and incentives of academic careers. In earlier work, Hackett (1990) also identified tensions the changing "organizational culture of academic science" between producing research vs. educating students, between efficiency and effectiveness, independence and dependence in maintaining academic freedom while being accountable to funders.

For Hackett, tensions in the management of research showing the challenges of encountering and managing tensions is a central part of the 'life course' of research groups and their members as they move through their scientific

careers. They also help explain how and why research groups display such variety in their trajectories and outcomes such as scientific productivity. While Hackett's studies offer a profound analysis of tensions in research, including one of the few studies that looks at the management of scientific research with a tensions lens (Ashby, 2015), his identification of specific tensions is limited in its scope. The empirical setting he favoured in the works I have cited are in the natural and engineering sciences, and are disciplinary-focused. The present study looks at a transdisciplinary research group, one based in a social sciences department. Transdisciplinarity, introduced into a university department, pluralises values, goals and relations by adding complexity, and this new context offers new potential for analytical insight into the nature and role of tensions in research.

Tensions in transdisciplinary research

As we have been discussing, transdisciplinary research has been put forward as a way for research and higher education broadly, and for researchers themselves, to address sustainability problems and contribute to 'grand challenges' society faces. This has not proven straightforward, and transdisciplinary research as an approach is still emerging despite its growing popularity. Empirical research has offered some answers as to why, revealing barriers and unexpected outcomes that emerge in efforts to work in this challenging space. They have also shown and/or suggested creative and effective ways actors have moved forward.

Russell, Wickson and Carew (2008) offer a view of the shifting landscape of knowledge production that is characterised by 'drivers' that pull transdisciplinary research in different directions, creating tensions. Two drivers are the 'knowledge economy' and its increasing commodification of knowledge including entrepreneurial universities' links with industry and government, and the 'environmental imperative' as ecological sustainability worsens and transdisciplinarity tries to tackle complex social-ecological problems. Resulting from the interaction of these drivers of change is a tendency towards 'institutionalisation' of transdisciplinarity, which can cause problems for realising the ambitions and ideals of transdisciplinary research to contribute to sustainability. Russel and co-authors (*ibid.*) argue that transdisciplinary research is subject to competing pressures from the knowledge economy and the environmental sustainability imperative of research.

The knowledge economy driver promotes consolidating around a theme, and building structures around transdisciplinary collaborations that form partnerships with industry and other non-academic actors. As the same time as such action establishes and stabilises transdisciplinary research, draws resources to it, and meets university goals and research policy aims, it also works against

another important aspect of transdisciplinary research. That is, as Nowotny (2003) argues, the ability to engage with heterogenous contexts, actors and problems. This is what the transcendence of disciplines and of university-society boundaries in transdisciplinary research is purposed towards (Jantsch, 1972). 'Institutionalisation' can actively work against this, as a particular theme and set of relationships can become embedded in structure and stabilised, reducing the possibility of new directions and mutable relations (Russel et al., 2008). This is potentially problematic for the direction of the 'knowledge economy' driver, in that a contradictory dynamic emerges. The building up structures around an area of strength, and the solidifying of long-term partnerships "is born of the desire to interconnect different researchers and disciplines, but then may inhibit new ones" (*ibid.*, p. 467). In addition, and perhaps more importantly, that creates problems for the aim that transdisciplinary research should address social-ecological sustainability issues. This is because "interconnection, responsiveness and flexibility are so important when dealing with environmental sustainability problems". Transdisciplinary research

> recognizes problems as existing in an interconnected social and natural context and, as such, being complex, uncertain and lacking clearly defined boundaries. […] finding solutions to environmental problems requires not only an understanding of the environment and threats to it; it also involves influencing the actions and behaviours of multiple societal actors. (Russel et al., 2008, p. 464)

Transdisciplinary research groups and their projects that become static in organizational configuration or siloed behind new walls will not be flexible and open enough to address environmental problems, with their post-normal (Funtowicz and Ravetz, 1993) systemic complexity and plurality of values among stakeholders. Russel and co-authors pointed to this macro-level tension within transdisciplinary research and argued that it had the potential to cause problems for transdisciplinarity in realising its potential. They called for a close look at how this and other tensions would play out empirically. Further, they called for consideration of ways to address or circumvent the potential problems here.

Others have also looked empirically at tensions in transdisciplinary contexts, identifying specific tensions and some responses to them that show the challenges of working with transdisciplinary research. Tensions in inter- and transdisciplinary research have been studied, in groups, centers and institutes. Studies have shown how the presence of tensions impacts work, knowledge outputs, organising efforts and other aspects. In identifying tensions and sometimes responses, these studies offer insight and explanation into why inter- and trans-disciplinary research and its promise in addressing sustainability

challenges has been hard to realise. But also how actors find ways to creatively through challenges.

Focusing on a societally engaged research context, Turner et al. (2015) offer a careful analysis of tensions in an transdisciplinary 'environment–society' research center. The authors show three 'levels' of tension: epistemic, structural and affective. The epistemic tension is shown in an interplay between disciplinary and interdisciplinary knowledge approaches, contradictory yet necessary. The latter aiming to move beyond the constraints of disciplines, but also requires disciplines to work at all. The structural tension is shown in a tension between flexibility and rigidity–in their case the need to build flexibility to allow collaboration between different knowledge specialties in spite of the rigid disciplinary boundaries of academia. And the affective is illustrated by a tension they found between risk-taking and comfort–the fostering of a comfortable, stable academic community in order to recruit scholars that would take uncomfortable intellectual risks for example in integrating with fields they knew little about. This reveals that these tensions emerge from the combination of disciplinary work with interdisciplinary work–and the tensions are interdependent, meaning changing one leads to change in others. A challenge here then is managing the intricacy of this interdependence without resorting to only favouring one or the other pole of a tension. Further, because tensions lead to outcomes that are hard to predict, it is hard for leaders to enact prescriptive solutions, but rather they must learn how to move with them.

It is worth noting that while the authors do look here at several different tensions, they are all dimensions that pertain to *epistemic* work and describing and analysing the epistemic culture (Knorr-Cetina, 1999) in which cross-disciplinary work happens. Epistemic culture may be crucial in understanding how research groups and centers produce knowledge. However, in the present study we are interested less in the epistemic and more in the organizational (although of course these interrelate in such settings). Knowledge integration is a key part of inter- and transdisciplinary research (Max-Neef, 2005; Lawrence et al., 2022) and particularly that focused on social and ecological sustainability (Kates, 2011). But establishing and doing transdisciplinary sustainability research also raises organizational challenges, as, for example, achieving it means introducing local organizational change, often within a university context and demands engagement with external societal actors.

The idea that the university's structures and entrenched practice acts as a barrier to realising transdisciplinary research is often put forwards by proponent scholars and practitioners of inter- and trans-disciplinary research, and in particular in the sustainability field (Hadorn et al., 2007; Jahn, Bergmann and Keil, 2012; Lawrence et al., 2022). However this is more rarely accompanied by looking into the local everyday manifestations of this tension for

researchers, and how they respond. Thompson et al. (2017) look at various aspects of transdisciplinary research, specifically looking at an early-stage transdisciplinary research project (similar to an application made by the group under focus in the present study, the Climate Center). One of the main findings of their study was that a central tension encountered by transdisciplinary researchers was generated between, on the one hand, the transgressive values of transdisciplinarity and on the other, the constraints of a university context:

> Many of the conflicts raised by participants can be attributed to the process of carrying out a new research approach within entrenched traditional research structures […]. actors who desire to participate feel hindered by the existing institutional structures they work within, which were built to support and reinforce traditional knowledge production modes. This incompatibility has resulted in a tension between transdisciplinary values and the constraints imposed by entrenched practice. (*Ibid.*, p. 37)

The authors identify this "friction" and offer that it shows tensions go beyond conceptual issues and are encountered in practice. They find that researchers anticipated this friction and it led to pragmatic problems in that they expected they would not be able to participate fully in the project, and that their limited time and resources would also mean they didn't want to deal with it. Further, this friction meant that contributions of transdisciplinary, societally engaged knowledge production would not be properly valued, and thus this made decisions about investing in such work riskier.

Müller and Kaltenbrunner (2019) looked at a Swedish-university-based environmental sustainability center with a transdisciplinary focus that invested initially a lot of time in outreach and engagement in environmental politics and policy in their local region. This outreach and engagement were promoted as a good thing by policy-makers in government, and in higher education. But this came into conflict with the logics of their department and the university system, which were such that after a time they had to turn their attention to disciplinary research outputs, which attracted more reliable funding. Here the confliction between on the one hand, the policy impulses in their 'institutional and policy environment' towards social engagement on climate issues, and on the other hand the structures and incentives of their department, generated tension. They faced competing demands to do interdisciplinary research and be societally engaged on environmental issues, but also to aim for disciplinary-focused research outputs as these attracted more funding and were more institutionally accepted. Their focus on societal engagement in policy and with local stakeholders paid off in the short term but risked undermining them in the long term as the departmental/institutional incentives they encountered in the university pushed them towards disciplinary work and away from societally engaged and cross-disciplinary collaborations.

Their study only looks at tension but specifically analyses responses. One organizational way in which researchers responded to this tension was to find work arounds. In one, they worked with these contradictory impulses by creating 'modular' research applications, which could be edited to fit different kinds of funding opportunities. They could be plugged in to disciplinary or trans-disciplinary research, for example. That meant always having a variety of avenues available so that they could be ready for whatever landed. Thus, responses to contradictory demands influence the form and direction of their research funding applications and ultimately its trajectory.

Other authors have also shown that societally engaged, transdisciplinary research organizations and their members operate within a landscape of complex demands, particularly those engaged in sustainability work. Parker and Crona (2012) analyse a university-based environmental research organization engaged in research and policy on water issues. They identify tensions as being generated due to the competing demands of academic, public and private stakeholder groups the center serves. Each stakeholder demands priority for their objectives, creating tensions that the center must manage. The authors conceptualise a 'landscape of tensions' which are generated as this organization tries to be 'all things to all people', serving the needs of multiple stakeholders with different interests while being embedded in their university. For example, some stakeholders demand disciplinary research and others interdisciplinary research. Some demand impartial and robust science, and others demand research outputs that are ready to use and tailored to their focal issues. The center's inter- and trans-disciplinary, societally engaged approach met with many challenges and tensions.

In the same study (*ibid.*), organizational responses to manage these ongoing tensions included changing the center's organizational structure and governance, and shifting research the overall research focus to include more focus on consultative work to produce knowledge more useful for stakeholders. Thus, identifying and analysing tensions and responses helped explain the challenges of transdisciplinarity, for example in integrating non-academics and trying to work on common problems. Ongoing attempts to respond adequately to these tensions shaped and reshaped the organization over time. The capacity to flexibly to manoeuvre within this landscape of tensions and find workable solutions was essential to managing the scientific and societal aspects of the center's research and mission.

Schikowitz (2020) looks at tensions amongst different kinds of relevance in transdisciplinary science. Her study finds that the ways in which scientists try to reconcile policy, scientific and practical relevance leads them to adopt 'standardized packages' of practices such as quantitative modelling. While this response to tensions does manage them, it produces rather narrow, and

natural-science-oriented, positivist knowledge outcomes, which are not what participants in transdisciplinary research had been seeking. The chosen, available, standardised response to encountering tensions lead them to produce outcomes that did not meet transdisciplinary values and thus their knowledge outputs felt short of ambitions. The study thus identifies, explicates and analyses tensions and responses, and helps explain why it is hard to realise transdisciplinarity in practice.

Finally, a study by Ashby, Riad and Davenport (2019) looked into paradoxes and their multiple underlying tensions in an environmentally-focused public-science research organization. The Crown Research Institutes of New Zealand "engage in both blue-sky and applied science and technology R&D to address critical environmental, social, and economic issues" (*ibid.*, p. 260). They face demands for academic excellence, must be viable in a highly competitive R&D space, and at the same time create public value and striving for sustainability. This generated tensions over questions of who and what they serve, how to carry out their roles, and how to maintain integrity across multiple professional domains. In looking at tensions that emerged in their work to address public, commercial, and sustainability concerns, and ways of managing these, the authors offer a rich and rare analysis that shows challenges and ways forward at the intersection between the management of research, the relation of research to society, and the concern for sustainability.

They show that underlying this work are multiple tensions faced by scientists, who have found numerous ways of dealing with such tensions. Much effort, it seems, is devoted to the management of tensions in such societally engaged, transdisciplinary research. Like in the present study, here the authors draw on organizational tensions and paradox literature, looking at 1) the management of paradoxes and the tensions that underlie the paradoxes, and 2) identifying and analysing different kinds of management responses to these tensions. The authors show how paradoxes and underlying tensions are "managed through a blend of practices" (*ibid.*, p. 274) that were either defensive or active, premised in either 'differentiating' or 'integrating' poles of tensions respectively. These responses made operating amidst such a tension-filled work situation doable. While scientists certainly did not solve tensions, they found numerous ways of working with them. Sometimes these produced results that they and others were not happy with, and other times the converse was true.

The concept of tension has thus offered and can further offer much insight into research organizations and their members, and how and why epistemic and organizational ends in research can be hard to realise, and efforts may not produce the outcomes we expect based on our ideals and aims. As exemplified in the last paper mentioned, studies of research in general and those similar to the specific case in this study could benefit from making use of the rich lexicon

of concepts from the organization and management studies field to continue this work. Drawing on this literature offers potential for a deeper understanding of tensions and challenges of transdisciplinary research. The present study aims to make inroads towards realising this potential.

2.6 Tensions and paradox in organization and management

The literature on tensions and paradox offers well developed concepts for analysing the tensions encountered in research organizations, and by researchers. It also has much to offer for exploring and analysing the changing conditions through which they become salient, and how they are responded to. Such knowledge is crucial if we want to 1) improve our knowledge of transdisciplinarity in practice, and 2) offer knowledge that helps research managers and practitioners to effectively carry out their work. Some authors also take the position that once tensions are better understood and accepted, they can be better responded to and managed, leading to improved organizational outcomes (e.g. Smith and Lewis (2011); but also see Hargrave and Van de Ven, (2017) for a critical discussion of managerial approaches). But further, looking into tensions in local cases can give us insight into why it the promise of transdisciplinary research seems to have been challenging to realise in practice.

The rich literature on tensions in the organizational field potentially offers some theoretical insight here. For example, it may help in considering the specific changing conditions or triggers that bring tensions into saliency in specific local contexts for actors, and at different levels. In much of the current literature on research organizations, we see that tensions are there, what they are, and that they make a difference, but it is not so well conceptualised how tensions come into being and are responded to. Or that they can be more or less salient in different conditions. It is not that these features of tensions are completely missing, but rather that they may be analytically pulled apart more clearly and systematically.

Tensions and paradox

Heraclitus is said to be one of the first to observe and write about *paradox* in the 5th century BCE (Wheelwright, 1959). The fragments of his thought that remain represent the world as made of things in oppositional *tension* with each other. For Heraclitus, the world is essentially always in 'strife' (Wheelwright, 1959); opposites are interrelated and contradictory, yet part of the same whole even becoming each other over time–day turns into night, life into death, and

a road up a mountain is also the road down. Heraclitus' thought seeks to show the ontological status of paradox, that the interrelation of opposites in tension with each other "lies inextricably at the very heart of reality" (*ibid.*, p. 92). Showing that philosophical truth, and how it is so, is Heraclitus' main philosophical project (Graham, 2021). That truth is his focus, rather than the analysis of any given, specific example of paradox, or entities related in tension. As Wheelwright (1959, p. 2) explains,

> To be sure, the logicising intellect will undertake to analyse each of these paradoxes into its elements, explaining in just what pair of respects, or in what pair of circumstances or from what opposite points of view, something is at once such and not-such. But Heraclitus regards the paradox itself and not its logical transformation, as more truly representing the real state of affairs.

Given this state of affairs, one should see tension as to be expected rather than as an anomaly. Opposition, contradiction, or confliction between interrelated opposites are to be seen as the 'natural' state of things and to be embraced or at least accepted. This is quite different approach to seeing them as problems, or as a sign of mistaken thinking or poor strategy, and so on. Some organizational scholars would agree, arguing that managers are best off taking a *both*/*and* approach (Clegg, da Cunha and e Cunha, 2002; Andriopoulos and Lewis, 2009; Smith and Lewis, 2011) rather than an *either/or* approach in their attempts to address persistent, interrelated, competing demands and the tensions they generate. Like Heraclitus, they argue that tensions and paradox are the 'natural way of things' in organizations. Taking such a perspective has conceptual and managerial implications. Not least that, as Smith and Lewis (2011) argue, much of organizational scholarship (and its informing of management practice) is based on contingency theory's assumptions that choosing between A and B is matter of figuring out what is most suited (the best 'fit'), given current organizational and environmental conditions, and making that choice. Whereas a 'paradox perspective' asks, how can we achieve both A and B?

Tension is a relational concept; exists within a relationship that connects two or more elements (Clegg, da Cunha and e Cunha, 2002). Tension is often expressed metaphorically in physical and spatial terms, relating to force, movement, direction and energy. Things can be in tension with each other. It denotes a pull in different directions; that the two or more elements are related and diverge from each other or contradict in some way. Tensions are the push-pull forces that become salient when such competing demands (or contradictory elements) tear actors in different directions (Gaim, 2018). Paradox is a conceptualisation of tension, paradox being a specific type of the more general category of tension (Gaim et al., 2018). In much of the literature on tensions and paradox in organization and management studies, the two terms are used

somewhat interchangeably, although paradox is usually emphasised and is defined as a specific conceptualisation of tension.

Paradox in organization and management studies is a growing literature. Cameron and Quinn (1988, p. 2) defined paradox as "the simultaneous presence of contradictory, even mutually exclusive elements". Smith and Lewis (2011) offer a definition (perhaps now the most commonly-used definition in this literature) that includes temporal and relational aspects, defining paradox as "contradictory yet interrelated elements that exist simultaneously and persist over time" (*ibid.*, p. 382). In this literature, paradoxical tensions cannot be resolved but rather must be coped with, managed, dealt with in some ongoing way; they are stable ambivalences. Organization and management scholars have found organizations tend to be rife with potential and actual paradoxes, tensions and competing demands (Smith et al., 2017a). Seemingly much of management is about responding in the absurd and (seemingly) paradoxical situations that organizational life presents us with (Farson, 1997), while addressing the tensions of competing, divergent demands on one's time, attention, resources, sense of self, etc. (Smith and Lewis, 2011). Some authors point out that the very act of Organizing is founded on paradoxical tensions (Clegg, da Cunha and e Cunha, 2002, pp. 483–484):

> All organization is founded on paradox: on the one hand it contains free, independent human subjects. On the other hand, the relation between these subjects aspires to be one of organization, order and control. The paradox is evident: how does the freedom of individual subjectivity accommodate the strictures of organization? How does the stricture of organization envelop the freedom of individual subjectivity?

The presence of this tension can be seen as constituting organization in a fundamental way. These mutually exclusive and oppositional poles–freedom and control–are interrelated and oppositional, but they are essential for organization to exist, and must be together in tension, like a bow's string and frame.

Organizations have a range of goals and ends between which tension can be contradictory, and persistent, such as the need to exploit existing resources or explore for new ideas (Lüscher and Lewis, 2008; Andriopoulos and Lewis, 2009). Much insight has been produced as to the nature and role of tensions and paradoxes in organizations, for individuals (e.g. Tracy, 2004; Carollo and Guerci, 2018) in groups (Smith and Berg, 1997) and in the unfolding of change and innovation (Quinn and Cameron, 1988; Jarzabkowski, Lê and Van de Ven, 2013).

Smith and Lewis distinguish paradoxical tensions as opposed to those resulting from dilemmas and dialectics. A dilemma is a choice between two options

which needs to be weighed up, and is thus different to a paradox. However, dilemma overlaps with paradox, and can be paradoxical in a specific sense. For Smith and Lewis (2011, p.387), dilemmas are "competing choices, each with advantages and disadvantages" and are "paradoxical when options are contradictory and interrelated such that any choice between them is temporary and tension will resurface" (Smith and Lewis, 2011, p. 387). A dialectic is "two opposites (thesis and antithesis) solved through integration (synthesis), which over time will confront new opposition" (Smith and Lewis, 2011, p. 387). Dialectics, like dilemmas, can be paradoxical when elements are persistent, contradictory and interrelated. If it is a paradox, resolution of poles is only ever temporary, as there is an inherent 'need for disparate qualities' that the synthesis cannot resolve. Thus, any synthesis of poles inevitably will be challenged again by the resurgence of the same persistent paradoxical tension resurfacing down the line. For Smith and Lewis (2011), either dialectics or dilemmas can thus turn out to be paradoxical over time, as when the dilemma keeps resurfacing, or the two elements of dialectic persist over time, resurfacing regardless of any temporary synthesis.

This is to say that various kinds of tension exist (for a further typological treatment, see Gaim et al., 2018) and may or may not be paradoxical. It depends on our observations and how we conceptualise those. In this thesis, I refer to tensions. Those I identify may be paradoxical and I see some evidence for that. For some authors, it appears to be enough that opposites are present and interrelated in some way in a given context and are perceived by and/or affect actors (Quinn and Cameron, 1988). However, if persistence, opposition, and interrelation are all conditions for paradox, this makes them, at least in my view, harder to substantiate. In other words, I have stuck with the language of tensions in this thesis, even though clearly, I identify interrelated oppositional poles present in organizational contexts and responded to by members, that show some evidence of persistence.

Latency and saliency, and paradoxical cognition

The contradictory tensions of paradox can be *latent* or *salient*; either under the surface and dormant, or present and felt acutely by people. Smith and Lewis (2011, p. 390) argue that "latent paradoxical tensions become salient to organizational actors under environmental conditions of plurality, change and scarcity". In addition, they become salient when actors apply 'paradoxical cognition', that is, use cognitive frames that view tensions in certain ways. Tensions can go from latent to salient and back again, depending on environmental and/or cognitive factors. Tensions can remain dormant in environmental conditions, and then become salient when conditions change and/or actors perceive and engage them:

> Even as tensions persist in organizational systems, they may remain latent–dormant, unperceived, or ignored–until environmental factors or cognitive efforts accentuate the oppositional and relational nature of dualities. Latent tensions then become salient–the contradictory and inconsistent nature of tensions becomes experienced by organizational actors. (Smith and Lewis, 2011, p. 390)

In the authors' conceptual model, environmental factors play a role in making tensions salient. As do actors themselves, who can highlight certain tensions and through rhetorical efforts bring attention to them (*ibid.*), making latent tensions more explicit to internal and external audiences.

Keller, Loewenstein and Yan (2017) explain paradoxical cognition by using the observation that people use *lay categories* to interpret their world. They interpret the conditions in which they find themselves, form categories to help understand them, 'assimilating aspects of experience' into useful categories. The important thing to grasp here is that while these categories are constructed by people, there are conditions which do or do not allow for the category to be used to understand them. They offer the example of a Japanese flag, and how it has both constructed and conditional aspects.

> The category of "Japanese flag" is a social construction. Only people with sufficient cultural knowledge can recognize that an image indicates a Japanese flag. However, only a narrow set of images exhibit features that indicate the "Japanese flag" category, and thus the categorization of an image as a Japanese flag involves both social construction (the Japanese flag category) and material conditions (certain colours and shapes in certain configurations). (Keller, Loewenstein and Yan, 2017, p. 540)

One needs a cultural understanding of the flag to see it at all, rather than just a white background with a red circle. But of course, the image could be interpreted otherwise also. The argument relevant to paradox here is that, as Smith and Lewis (2011) also argue, paradox is both inherent (part of conditions) and constructed (as a result of the artful efforts of actors to interpret their world). This allows us to see that certain conditions need to be in place in order to see paradox, while at the same time, specific conditions by no means automatically lead to tensions becoming salient. It will also depend to some extent on an individual's biography and cultural background, and to what other interpretations are available to them, and so on.

Smith and Lewis (2011) propose that actors who have cognitive complexity that allows the ability to hold multiple competing demands in mind and work towards them simultaneously, are more likely to respond well to paradox. This sentiment about behavioural complexity is also reflected by Denison et al. (1995, quoted in Jay, 2013, p. 154):

> The test of a first-rate leader may be the ability to exhibit contradictory or opposing behaviours (as appropriate or necessary) while still retaining some measure of integrity, credibility and direction. Thus, effective leaders are those who have the cognitive and behavioural complexity to respond appropriately to a wide range of situations. [...] If paradox exists in the environment, then it must be reflected in behaviour.

Thus, conditions may contain elements of paradox and leaders may adjust their behaviour accordingly in order that they can respond, strategically or otherwise, reflecting that environment. This claim refers to the individual level. However, as Jay (2013) shows, the reflection in behaviour of paradox in the environment can also be observed at the collective level. In that study, a collective in an energy agency with dual public- and client-service missions responded collectively over time to the paradoxical outcomes of trying to serve both simultaneously, changing its identity over time through sense-about and responding to paradoxical tensions. This ability to 'exhibit contradictory or opposing behaviours' while still maintaining their integrity and ability to keep working towards their ends was done through continuous effort to address tension. Thus, the (presence, emergence or creation of) conditions in which paradox becomes salient, along with actors who are cognizant of paradox, can be accompanied by behavioural complexity. That can result in innovative responses in the form of, for example, changing local practices and identities that address paradoxical tensions in new ways. Individuals and collectives that encounter and respond to paradoxical tensions can thus be productive sites of innovation within organizations (see also Quinn and Cameron, 1988; Smith et al., 2017).

Levels and nested tensions

Tensions can exist across levels, with one pole at one level and the other at another. They can also be *nested* across levels, meaning that the same tension manifests at different levels (Andriopoulos and Lewis, 2009) and thus, responses to tensions can also appear at different levels. Paradoxical tensions between for example, newly adopted goals at the organizational level may then manifest within projects and for individuals in different ways, and can thus also be responded to at workgroup or individual levels (Jarzabkowski, Lê and Van de Ven, 2013). For example, an organization that is tasked with providing both public and private value will encounter tensions between oppositional organizational objectives (e.g. Smith, Gonin and Besharov, 2013) and this tension can manifest within projects as partner-participants from business and from civil society expect different product outputs, or at individual level as organizational members are torn in two directions, experiencing personal value tensions as they try to reconcile serving, on the one hand, business/financial interests, and on the other, the common good. Others have

called this expansion of tensions across levels a 'cascading' effect (Gilbert et al., 2018), as tensions from one level cascade down to others like water falling.

Responses to tensions and paradox

Tensions are not only found throughout organizations, but are (or at least can be) felt acutely by actors when they become salient (Clegg, da Cunha and e Cunha, 2002), and this affect can spur reactions of different kinds. Different types of responses to paradox and tension have been theorised (e.g. Poole and van de Ven, 1989; Smith and Berg, 1997). How organizations and their members respond to tensions is important as responses affect outcomes. Smith and Lewis (2011) argue that managers can best serve their organizations by adopting a both/and approach; accepting that tensions may not be resolvable and working with them rather than defending against them or trying to solve them. They can go from seeing either/or dilemmas, to achieving both/and thinking that sees tensions as perhaps contradictory but also able to be addressed, and eventually getting to a 'workable certainty' which accepts a kind of a stable ambiguity (Luscher and Lewis, 2008).

Responses can also influence organizational outcomes over time, becoming embedded in conditions and setting the ground for how we respond in future (Jarzabkowski, Lê and Van de Ven, 2013). In other words, responses in one period of time may affect how we respond or are able to respond, when tensions arise in future.

Van de Ven and Poole (1989) point out four different strategies for managing, 'working with' tensions. These are *acceptance and working-with, spatial splitting, temporal splitting,* and *transcendence* with respect to how they deal with the poles of a tension. In other words, either one tries to have a range of strategies for dealing with both *poles* (or oppositional elements) of a tension, or splits them either across space or time. The first response, *acceptance*, is to accept the paradox and "learn to live with it" (*ibid.*, p. 566). This allows for potential creative thinking towards productive use of tension; its implications for the organization are 'pursued actively' rather than avoided. *Spatial splitting* involves locating different poles at different levels or locations within the social world. This deals with paradoxical tension by addressing its different poles in different locations, say within different departments in an organization, in an attempt to neutralise or 'eliminate' the tension. *Temporal splitting* involves separating poles of tension and dealing with them one by one across time in a kind of oscillation, a back-and-forth movement that first attends to one, then attends to the other. This deals with paradoxical tension by taking on the competing demands of the tension at different time periods, in an attempt to avoid tension by, for example, avoiding feelings of absurdity or confliction that emerge (Smith and Lewis, 2011) when both poles are side by

side at the same time. Another strategy is to attempt *transcendence* of paradoxical tensions by finding a new concept or way of seeing the tension that eliminates its oppositional force, so that the "novel composition dissolves or supersedes the opposition" (Van de Ven and Poole, 1989, p. 574). Here, by forming a new conceptual understanding of the tension encountered, one can get beyond it to new cognitive ground.

Table 2. Managerial formulations of Poole and Van De Ven's four options for researchers addressing paradox, adapted from Beech et al. (2004)

Response option	Poole and Van de Ven's (1989) description for researchers	Formulated as managerial responses
1	Accept paradox of A and B and cope with or find productive use for it	Accept and/or engage (to live with or transform tension)
2	Resolve A and B by arranging them at different locations	Spatialise (to eliminate tension)
3	Situate and address A and B at different temporal locations	Temporalize (to avoid tension)
4	Find a new perspective which eliminates the opposition between A and B	Synthesise (to transcend tension)

It should be noted that Van de Ven and Poole's (1989) article was aimed at researchers. It is to do with conceptual work and theory development, rather than practical-managerial advice or implications. Still, as a generic set of potential responses to persistent oppositional tensions, it holds value for researchers or managers. However, one can see the overlap between the first and the last responses. Learning to live with paradoxical tension and putting it to productive use, and finding a new concept or perspective on it are hardly mutually exclusive. Especially given that concepts or perspectives may not at all resolve or eliminate the underlying tensions, especially if they are (at least in part) existing in conditions rather than only cognitively as seen by actors. In other words, a way of accepting, living with, and using tensions productively (the first option) may be to find concepts and perspectives to make sense of it in new ways (the fourth), for both oneself and other audiences. Transcendence can thus be a means of achieving the first, especially over the long run given that paradoxical tensions resist resolution and thus our concepts may only offer partial and/or temporary transcendence.

Table 2 offers a productive sensitizing lens for empirical analysis. Sorting these different possible responses into these four categories helps to make sense of different ways of managing tensions. However, more recently other authors have grouped such responses to paradox and tension in a way that emphasises the stance of the actor encountering them. Jarzabkowski, Lê and

Van de Ven (2013) sort the various different kinds of responses to tension into a neat distinction, using the categories of *defensive* and *active* responses.

Defensive responses "provide short term relief" allowing people to "temporarily overcome paradoxical tensions but do not provide a new way to work within or understand paradox" (Jarzabkowski, Lê and Van de Ven, 2013, pp. 248–249). Defensive responses to tensions include the abovementioned splitting of the poles of a tension and dealing with them separately. This can be done partially/structurally–e.g. one department handles one, and another handles the other. Or, it can also be done temporally, responding to different poles of a persistent tension at different times. The authors also include in defensive responses, 'reaction formation' in which, unwilling to compromise, actors heavily favour one pole generating opposition with the other pole, and 'ambivalence', in which actors vacillate back and forth.

Active responses, on the other hand, "attempt to deal with paradox on a longer-term basis" and "acknowledge paradox as a natural condition of work" (*ibid.*, p. 249). Active responses include *non-confrontation*, in which paradoxical tension is actively avoided altogether, *acceptance*, in which tensions are lived with and/or worked with or through, and *transcendence*, in which the poles of a tension are moved-beyond. Transcendence is reaching "a higher plane of understanding in which paradoxical elements are understood as complex interdependencies rather than competing interests" (*ibid.*, p. 249) (see also Smith and Lewis, 2011). One way this is achieved is through reframing and paradoxical thinking. Yet tensions and paradox can remain, because reframings, perspectives and new concepts are not permanent and may not remove paradoxes so much as rethink them. Thus, even transcendence is ultimately temporary (Abdallah, Denis and Langley, 2011).

2.7 Chapter summary

This chapter has tied together several parts. The conversation on turning towards sustainability in organization and management studies, the relationship between researchers, sustainability and 'grand' challenges and transdisciplinarity, the study of tensions in research in particular in inter- and transdisciplinary research contexts, and some conceptual features of the way tensions and paradox have been addressed in organization and management studies. The aim here was to give a theoretical background and conceptual frame that are utilised to answer the research question.

In this study, we look at transdisciplinary research, in particular as it relates to sustainability-oriented research contexts, addressing a need to extend our

understanding of this phenomenon. I argue that insight can be gained into the management of transdisciplinary sustainability research from an in-depth look at the micro level. Further, that studying the establishment of and work within a nascent center could extend knowledge of the organizational aspects of transdisciplinary research and offer insight into the challenges that research managers and practitioners in such centers face in their work. Conceptual tools from tensions and paradox literature are selected in order to help tease apart the empirical material gathered, making the argument that closer attention to and ability to understand and handle organizational tensions, be they paradoxical or otherwise, can advance understanding of transdisciplinary research. It also can provide insight for managers and organizational members, particularly in settings characterised by complexity and plurality, like transdisciplinary sustainability research.

Chapter 3
Methods: *Studying a research group's journey*

3.1 Chapter overview

This chapter shows how the study was carried out and constructed as a dissertation. It covers the fieldwork including the collection of field materials, how the material is used, and ethical considerations. It also addresses how and why the study is written up as it is, describes the analysis procedure, and discusses methodological issues in studying tensions. Finally, it gives some descriptive background information to inform the field study.

3.2 Fieldwork

Gathering material

I collected the materials for this study within a period of 18 months between 2018 and 2019. A visual timeline of visits and local events is presented in Figure 1. In addition, I attended a five-day event in 2017, which features in the thesis, as part of the fieldwork, as a pre-study. During the 18 months, in-person field visits were concentrated in four periods of two to three weeks each time. During these visits, I was at the organization from morning until evening. I observed special events such as conferences and workshops, and everyday working life at the center. I attended meetings and events the group arranged, interviewed members of the organization, read their publications, ate lunch with them, joined social events outside work, attended seminars in person, and so on. I engaged in many informal, spontaneous conversations with members of the center. Over those 18 months, I also conducted some online interviews, and attended some seminars online. I also attended a day-long affiliates meeting for researchers attached to the center, which was converted to an online event due to the COVID-19 Pandemic. Overall, I attempted to get a feeling for how the group thought and felt together and as individuals.

Figure 1. Chronological view of field visits corresponding to local events

The first visit was 'explorative', in other words, I tried to be as grounded as possible and open to possibilities and patterns raised by the setting, the organization, and by the subjects. During further subsequent visits I explored themes and issues that seemed salient for my participants, and allowed for flexibility in selecting the concepts that would form the conceptual frame. On the second visit, I spoke with all permanently employed members of the organization, interviewing most of them. In interviews I was seeking to understand 1) the narrative of 'start up' and initial phases of the organization, 2) their thinking about how the organization is/should be structured, 3) their perceptions of the meaning of their work, for themselves and for others (regional actors, public), 4) who they were collaborating with, 5) their perceptions of the organization's identity (including what was threatened during organizational changes). On the third visit, the organization had expanded, and newer employees who had not been part of the initial research group, the

Climate Laboratory, were now employed at the Climate Center. In these interviews I focused more on their everyday work, why they had joined the research center, what they saw as meaningful in their work. On the third and fourth visits I continued deepening the discussions I had previously had with interviewees. I continued discussions about the organization's expansion with the Director and research coordinator. By this stage, it was clear that a few themes/areas were particularly important. The transition from an early small group to a larger center was one, and another was their relationship to society and the meanings, perceptions and practices that were important to forming and demonstrating that relationship.

I approached the fieldwork as an ethnographic project, one in which I would produce, if not a full ethnography, at least a host of material gathered through participating, observing, interviewing and collecting artefacts and texts. The approach of the ethnographer would certainly be useful. Practically, this involved several main tasks which Kunda (2013) summarises so:

> Ethnographic research, in practice, consists of four very basic activities, regardless of the fancy names attached to them by methodologists seeking legitimacy in various popular genres of academic rhetoric: observing people's activities, talking with people willing to answer questions about their life, collecting texts of various sorts produced, preserved and consumed by the people one is studying, and devising ways of keeping a comprehensive, detailed and reasonably legible record of all this. (Kunda, 2013, p.14)

Below, I outline how I approached these tasks and how I moved on to working analytically with the material.

Interviews and conversations

I conducted 36 semi-structured interviews, which range in length from 40 minutes to two hours. A full list of participants, some individual's details and the times at which they are interviewed are provided in Appendix 1. Most interviews were conducted with members of the research group and new members of the center. I also interviewed the Dean of the Social Sciences Faculty, and a group of students who had been involved in a conference and various other activities related to the research center. All were transcribed in full. All interviews were stored as Word documents.

I see the interview as an 'orchestrated conversation' between researcher and a participant in which meaning is co-created. I also see them as a site for identity work, in which people can both realise and perform extant or desired identities (Alvesson and Sköldberg, 2009). Further, I do not see interviews as being islands in which events happen outside the field setting. Rather, they are

conversations going on very much as part of the rest of what is happening in participants' everyday lives. This was even more so the case as the interviews were conducted at their workplace or on the grounds of the nearby campus and museum. Other conversations and observations occurred at various organized events the participants were managing or attending, again, very much as part of their work and in the field setting. Here I follow, in a general sense, Baker (2001), who places interview material on the same 'level' as other material, seeing the interview in no way an exit from the field setting.

Czarniawska (2014) reminds us that when it comes to participants' talk in interviews or the texts they have produced, we need not be concerned how to ensure people's statements about 'what happened' is historically accurate. Their constructed tellings need not be taken as fact. Rather, these interviews or texts should be seen as *accounts*. The organizational researcher can then become curious about the processes, structures, culture, ideas and so on–depending on the inquiry–that have been in play the production of such accounts; the context in which such accounts arise.

Observant participation

Over the course of the multiple visits to the field site and participation in online fora, I collected observation notes and participated in activities. What Czarniawska (2014) calls being an *observant participant*, rather than the usual label of *participant observation*, emphasizing a less hierarchically inflected role for the researcher in the field situation. Relevant field situations included internal meetings about general workings of the center, research seminars at which members of the Climate Center and/or Climate Laboratory were present, sometimes presenting work. It also included informal meetings in which participants and others were debating or discussing organizational matters, and spontaneous discussions in the hallways–both those I witnessed and those I was part of. Regular-day lunches–a surprisingly rich site for getting the feel of the place and group–in which many topics about the group and its concerns and hopes were discussed. I also had numerous conversive interactions with participants that were not within the orchestrated bounds of an interview, and these also informed my study. Often after these, or at occasions during, I would take notes, some of which were detailed and others more haphazard.

I also attended several events in which Climate Laboratory/Climate Center members and many external guests also participated. These were an 'Affiliates Meeting' in 2019, the Renewable Futures three-day conference in both 2017 and 2019, and an 'Accountability in energy transitions' two-day research workshop in 2019. These events also provided space for me to see my research subjects presenting themselves, their work and their ideas to audiences. They also gave me a chance to see how they organized interactions with other

researchers and the public. These were also instances in which I could observe people's attempts to present themselves as a certain type of group, and could see how the team functioned to do this. I was also able to see important issues and tensions in their efforts and actions, and as they discussed with each other 'backstage'. Each of these formal events came with several informal moments and chances to interact with and observe people. I often joined for these activities, such as walking in the city or hiking, lunches, dinner, etc. This allowed me to meet and talk with many participants and question them about their view of the work the Climate Center and Climate Laboratory were doing.

I kept what I entitled a "Field diary" filled with reflections on the days' happenings and specific salient moments, along with jottings of notes and theoretical reflections that attempted to capture experience and thinking. Some of these entries also informed the empirical chapters, provided material for analysis and recording early analytical thinking.

Documents

I have collected other documents relating to the founding of the center from the period 2015-2017. These documents familiarised me with the case and provided materials for analysis and validation during analysis of interviews and narratives. These include internal notes and presentations, internal discussion papers, preparation notes for meetings, summary notes from meetings, and PowerPoint slides for presentations. Cocktail napkins on which the original ideas were drawn. I also have collected newspaper articles reporting on the awards, grants and achievements of the group.

In addition, applications for a research grant to expand the center with funding for 8 years which was recently submitted. Finally, several of the organization's members co-authored a published reflective article on what it means for them to do 'transformative science' as social scientists in the field of climate and energy. It included examples of work in which they felt compromised or confused, and showed some thinking about the organization's identity and role in the region. Reading this helped me in forming some interview questions. In addition, I have scanned website texts and latest cited publications from the researchers. Table 3 presents a selection of key documents showing personal thoughts, idea formulations, and formal letters from the formative years of the Climate Laboratory and center circa 2014-2017 . In addition, as with all long-term case studies, I also consulted countless other less important documents and information sources in familiarising myself with the setting and participants.

Table 3. Documents used as empirical material

Documents	Source
Climate Laboratory idea papers (idea stage)	Johannes
The Climate Center discussion papers (idea stage)	Johannes, Discussion Group
The Climate Center presentations of the organization to various groups	Johannes
Reflective article on practicing transformative science co-authored by Climate Laboratory	Jonathan, Solveig, Johannes, Jessica, et al.
Applications to Norwegian research council (submitted and still under review as of Feb 2019)	Climate Center
Newspaper articles	The City Times, various other publications
The Climate Center, Climate Laboratory and Norwegian U websites	Norwegian U
Written descriptions of fieldwork in the form of presentations/texts	Various participants
Records of research group / center budgets and lists of affiliates, publications	Center administrator
Zero Carbon grant application	Research coordinator

How materials are used in the study

These and other material gathered, as described elsewhere in this chapter, including notes I had written in the field, my own reflective diary entries, official university documents, documents produced by participants, articles about them by local news organizations, and other artefacts, and were stored together into a project in the coding software NVivo.

These diverse materials were drawn upon in the construction of the study. Some are directly quoted. In most cases, when participants are quoted in the following text, quotes are taken from interview material and are clearly marked as such. However, there are some instances where I recount words spoken and actions taken in public-facing events. In these instances, I have either transcribed quotes word-for-word, or have used a recording of the event made by either myself or as part of the proceeding which was then later shared. In informal situations, any quotes were jotted down by me after the fact or during the interaction. As I elaborate upon further below, the research report, some events are rendered drawing upon my memory, and offered as more 'impressionistic tales' of the fieldwork.

The empirical chapters were pieced together using the corpus of interviews, documents, notes, artefacts and the memory of the author. Central to this was the accounts of the members of the Climate Laboratory/ Climate Center and their stories. I also queried the participants when necessary, in particular the Director who helped me with the chronological sequencing of events I cover. In this sense the empirical chapters are co-constructed with the field members.

Ethical considerations about materials used

As the reader will already be aware, the text has been anonymised. The intention here was to retain the anonymity of members interviewed, so they would not be individually identifiable. Even though I and the participants were not covering particularly ethically sensitive issues, I decided on the anonymity simply because there was little reason for more specific identification of individuals or the organization. However, as the reader will be aware, I have attempted keep some of the local details of the setting and group front and center, even with the anonymisation, in order to give a sense of place and to make use of the fieldwork. This was a decision made in service of the substance and aesthetics of the text for the participants and the reader.

All participants were currently or had been previously working academic researchers, and were aware that the material I was collecting would potentially go into a publication. However, the participants had different backgrounds and some were not well-versed in qualitative or fieldwork-based research. Nevertheless, they were made aware that the interviews, documents and my own observations while at the center would be used as part of a published research project. This was conveyed verbally in person at several staff meetings and also in face-to-face conversations with individuals about my project, when requesting interviews or to join activities.

All participants were offered the chance to review empirical material used in this thesis before its publication. In a personalised email I provided each of them with the information that the text was anonymised–their names and the names of the organization and city were changed. However, as I also informed them, those familiar with their research group and research center would likely recognise it. They were offered the opportunity to read the empirical chapters and the interview material used in the final text and make suggestions on accuracy and or any other comments or misgivings they may have. And further, that they should feel free to point to any sensitive information they may feel needed special treatment or they did not feel comfortable with. What they were offered did not include the parts of the text that show my own framing of the study, analysis or discussion. They were only offered the empirical material. All members responded to this personal communication and all participants approved the material for use. Some declined to read over the

text, and confirmed they were satisfied with any use of the anonymised material I wanted to undertake. Others inspected the chapters, with two participants giving comments on accuracy and that context for some quotes needed to be better described. These corrections were relatively small and were made in the final text.

3.3 Research design and site selection

I first familiarised myself with the case by attending a two-day conference organized by the Climate Laboratory research group, *Renewable Futures*, which was followed the next day by the official launch of the Climate Center. Both of these events happened in October 2017. During this first visit I met members of the organization for the first time. It seemed to me that I was meeting a group that was in the midst of change. They were encountering problems and processes probably experienced by other research groups. But their situation also offered some unusual characteristics. They were a new entrant into a politically charged field, and it seemed they would need to negotiate the boundaries of science and policy for and within the university. They were being presented as a good example of the university's action on sustainable development. They used concepts of sustainability, transformation, engaging with societal actors, an example of the kind of group I am interested in. Perhaps more interesting at the time, the politically charged and conflicting views given by politicians, scientists and industry representative at the public opening day of the center seemed to constitute a 'breakdown' of sorts for the members of the organization. It did not run as they expected; *this* I found interesting. Some were visibly agitated. During this opening I took some notes and photographs, however, I had not yet started to see this as fieldwork.

A former colleague who was employed at the center was my first point of contact in asking for access to come to Norway and study and participate in their work. He also offered guidance and encouraged me to study the organization. He seemed interested in having me study and write about the educational work the center was doing largely due to his effort: they were trialling a 'student-driven' initiative they called, which was initially a focus in my fieldwork. However, as the study proceeded, other parts of their group's work group became more interesting.

Initially, I conceived of this study as being best carried out through a comparison-focused design. I would visit multiple sites and make comparisons between what I found. However, several decisions and external events led to, in the end, focusing on one case. The focus of the study started to shift as the

research progressed, meaning that some ideas in the initial design needed to change too. As I got to know the setting, and to see what was important and salient in it, the focus shifted from the level of the university to the level of the small group. The research design in its provisional and developing stage shifted from university sustainability to the study of a research group. This did not preclude a comparison-based study by selecting multiple cases, but initial thinking about which settings to carry out the study was no longer valid–instead, time went into trying to rethink and rework the study into something that tracked much closer to the story of this one group, and could conceptually offer something new to the study of these socially engaged climate researchers in action. This flexibility to rethink the relationship between the empirical study and that which it is 'a case of' is central in case study research, that is, qualitative work that samples data through the selection of cases. This also can entail shifts in research design.

Single significant case

Case studies offer the chance to delve deeply into rich instances of phenomena. Thomas (2011) points out that case study research comprises two components that exist in continual tension with each other: what he refers to as the *subject*, the particular instance one is studying and the *object*, that generalized conceptual frame which studying this object has the potential to explain (and/or challenge, extend, etc.). For Thomas (*ibid.*), The subject is in no sense a sample that is representative of a wider population. Rather, the subject will be selected because it is an interesting or unusual or revealing example through which the lineaments of the object can be refracted (*ibid.*, p. 514). However, the object that the study will ultimately inform can emerge in the course of the inquiry and can thus change over the course of the study, perhaps multiple times. When this happens, this also redirects the researcher's attention to different elements of the subject being studied. Thus, the relationship between subject and object is always a dynamic one. As one gets further into observing the particular instance, one may realize that it is a different object that one thought going in. A study of community gardening in an urban neighbourhood turns out to be a case of organizing across racial divides. A study of the workings of an agricultural authority turns out to be a case of cooptation where legitimacy is shared but not power (Selznick, 1966). This shifting relationship is the generative potential of the process of qualitative case research that makes it so valuable. And it is enacted by the continual querying of the relationship between subject and object–a process in which the researcher asks again and again, 'what is this an example of?' (Kunda, 2013).

In this study, I am sampling a single significant case. Within this approach are two points I will expand upon here. The first is looking for a high impact case, for example an elite or powerful organization, or a highly visible, culturally

salient instance of a phenomenon, e.g. an individual or policy (Patton, 2015). Another is sampling an exemplar of a phenomenon of interest. In this approach, individuals, events, organizations, groups, and policies can all be case studies (*ibid.*). In involves straightforward selection of a case of a particular phenomenon that is mysterious in one way or another, and that once completed offers us new insight into that case study. Anthropology and sociology offer up well-known, sprawling examples here, such as William Whyte's (1993) *Street Corner Society* in which he rendered a picture of the social structure and experience of life in a poor Italian neighbourhood. The degree to which a case can be said to fall into one or another of these categories is first in the eye of the researcher, and then depends on convincing arguments to the readers that it does. What makes a case elite or highly visible depends on perspective–does being located in one of the wealthiest countries on earth make a case high impact? Does wealth or notoriety make a group elite? If the latter, what is a particularly good instance of a phenomenon of interest? The researcher's access to it, the presence of a good mystery, a successful project or one full of conflict? These questions are to be asked, but their answers depend, in the end, on *what the case is interpreted to be a case of*–that is, the relation between subject and object. Going into the study, I selected this single significant case with consideration to both of these categories. The center we visit was selected for its newness, the politically charged issue it addresses and location in an internationally known university in a country with a 'high impact' university sector. It was also selected as an exemplar of a phenomenon of interest. I saw it as a potentially providing a good sample of a group working towards sustainability within a higher education institution, and that was still in the process of developing and working through challenges.

Level of analysis and units of observation

The study focuses on the management and organizational activities of a *group* of researchers. Thus, the level of analysis can be said to be at the meso-level. For comparison, an example of the micro-level could be the individual researcher, and an example of the macro-level could be the entire higher education system. The units of observation in the study are several, in that I have observed individuals, artefacts and interactions between people. These units of observation, however, are used in the study to inform the analysis, which is interested in gaining insights that illuminate the group level.

Interviews are, of course, accounts given by an individual and to some extent co-created in an interview exchange situation. But the material in this study is quite often taken to tell us something about the level of the group. This is an important distinction to make–when the Director talks about his choices and dilemmas, we could investigate these accounts as, for example, about his own personal career. And they most likely are those too, but here focus I on how

his accounts, thoughts, emotions refer to, influence and are part of the collective. We look into them in forming interpretive insight about the organizing of a research group, rather than solely focusing on how an individual feels, for example.

3.4 Writing up

Van Maanen's (1988) delineation of writing styles in *Tales of the Field* outlines three 'styles' for writing up fieldwork: *realist*, *confessional,* and *impressionist*. In *realist* tales the reader is offered a naturalistic rendering, in which "a single author typically narrates" in a "dispassionate, third person voice" (p.45). The realist style, more than the others, "pushes most firmly" the representation of the group, setting, culture, etc. conveyed in the text as an authentic representation. As the reader will see, it is this style that I, like most other studies, lean heavily on in constructing my own tale.

In *confessional* tales, the author adds their personal experience of fieldwork and participation as it happened, showing the looseness and open-endedness of fieldwork as a project. In contrast to the naturalistic rendering with 'a voice from nowhere', in confessional style the author tries to show that "the ethnographic report is more than a personal document, it also something disclaimed by proper fieldwork habits" (*ibid.*, p.74) and that they have grappled, imperfectly, with the "epistemological problems characteristic of social science". As van Maanen points out, confessional style does not replace the realist style but is often placed alongside it. This I have done in limited ways, included predominantly in this methodology chapter, rather than having it alongside or interwoven with the field material. Having tried this early on, I decided it did not add a great deal to my study and added an I wanted to devote my attention during fieldwork to the happenings in the field (such a personalised and self-focused style not only requires having recording one's own experience well, it is also about choosing to invest the attention and time to writing it well).

In *impressionist* tales, a term borrowed from art history, the author is seeking to "evoke and open, participatory sense in the viewer" (*ibid.*, p. 101). This style captures a particularly salient moment or scene that occurred for the fieldworker. Here the author can seek to evoke a particular affect relevant to the field, and uses as material "words, images, metaphors, imagery and most importantly, the expansive recall of fieldwork experience". It perhaps crystallises a theme or themes in itself (see also Emerson, 2004) or presents a story from which "reflective, meditative themes" (*ibid.*, p. 101) are spun off into longer threads within the study. I have made sparing use of this style in this

study, including the opening section entitled "Launch", in order to give a sense of place and raise some of the themes of the thesis in microcosm.

The thesis is written in a structure of an opening vignette, an introduction and theory chapter, and several empirical chapters, followed by an analysis chapter that includes some empirical material and then a discussion of the findings. Throughout the study I recruit all three of these styles of writing, leaning most heavily on the first, but including in places the others. Ultimately, I did this to retain the character of the study as emerging from an act of fieldwork experience, seeking to make a convincing rendering. As van Maanen points out in a later piece, despite the numerous problems with seeking 'true' representations, the credibility of fieldwork is still fundamentally grounded in of the act of witnessing (van Maanen, 2010), of having been there and experienced the place and its unfoldings and giving an account of those that is convincing. Whether or not I succeed in this is, to an extent, up to the reader to decide. The aim was, however, to offer rich descriptive detail and then a later analysis in keeping with the focus on rendering, representing, the field setting. This contrasts with the approach of taming all the material within the frame of the analysis as some studies do–basically moving from a discussion of method to the material already presented within the frame of the analysis. While that approach may be briefer and there is value in that, the reader remains at an extra remove from the empirical material.

Construction and analysis of qualitative empirical material

For Geertz (1983), the aim of the ethnographer is to try to understand *what people imagine they are up to*, what they *are actually up to,* and *to what ultimate ends*. The key then, is to try to describe how they achieve that end. But we must strive to do it in a way that is not merely feeding back the field members' own words and ideas to the reader. This, van Maanen (1988) points out, is a common ditch in which to get stuck in field studies. It is a ditch I have not entirely avoided in this study. However, I have attempted to offer an interpretation that goes further than this mere feeding-back.

Strathern (1999) writes about the double location of fieldwork; the two 'fields' that open up for the field researcher. The two uses of the term 'field' here are, first, the one in which material is collected and events experienced–during the fieldwork–and second, the one in which it is being written-up "in the study, at the desk, or on the lap" (Strathern, 1999, p. 2). The interrelation between these two fields, locations, is one of movement. Insofar as the ethnographers' [two] locations can be seen as alternating, each offers a perspective on the other. One reason fieldwork is so challenging, writes Strathern, is that it is an act done with a mind tuned towards expressing it another way entirely; in writing.

The next step after fieldwork, as we know, is to write up the study with the help of other thinkers and theories.

We usually admit a large role for the researcher in exploring and attempting to record the empirical world, describing and analysing, and so on. But we may also register the considerable power over constructing empirical material that comes with any fully realised research inquiry. In this view, data is not seen as the building blocks out of which theory is raised. But rather the researcher constructs material and its analysis.

> […] researchers will always construct the phenomenon they are studying. We must in a sense invent the world we are trying to understand (Alvesson and Kärreman, 2011, p. 38)

The research then proceeds as a dialogue between researcher, empirical material and a range of possible ways of interpreting it. This means taking a position on research in which the researcher (for better or worse) takes or admits to responsibility for more decisions than in other approaches. Alvesson and Kärreman emphasise this 'constructionist' (not constructivist) position on the nature of research:

> The various turns or passages where construction work is done are important to consider. If one looks closely at the research process, there are further constructions after the construction work that is carried out in interview settings or in producing observational protocols. These further constructions (coding, interpretation, analysis), or reconstructions of the social constructions, are produced or read into the lives of those studied–and also known as 'data'. The systematic consideration of a variety of 'native-constructions' and 'researcher-constructions' then offers various possibilities (and possible pain) to researchers trying to open up material for novel and surprising constructions (Alvesson and Kärreman, 2011, pp. 33–34).

They contrast this approach with other inductive approaches, such as strict adherence to grounded theory (Glaser and Strauss, 2009), or to phenomenological approaches. Taking multiple readings of the same material increases the "chance of encountering/producing novel constructions–opening up rather than letting common sense (as in grounded theory) determine 'reality'" (Alvesson and Kärreman, 2011, p. 43). Given the constructed nature of research at every stage, the authors' claim is that the researcher's job is primarily to interrogate material for interesting theoretical insights and plausible claims, rather than be ritualistically faithful to only showing what is 'in the data'. In this view, *verification* of these insights and claims is seen as valuable but secondary and often not entirely possible. Theory cannot always be 'checked' against reality in a straightforward way. Analysis is thus not simply a matter of letting the data itself 'point to a correct use of language' with which to

describe it. It is rather about the researcher trying to create a range of possible frames and meanings through which to view the empirical material they have, in search of interesting theoretical insight (*ibid.*, p. 39).

3.5 Analytical moves

Initial sensitising concepts

I came in with a set of sensitising concepts that I had thought were relevant to the study: Roles, Sustainability, University-society relationship/boundary/interface, Practice. These initially guided the study and my research questions. I was interested in how people understood and responded to their formal roles as researchers, given that they were trying to change the institution they were a part of. How did they see their roles? What did they think was expected of them? How did insistencies here create conflict? Further, how did they put the fuzzy concept of sustainability into practice in their work? What challenges did they face here? And finally what kind of work practices did they use/develop? I also reasoned that as sustainability research was concerned with societal problems, the question of where the university ends and science begins and vice versa, would be of concern them–how did they negotiate this as thinkers and in practice?

After spending some time in the field and with the material I was gathering along the way, it started to become clear that other sensitising concepts were going to be relevant, and I set out to find them. The initial concepts were still useful, in that they oriented me towards an area of the empirical world undergoing change characteristic of wider social and cultural changes, and offered a chance to study a sample of a group of people who were engaged in work that is valued and arguably consequential to societal outcomes.

On closer inspection, and as I adjusted the research design, other concepts came into view. It appeared that *membership in the group* I was studying raised important questions of and challenges for the *identity* of its members. These issues and responses to them changed over time as their setting changed; as they established their research center. *Tensions* arose and were managed with ensuing consequences, and these were at times responses to rules and policies encountered in their environment. In addition, it seemed useful to not only see them as a subgroup in a larger organization, but as a *research group* engaged in knowledge production activities, and for whom professional, expert *identity* was of central concern. Rather than looking at work practice alone, the shaping of a story about who they are and what their work means seemed crucial.

Analysis of empirical material

A new conceptual framework started to emerge during, but mostly after the fieldwork was completed. The data analysis proceeded through stages of *sorting* and *reducing* as part of the overall process of analysis. Initially the data was somewhat chaotic. I made the choice early on to take an interviewing style that would allow for my participants to offer wide-ranging accounts of their work, workplace and thinking. A main aim was to allow me to see as far into their context, and what they saw as important, as possible. Rich qualitative data is by nature chaotic no matter how structured the researcher is in collecting it (Rennstam and Wästerfors, 2018). Interviewees and observation notes are collected in somewhat unfamiliar contexts with unpredictable subjects and contains all kinds of themes bound together.

The material was first sorted into broad themes that were guided by initial sensitizing concepts. Several rounds of detailed coding were then generated using a grounded, inductive approach, often using action-words and in a concerted effort to "stick closely to the data" (Charmaz, 2006, p 47). Three main coding strategies were used. One coding strategy was to 'identify local terms' that seemed to be significant to the participants and their world. The terms came up often in conversation, seemed to be used to refer to multiple different things, and/or were offered up as ends the part participants sought to achieve. These are what Ryan and Bernard (2003) call 'indigenous categories' or typologies used by participants. Another was looking for 'repetitions' (Ryan and Bernard, 2003): topics that reoccur regularly throughout material (e.g. 'societally relevant'; 'how we collaborate with non-academic actors'). And a third was inspired by Grounded Theory's notion of constant comparative method, in which the researcher constantly compares data to existing and new data, and existing researcher-developed categories, asking how new data fits or doesn't, and then rethinking categories appropriately (Charmaz, 2006). This is what Ryan and Bernard (2003, p. 91) call looking for "similarities and differences". Here the researcher sees how findings are similar to other findings, and is also able to see difference and make distinctions within categories, sharpening categories' analytical insight. Throughout the project, coding and memo-ing (Charmaz, 2006) have been used to sort the material, develop categories and capture researcher insights.

Several initial *sensitizing concepts* were initially present in the interview guides/questions. Initial coding used these categories to do some preliminary sorting, although this was (in hindsight, with the benefit of having crafted a more developed analysis at the time of writing) rudimentary. These concepts were: (1) past work vs. today's work, (2) relationship to university, (3) relationship to society, (4) characteristics of everyday work, (5) challenges faced,

and (6) view of sustainability. As the analysis proceeded, these were left behind and the material was sorted with other strategies.

Later, several *local terms or categories* were identified: (1) producing "actionable knowledge", (2) being "societally relevant", and (3) being part of a "transformation". They are dense terms, having multiple usages that define and distinguish different aspects of work, and broadly refer to the researcher-society relationship. These terms themselves are not unique to the local context, however they were used in ways unfamiliar to the researcher and seemed to refer to a range of different activities and locally-specific ways of thinking. The local terms sensitized me to the research-society relationship that seemed to be a central focus for members of the Climate Center.

In interviews, participants often would often offer accounts that exhibited or reflected upon tensions and contradictions in how their work related to society, and about their relationship to the rest of their university. In conversation, participants did not appear to give rote or routinized answers. They often became reflective and seemed to try hard to make sense of what is an ambiguous area for them. What this relationship is or should be was not settled locally. I started to turn my attention towards this, being sensitive to the fact that figuring out their relation to the society outside the university, and to their position inside it, was an ongoing concern for individuals and among the group, and was being worked out in an ongoing way in talk and action at the Climate Center.

A theme emerged in which they on the one hand referred to working inside academia/the university research system, and on the other to working outside, in the context of other societal actors, their city, and the broader climate crisis. A category was developed which referred to this different perspective-taking on their own work. Initially I labelled it "activist vs. scientist", thinking this could be a sign of different identities at play. As I investigated and filled out the category further, more or less in the mode of constant comparison, it seemed they were describing various aspects of their work that suggested an *ongoing tension*; a need to be working both inside and outside of academia. The category was edited to "needing to work both inside and outside the academic system". And then, as I noticed them considering the plurality of positions on this issue, later "social scientist vs. societally engaged actor". This tension is visible in (but not only in) discussions around the local terms: "actionable knowledge", "transformation", and "societal relevance".

This led to trying to identify tensions arising in local conditions in different and sometimes contradictory imperatives that seemed to come with needing to work, and see oneself as working, inside the academic system, while also working outside academia and influencing change in society.

It was at this point that I started to make decisions about what areas of theory the study could speak to. Two areas of literature seemed relevant, given the material, my early sorting/categorisations of it, and my reading of literature, in particular that which studied management and organization within scientific contexts. First, *identity*, including the concept of *identity-work*, appeared relevant given members of the Climate Center's efforts to remake themselves within their disciplinary department, and towards projecting a coherent self-image of being those who could contribute to societal transformation for climate issues. Here in particular studies of identity work in organizations were influential on my thinking (e.g. Pratt, 2000; Ashforth, Harrison and Corley, 2008), and Alvesson and co-authors' work on regulating identity, crafting the appropriate subjectivity in knowledge-organization contexts (Alvesson, 2001; Alvesson and Willmott, 2002). And finally, Lam's (2010) standout work that is a study of science using organizational concepts was an inspirational, if not ultimately central, text. Of particular relevance is its study of identity formation as a response to tensions in the institutional environment of the science system, as scientists sought to make sense of their relationship to scientific and commercial logics.

Second, *tensions*, including both studies of tensions in science and research on tensions and paradox in organizations–particularly those taking on sustainability challenges. Here Hackett's (2005) study was influential, but also other works (Hackett, 1990; Hackett et al., 2004; Hackett and Rhoten, 2009) that focused on tensions in science work, and in particular in research groups. In addition, works in the sustainability and management literature (such as Hahn et al., 2015; Van der Byl and Slawinski, 2015) and studies of tensions and paradox in research management (Gorm Hansen, 2011; Ashby, Riad and Davenport, 2019; Cairns, Hielscher and Light, 2020).

I list these influences not to re-enter into a positioning of the study and its contributions, but rather to point to the works that were influential at that stage, in the developing of the interpretive frame for the study *after* the data gathering and initial sorting and building of categories with a grounded approach. Both of these areas, identity and tensions, were initially in focus, but at a certain point the focus became solely on tensions and paradox. There are two reasons for this. First, the material gathered and indeed the main 'basic social process' (Charmaz, 2006) undertaken in the context I was studying seemed to have to do with managing and organizing a research group across difference; working across both the domains of scientific research and societal change, both inside and outside the university, and with academics and non-academics. Second, there were resonances with Hackett's and others' studies of tensions in science that indicated where the best contribution might lay, and that a focus on tensions may help illuminate societally engaged research as a phenomenon. However, for me as the researcher, and as with all research,

indeterminacy and therefore risk is always present in these decisions; one can never entirely know in advance whether a particular chosen path will yield fruitful scientific results. A good deal of intuition and creativity is involved in the research process (Swedberg, 2014). The choice to look at tensions was thus made in a constructive "dialogue" with the developing sorting and categorisation of the material, the literature that appeared relevant to it and was influencing my thinking, and my own intuition and interests (Alvesson and Kärreman, 2011).

Once *tensions* became the main conceptual focus for the analysis, the categories were further shaped to capture tensions and responses more precisely where possible. In terms of coding, earlier rounds of coding were built upon, with some codes no longer being relevant, while others were further refined, becoming more focused on tensions.

For interview material, in particular where people weighed up different forces, imperatives, pathways, options, opposites, etc., this was sometimes as simple as focusing on instances where comparative terms and phrases such as the use of "but" when giving accounts of work practices or reflecting on choices, "on the one hand X, on the other had Y", "at the same time", and so on. In addition, the presence of oppositional, divergent goals or activities in my observations or in interview accounts was also an alert that tension may be present and/or being responded to, and rather than the particular interviewee making the juxtaposition of opposites, it is my own sorting of material that does it. However, where this occurs, the interrelation between divergent poles or elements is clarified in the analysis, for example, that mutually exclusive activities were pursued in different projects within the same center.

3.6 Studying tensions

Constructed or inherent?

Smith et al., (2017) point out that there is a central debate within the literature on paradox and tension in organization and management literature: whether paradox exists out there in systems and is to be managed in various ways by actors, or is constructed through sense making and discourse of actors over time.

I take the position, along with Smith and Lewis (2011) that the tensions we see in this study can be both constructed by actors and latent in certain conditions. They may help explain problems or difficulties that arise due to conditions around the research participants, but ultimately, I am using their accounts and discourse to derive these tensions. So basically, they are not

outside of what I am reading from my actors. Individual people or categories of actors can be in structural positions that suggest they would experience certain tensions more than others (e.g. Lam, 2020), however the tension itself is nevertheless something we can see through the accounts of people in their various forms, and/or through the analysts (my) interpretations of those accounts.

I see tensions as having both inherent and constructed components. Put another way, I take a both/and approach to the question of whether tensions are brought into being through actors' intersubjective constructive efforts, or are present in systemic/organizational conditions. Some studies such as Tracy (2004) or Ashby et al. (2021) focus their analysis entirely on the interview accounts of members and deriving tensions from these accounts. Others focus on tensions as fundamentally present as part of organizing, inherent in organizations. They use interview accounts as data to trace what goes on (e.g. Jarzabkowski, Lê and Van de Ven, 2013), not necessarily taking a positivist view on the phenomenon, but also not emphasising the constructed nature of tensions, rather taking interview accounts as evidence of what went on. In this study I have aimed to describe a local setting and change process, while also giving attention to members' accounts within these local conditions (rather than, for example, relying on decontextualised interviews from members of the same profession across a number of organizations). The focus is still on member perceptions of tensions and responses to them, but changes in local conditions are also important, as they can make tensions salient and felt acutely by members. I do not claim to have rich enough material to be able to show a processual model of inherent and constructed components of tensions as they arise and pass away, or their effect on outcomes. Rather, I can show windows into the empirical world, and make analysis of them with the assumption that it is inherent *and* constructed qualities that comprise the nature of the phenomenon.

Different ways of making a theoretical contribution

In a recent article, De Keyser, Guiette and Vandenbempt (2019) review tensions and paradox literature and outline various ways paradox is utilised for generating theoretical contributions. These include 1) to theorise, to 2) understand and advance existing theories, and 3) to verbalise something puzzling. Of particular relevance in this study is the second approach for making a theoretical contribution–to understand and advance existing knowledge/theories, such as on strategy or leadership, moving that theory forward. The authors identify two ways this has been done in scholarship on tensions and paradox, "reframing phenomena" and as a "managerial problem solving tool". It is the first that I predominantly utilise (although I also conclude with some managerial/policy recommendations that suggests the use of a tensions lens as a way

for research managers and practitioners). Using a tensions and paradox lens to reframe existing phenomena allows getting a "conceptual angle from which to gain a new perspective on a particular phenomenon", and "reframe the indicate complexities of [its] respective theoretical discussions" (*ibid.*, p. 149). In this study, tension is used as such a conceptual angle from which to gain new perspective on the intricacies of organizing and managing university research and its changing relationship to society, specifically transdisciplinary research that aims for social-ecological sustainability–to help bring this conversation forward.

3.7 Reflexive discussions

One always needs to do a little sociology of one's own sociological study–the practical and epistemological challenges of which are not small.

From higher education to the study of a research group

Going into the fieldwork, I found myself on the one hand worrying that the place I had arrived at was too small, not prestigious enough, or not established enough. While on the other hand being worried about the opinions of those I was studying, who were far more accomplished than me and actually doing something I wished I was doing–working directly on what could be called sustainability science, doing engaged research on climate change.

I found all my notes to be terribly boring, and just random observations of organizational life which could have been describing the life inside any university building in Europe. Worse, I was sure I was looking at the *least important, least interesting part* of their work. They travelled to Ethiopia to talk to mayors of cities struggling with climate policy, or did fieldwork in the tar sands of Alberta, and here I was asking them about their daily lives and taking notes in their lunchroom. I'd come into this wanting to find out about the challenge universities faced in putting the concept of sustainability into practice, becoming 'change agents' for sustainable development. And what was I seeing? Academics at work. A center that had not done that much yet in terms of changing the university. And one that was more outward facing than inward facing–working with societal actors and stakeholders, with local government and industry, to be what they wanted to do. They were not doing this to change the university, it seemed to me.

This led me to start reading about how university-society relationships had been theorized. Reading the literature on innovation systems, and the triple helix model of regional innovation. Reading about Mode 2 science, the

apparently new paradigm we had started entering in the 90's, argued for in *The New Production of Knowledge* (Gibbons et al., 1994) and beyond. Apparently, research was now done in service of the knowledge economy. Universities are drivers of global and regional innovation, science was no longer only an endless frontier (Busch, 2011/1945) of knowledge production, but is caught in an 'endless transition' of value creation as the needs of and connections between the three spheres of government, industry and academia shift in rapidly changing societies (Etzkowitz and Leydesdorff, 2000). Maybe this was what I was seeing here, researchers with deep sympathies to social and climate justice trying to further a cause and, in the process, needing to find their way in the knowledge economy? Sustainability at universities was not just a matter of small groups of like-minded and alternative-thinking people trying to do something different in the traditional institutional environment of the university and succeeding or failing. It was about how in their efforts to do this they would inevitably be caught up in a discourse that now pervaded research and higher education policy. And whether and how they were responding to that.

What of all the teaching and evangelizing I had encountered in my Master's degree about inter- and trans-disciplinary research and sustainability? This was delivered alongside critical views of capitalism, markets and mainstream economic thinking like the centrality of GDP and economic growth. Was this different to what was being talked about as 'engaging with non-academic actors to produce innovation'? Didn't we need to do transdisciplinary research, coproduced with stakeholders, to achieve sustainability? Wasn't *that* the reason? Across different literatures, there transdisciplinary research was being described as alternately a new paradigm for research, a driver of the economy, and a way of moving towards a more sustainable society.

And why was it that, rather than being sceptical about engaging with industry and government, about the potential loss of independence which apparently was what critics of the knowledge economy, and scientists who had been dragged into it kicking and screaming were afraid of? Instead what I was seeing here were people thriving in it, their entire project was built on exploiting arguments for needing to get out of academia and close to society as possible. Maximize impact, situate our knowledge, solve the climate crisis, be critical.

On failing to be a credible outsider–the enhanced imposter syndrome of a researcher studying researchers 'in situ'

Researchers doing fieldwork are often outsiders who have been invited to the field members' worlds (or at least, have been tolerated as outsiders). In the classic ethnography *Street Corner Society*, Whyte (1993) discusses a moment in which he began to speak like the Italians he was studying ethnographically.

It happened while hanging out with them on the street in their neighbourhood. One day, he tried adopting their speech patterns and started swearing just as much as they did. A main "informant" (Whyte's term for what I call in this study participants or members) who had brought him along to the corner that day seemed distant, irritated. Whyte did not hear from the informant for some time, and he wondered why. When they did finally speak again, he found his informant was very upset with him, telling him that if he ever did that again he would not speak to him again. What had he done, he wondered? The informant explained, telling him: 'we know you are not one of us. We invited you in anyway. Do you think we will just believe you are one of us if you act that way? Don't pretend you are one of us. Don't act fake.' My reading of this moment is that Whyte learned that in order to be accepted by insiders he needed to continue to be an outsider. In trying, however earnestly, to fit in with the group he had instead managed to be condescending, display dishonesty and nearly lose a key informant in the space of a single interaction.

It seems the dance of being both an insider and an outsider is to be learned in the field. One is bound to trip over one's own feet quite often. But I had the opposite problem to Whyte. Given my background in sustainability studies, having worked with one of the members (my initial contact) in an interdisciplinary center in Sweden, and carrying out field research as many of the participants in my study also did for their work, I found it difficult to be a credible outsider. This led to some awkward moments.

For example, a conference dinner where I attempted to avoid telling people what I was researching when asked about it by other more experienced researchers, and while in front of a few of my research participants. I was asked about my research and couldn't give the good description that I assumed more experienced researchers would want from me. In hindsight, I could have just given a simple description with little content, perhaps even signalled the end of the discussion by tactfully using short answers. But because I thought that the audience made up of my questioners and my informants assumed I was one of them and were uniquely qualified to judge me, I was awkward and defensive. If I were following say, pig farmers at work, I could have credibly been seen, by both myself and others, as a total outsider. They would have likely asked me about my project, and I would have answered as best I could, in ways I thought they would understand. But as they were academics whom I respected, and had just seen presenting their work for several days, I felt an imagined expectation from them that I be prepared to openly discuss my work. To offer in a confident way the project I had only recently completed the full proposal for and was already beginning to change based on my field observations.

Further, as I was seen not as an outsider but a fellow academic, throughout interviews there were areas of knowledge that it was assumed I would understand. To get into discussing them–I imagined–would show that I was confused about something I should already understand, and so would be seen as either incompetent in my role or putting on an act of being an outsider, neither of which would be good for the interviews or interaction. This made it harder to talk about (or produced an incentive for me to not ask about) why field members did or said certain things. Just as in any situation where we believe we are being assessed by those more competent than us in our own field, I was hesitant to put a foot wrong. Again, this effect probably always exists for the field worker and is to be overcome–no one wants to appear foolish. At the same time, it is fine and even rather beneficial to appear foolish, like you just dropped in from Mars, when doing field work. "I don't know anything and I am so curious about what you do" is a quite useful position to be in when one wants to uncover things. It is ok to be ignorant if it is agreed you are an outsider that has been invited in to ask questions. I was not part of their group and that was clear to people. So, in a sense I was certainly an outsider. But in terms of interest, profession, and technique I was employing, and even to some extent theory I was relating to, I was certainly seen as one of them, as barely an outsider if at all.

This caused issues for me, not so much for them, it seemed. I felt I was being assessed by them in a way that was unique to the fact I was an academic researcher studying researchers. On the other hand, my being part of the same professional group seemed to put them at ease, and also made it easy for them to invite me into their world, about which I understood many things already. For the most part I muddled through the above-mentioned discomfort, and eventually found ways of differentiation myself from the field participants, for example pointing out in advance that my field was different, and that I was not involved in many of the societally engaged activities they were and so knew little about them.

On 'breakdowns'

Breakdowns in research, as I use the term here, are situations in which things did not go according to plan, and that signal underlying assumptions that may be false in some way. Breakdowns can occur in the world of the researcher and those being researched (Alvesson and Kärreman, 2011). For the researcher, a breakdown means seeing the empirical world–people, systems–behaving in a way that does not match assumptions and expectations (theory, worldview). This may seem obvious–of course the qualitative researcher wants to find examples that challenge theory–but often this is not the case in practice and instead we tend to try to ignore data that does not fit theory (Alvesson and Kärreman, 2011). For the research participants, the 'natives', this

may mean a situation in which their own assumptions prove incorrect or unsuitable to the task at hand; their working theories fail. An excellent example of this is found in Karl Weick's classic paper on the Mann Gulch disaster (Weick, 1993), in which a group of fire-fighters were killed when, Weick argues, the *sense-making* their organized group tacitly relied upon broke down in the most extreme conditions.

In the introduction and later chapters I outline breakdowns for Climate Laboratory/Climate Center members in practice: revealing and valuable moments that directed me towards insights into their world. However, *my own* assumptions clashed with the empirical world too. For example, as mentioned above, my experience and worry at seeing a 'normal' research group in action, revealing my own deeply held assumption that people in this setting would be doing something explicitly radical and different, alternative and even revolutionary. I wanted them to be at war, fighting against a system that would hold them back and get in their way. In fact, what I found was the opposite; a system supporting them, opening doors, allowing them to move forwards. My analyst's hat kept telling me that this couldn't be, that surely, they must be experiencing difficulty, they must experience some pushback from their battle against the system. This is what all the literature focuses on in sustainability in higher education–how difficult it is to shift universities towards sustainability (Ávila et al., 2017), the university's structural and cultural barriers to implementing impactful climate research (Leal Filho et al., 2018), lack of incentives for inter- and transdisciplinary initiatives (Fam et al., 2020), and so on. Anyone working in this space surely will face serious difficulties and barriers to change at every turn. However, it appeared that the participants in my study were not! The reports I was getting from them in informal discussions and conversations in interviews was: this is fun, this is working, this is developing as we'd like it. Back at the desk, I wondered what to make of this. Were they guilty of false consciousness? Were they telling me an intentionally partial story? Was it simply an oversupply of money in Norway making everything possible? Or could it be that their center was simply not threatening any norms of the university, or science for that matter? If you follow the rules, presumably you won't get pushback. Perhaps they were just following the rules more successfully than others. This early observation of a breakdown in my assumptions from literature was a driving force in the study, and was influential in making the decision to focus in on this one group, and to let go of those un-reflected-upon assumptions that this was a case of people struggling against a system holding them back.

On not losing sight of the knowledge production setting

Latour and Woolgar's (1986) early study of scientists at work highlighted and tried to rectify the tendency in sociological studies of science to treat the social

aspects of science as separate from the technical. They pointed out that macro studies of science policy that focused on publication rates, funding and so on were at that time (and some are still today) fairly uninterested in reflexively considering how they were producing knowledge about science. For the authors of those macro studies, the aim was optimisation and improvement of the current organization of science, rather than the study of science work itself–its 'substance'. That meant that little reflexivity was required from the sociological researchers carrying it out. The big assumptions of the system of science, for instance that science happened in its own contained sphere separate from the social, were easily to take for granted–why employ methods that lead beyond those assumptions if the aim was improvement of what already is? Latour and Woolgar (1986, p. 24) offer the following passage in a section of the book they point to critique of the apparently shaky empirical foundation of Merton's claims about the normative structure of science (with an insufficiently critical lens he took scientists' statements about science as true):

> More important than this criticism of the empirical basis for scientists' norms, however, is the point that such sociological analyses ignore the technical substance of science. Even if the norms specified were found to be correct, the sociologist may as well be describing a community of expert fishermen, for all he tells us about the nature or substance of their activity.

In separating the social and 'technical' aspects of science to focus on the social means we are left with a community of 'professionals' or maybe 'experts' without seeing how the social relates to what they are doing. And what they are doing is by some accounts work of high consequence, at least potentially, in modern life. But this quote also offers a parallel which relates to the researching and writing of the present study. We might look upon the people we meet in this thesis as 'professionals' or 'managers' or 'knowledge workers', in other words, as subjects amenable to theorising about organizations rather than researchers or scientists engaged in a growing and salient research field highly relevant to climate politics. What instead I have wanted to do, is to keep in the picture the special character of the setting in which my study is carried out and the substance of the work people are trying to do. In other words, to make sure not to resent the people under focus in this thesis in such a way that we may as well have been looking at highly skilled managers working in any corporate setting, or expert fisherman for that matter. Nonetheless, I also reach some conclusions that may generalise across local settings and professions.

On (un)sustainability in the organization and management field, and the study of hopeful spaces

Ergene, Banerjee and Hoffman (2020) argue for a radical engagement with sustainability in management studies. For them, this engagement takes many

forms, starts from a recognition of what sustainability is theoretically and conceptually, is informed by the history of sustainability within the management studies field. They advocate moving from a value-free stance to one of engaged scholarship. One which engages with the normative, challenging propositions of sustainability-as-political-and-practical-problem that is absolutely relevant for academics in our field. It is a field dedicated to producing knowledge about the organizations, often corporations, so deeply and often blindly interrelated with the natural world in ways that are producing its systemic unsustainability. Any progress will also, arguably, require their engagement, and, according to Ergene and co-authors, our engagement with them. This thesis is not a work of engaged scholarship precisely in the way they advocate for. Rather, I seek to bring some light to what happens when research organizations and the scholars that make them up, make efforts to step into this societally engaged space.

One way for researchers to reach for a better world beyond dominant discourses is through our choices of settings and phenomena to study (Gibson-Graham, 2008). Rather than choosing to study the case of, for example, how organizations fail to achieve sustainability (e.g. Wright and Nyberg, 2017), in this thesis I have attempted to look at a part of the social world in which some hope can be placed. This is not to say that studies that focus on say, the failure of environmental policy or the hegemony of free-market capitalism are not needed, but rather to point to the fact that we can choose otherwise. Perhaps there is 'nothing new under the sun'. Yet to assume this from the outset means that we surely will not look for the seeds of possibilities. The important question here is how to keep alive the potential that other worlds than this are possible (Gibson-Graham, 2008).

The problem with a sole focus on producing a contribution to the literature is that we can be pedalling so hard to produce theory we miss the ground beneath our feet. Where are we? Are we part of this struggle to make a difference on this earth, and in this era in which we know so well many trends are leading us towards the edge of an ecological cliff? How are we engaging with the (un)sustainability inherent in the way we organize and manage the societies we live in? Such questions risk being seen as little more than an exercise in performative moralising. Or they end up as convenient window dressing for yet more academic papers that need a novel framing so that they have a reason to exist. It can become the academic version of Hollywood's latest politically progressive remakes of classic films–made for industrial reasons rather than as a result of engagement with actual social and political struggles they signal towards. I do not place myself above or outside of this set of problems. Throughout my PhD I have struggled to deal with this tension between on the one hand wanting to do meaningful research that contributes societal value and engages with sustainability, and on the other realising that the academic

system is set up for different things. And that the way I designed my own research and the aims of my own department and the disciplinary field I am part of are not necessarily aligned to such a purpose. What I can offer is an attempt at bringing to light some aspects of a context in which I see people trying to do something different where they are, to advance the cause of facing the climate challenge.

3.8 Background for the empirical setting–Climate change, social science and Norwegian climate policy

Climate as grand challenge

Climate change research spans the natural and social sciences and seeks to explain changes in the planet's atmosphere, with a particular focus on the anthropogenic causes and impacts of the heating of the atmosphere and the impacts that has on planetary systems. The concept of the Anthropocene captures the Earth Sciences view of how humans have become the major driving force of environmental change on the planet (Crutzen and Stoermer, 2000). Climate change is an example of an imminent Anthropocene reality that is dangerous to all societies on Earth (IPCC, 2018a).

A note on the science of sustainability

For some time those academics and scientists working in the broad field of what is called by some the sustainability sciences, have been (at least nominally) seeking to make an impact on the state of society and its relationship to the planet. That relationship has been built into structures, systems and psychologies over a considerable amount time (it is debated when the Anthropocene began, and who or what is causing it (Malm and Hornborg, 2014)) and that has brought about the state of the social and ecological crises arriving at the time of writing of this text. Their careers become intertwined with the idea of making a difference to the great problems of our time, even as they continue to go about their everyday work answering emails, making research applications, sitting through departmental meetings and hanging pictures of their families on their office wall. While all academics may have some sense of such a 'social mission', this is more specific and places this group and its members as agents of change who can do things others do not or cannot. A belief that they need to work across disciplinary and university-society boundaries tends to inhabit such researchers and the organizational environments they create. The transformation of society is often talked about as an ultimate goal and much time is given to talking about how it can be empirically

studied and theorised, but also achieved in practice. To degrees that vary from individual to individual, they see themselves as both analysts and actors. At the level of ideas, many see both carrying out rigorous research and acting as catalysts for change in society as necessary (Kates, 2011; Jahn, Bergmann and Keil, 2012).

In fields where academics are interested in notions of aligning themselves with the discourse of social and ecological sustainability, transdisciplinarity has emerged as concept intended to capture research than spans both the boundaries between the disciplines (alone this is interdisciplinarity) *and* the boundaries of the university to involve non-academic actors and contexts. This is said to be a new way of producing knowledge in a way that is 'societally robust'. In these academic science and scholarship contexts, transdisciplinarity and sustainability are important *epistemic* projects; they refer to areas and approaches to knowledge production. But they do not simply guide research designs, appear in academic papers or make their way into peer-reviewed journals. They also entail ways of thinking, acting and organizing that animate researchers in their everyday work and are over time integrated into their self-concepts. They can be felt and experienced 'in work and at work'. In the following text, I try to open up a window into how *organizational* aspects are preconditions to the *epistemic* work they aim to do. Studying the establishment process of a research center and the working lives of the people who populate it provides a good setting for doing this.

Climate research in Norway, a short history

According Anker (2016), climate research in Norway began to be prioritised by policy makers during former prime minister Gro Harlem Brundtland's efforts in the 1980s and 1990s to promote Norway as a pioneering country that would show the way on sustainable development and climate change. The seminal UN report of the global sustainable development program, Our Common Future (1989), which Brundtland helped bring into being, featured climate as humanity's biggest challenge. Domestically, Brundtland wanted to show she was serious on climate change, facing critique from many sides, in particular the deep ecologists, as Norway continued to operate and expand its oil industry (*ibid.*). (The deep ecology movement was founded in Norway in the 80s and 90s and had leading figures in Norwegian universities, offering a radical eco-philosophy wholly incompatible with industrial capitalism and the notion of sustainable development as put forward by the UN. See for example Naess (1990)). As part of that effort, she put into place two centers that would advise the government through their own research and the interpretation of existing research: the Center for Development and the Environment (SUM), and the Center for International Climate Environmental Research, Oslo (CICERO). Climate research centers have proliferated since then in Norway. In

addition, the Government has prioritised climate action in its higher education and research policy.

Research and higher education in Norway

Norway is a wealthy country. Their oil and gas sector has also made the country the richest (per capita) on Earth. Its profits are still accumulating in what is the world's second largest sovereign wealth fund. Norway, with its population of under 5 million people, owns 1% of the entire global stock market (Economist, 2017). Oil and gas production accounts for over half of total exports, and the industry employs six percent of the population (Teigen, 2018).

Norway's research and higher education sector is, as one might expect, well-funded. It gives large amounts through the Research Council of Norway (RCN) to both universities and institutes each year, for example Environmentally Friendly Technology Centres (FME), which for the last decade have aimed to stimulate environmental R&D for environmental solutions. This involves intentionally creating the right conditions for partnerships between universities, business and government. The Ministry for Education and Research is recently increasing focus on competing with other Scandinavian countries in research publication and excellence in line with recommendations for the OECD on its 'innovation performance' on a range on knowledge economy indicators (OECD Paris, 2017). Its Strategic 10-Year Plan for Higher Education and Research positions research and education as the way to solve societal challenges, for example, climate change and health (Norwegian Ministry for Education and Research, 2014), as does the aforementioned OECD report. Norway's energy and climate policy objectives include energy system transitions, reduction of greenhouse gasses, innovation in energy and energy technology and the utilisation of profitable renewable resources (Ministry of Climate and Environment Norway, 2016).

A research university

The *Norwegian U* is a Norwegian university with close to 20,000 students and 4 200 faculty and staff. It is one of Norway's leading research universities, and presents a profile that focuses on the natural and life sciences, and knowledge about the natural world. This study centers on actors and organizing connected to the social sciences faculty, particularly in the geography department. Climate science at Norwegian U has a high profile relative to many other universities due to the presence of a center for climate change in natural sciences, an internationally renowned center made up of around 120 researchers. The university has an arrangement with Equinor, the state oil company to fund promising research. Also present and highly influential in research funding in The City and its university is the Innovative Research

Foundation, a philanthropic organization that funds research that will be 'competence building' and raise the research profile of The City internationally.

In 2016, Norwegian U released an updated strategy, which is thematically focused on how knowledge is ever more involved in actively shaping society in Norway and internationally. Much of the content is similar. In the spirit of this theme they aim to "to continue to innovate; to transcend the boundaries between disciplines; to advance the frontiers of knowledge and to progress on the path toward a sustainable future."(Norwegian U, 2019a). According to the strategy "Our students and scientists contribute with knowledge and new insights to meet complex challenges that shape our society" (Norwegian U, 2020). Norwegian U present itself as promoting cutting edge research that emphasizes cooperation across disciplines. The strategy document outlines four things the university does (Norwegian U, pp. 5–11). First, "Explore" (basic research): "Academic staff and students at the Norwegian U work together to research important topics spanning the origins of the universe, human history and Earth's future". Second, "Educate" (teaching): "Through our wide range of study programmes, we educate Norwegian U students to actively contribute to a society based on knowledge, expertise and democratic values". Third, "Develop" (partnerships with stakeholders and decisions makers): "Through local, national and global interaction with our partners in academia, industry and society, we will make knowledge based contributions to the decisions that shape our societies. Our researchers and students to engage in international research partnerships and educational collaborations." Fourth, "Challenge" (contribute to decision making, dissemination of knowledge in society): "Research, education and innovation yield knowledge, technology and expertise that are decisive when important decisions need to be made. Our researchers and students will contribute insight and disseminate knowledge in the public arena".

A focus on Sustainable Development Goals (SDGs) is part of their promotional profile. They claim to be Norway's "premier SDG oriented university". In recent years, they have focused a lot on the SDGs. They are now publicizing their place in a new type of ranking, *impact rankings*: "For the second year running the Norwegian U is ranked in the top 100 THE University Impact Rankings. The rankings are based on how oriented a university is towards the Sustainable Development Goals and social responsibility" (Norwegian U, 2020).

A number of SDG activities have been introduced since 2017, including The City's *SDG* program. This is a 'strategic initiative' by the university that runs an annual conference and events around the SDG theme. The SDG Conferences started in 2018 and are meant as a university-wide event to link researchers to the themes and to bring in international visitors. They have also

put together *Science Advice*, a group of professors that do 'science diplomacy', and seek to be involved in organizing or attending high profile SDG events, such as representing Norwegian U at the UN. The university, like many others, has formed 'Knowledge clusters' based on "interdisciplinary collaborations to solve complex issues" (Norwegian U, 2017) and financed through external funding. The clusters most relevant to the case in this study are 'climate research' and 'energy and technology'.

Norwegian U presents itself as having a scientific profile that is both curiosity-driven and impact-driven. Their profile is highly focused on real-world, societal impact and contributing to society. At the same time, "The Norwegian U is an international research university in which all activity is grounded in the principles of academic freedom and curiosity-driven research"(Norwegian U, 2019b). According to Norwegian U's own organization chart, most of its faculties are in the social sciences and humanities, or professional schools like law and medicine. At the same time, there is a large focus on the natural world and sustainable development, which is central to their projected image.

Climate and energy research with an emphasis on social science

The focus in this thesis is on transdisciplinary research. The research group under focus and the center they create, however, are administratively based in the Geography department, though the center does have its own strategy and a growing interdisciplinary group. For some geographers, their research focus in on climate and energy concerns. The field of energy transitions, which focuses on the how and why of shifts towards more sustainable energy systems and energy futures, has recently seen increased calls for the role of social science in building knowledge about key aspects of such shifts (Norwegian Ministry for Education and Research, 2014; 2016; Overland and Sovacool, 2020). There are, of course, large questions in the Energy field being worked on by the technical and natural sciences. But as Araújo (2014) outlines, there are now prominent examples of systems change towards more sustainable energy systems such as the Danish shift to wind power or Germany's nuclear phase-out. However, many questions remain around "how the shifts are accomplished or what implications the transition may have" (*ibid*, p. 113) and this is where social scientists are needed. Zooming out a level, Social Science's contribution to the energy research field is still rather early in its development. Araujo's article forms part of the first volume of the journal Energy Research and Social Science, launched in 2014. The journal now hosts central conversations in this intersection of a traditionally more technically-oriented field and the tools and perspectives of social science fields like geography or psychology. Another contribution in the same volume (Pasqualetti and Brown, 2014) discusses the current role and potential contribution of geographers in research on energy and society, positioning geography as an

extraordinarily useful perspective. “If energy and society are parts of the same cloth, geography is the thread that ties them together” (*ibid.*, p.122) the authors boldly claim. Geographers’ preoccupations with space, scale, cities and disparities between regions, among many other concepts, do indeed lend themselves well to the analysis of the interlinkages between energy and society:

> Geography provides the tie that binds, places it in context, highlights scale, and identifies location in reference to all other factors of supply, demand, transportation, consumption, and impact. The modern energy world is too complex, too interdependent, and too vulnerable for us to ignore how it all fits together. As we have tried to make clear, geography and geographers have been playing an important part in this process, and they will contribute even more in the future. (*ibid*, p. 122)

Geographers and other social scientists contribute to the field of energy research, bringing to bear their theoretical perspectives and other disciplinary apparatus and publishing peer-reviewed science and scholarship. But they also bring their research projects and funding, many of which, by way of growing convention in research approaches and in the demands of funding policy mechanisms, involve potential users and applied applications for the research produced. In the case of the Climate Center, and as is the case with many fields that seek approaches for making societal impact, particularly in relation to sustainability challenges, they hit upon transdisciplinary approach as a way forward in their climate and energy focused research direction.

Chapter 4
At the Climate Center

4.1 Chapter overview

This chapter gives a descriptive introduction to the setting and the group under focus. It gives the reader bearings in terms of descriptive factual information, and how the organization describes and promotes itself. It describes central, animating ideas for the group, its purpose and thematics, its structural position in academia, and the kind of epistemic and practical work it does. It also shows that there are multiple aspects to the setting and the group that may not be visible at first glance.

4.2 Where knowledge shapes society

"What Is Knowledge?" reads the giant canvas is roped across the façade of the city's Museum of Natural History, advertising the latest exhibition. The museum is an imposing white structure, fronted by pillars and surrounded by gardens and a cluster of buildings housing several university departments, all spread across the top of a hill that rolls down to the city's harbour, fronting the same sea populated in the north by the oil rigs dot the coast. In this area, the university's and the museum's grounds merge. Students file through the museum's open gardens on their way to classes. On a cold day in October 2019, knowledge is on display inside the museum's freshly renovated halls. Just inside, the permanent exhibition contains some museum standards: scale models of plants and insects, the skeletons of several blue whales. Less expected is an immersive life-on-the-ocean-floor room, encircled in video-wall installations of undersea animations, featuring occasional sea-bed explosions from deep-water mining.

Moving deeper into the museum, the new exhibition begins. Unlike what we might expect in a natural history museum, the current exhibition is explicitly

a tour through the achievements of science and knowledge themselves, rather than displaying the natural world. Each exhibit provides histories of science, informing us about the scientific effort of rendering it knowable or workable. A vertical conveyor belt with sculptures of human-created interventions into the time and space of nature–clocks, radioactive waste, machines, biotechnology, satellite imagery. Further along the corridors, the phrase "Knowledge Shapes Society" occupies a wall in a section on "worldviews". Next to it are two clashing exhibits. On one side, occult knowledge from the past–a strange set of bulbous and mushroom-like plant materials. These were used long ago by 'witches' to manifest a sinister cat-like creature they said would prowl through the woods at night. On the other side, the medical knowledge of today–a series of model skeletons of the type usually found in clinical settings, lined up chronologically, each an improvement on the last in terms of anatomical accuracy and pedagogical usefulness. The sign's text reads:

> Knowledge shapes society | Our world view changes over time, and research both shapes and expresses the view we have of the world. Research based knowledge is modified when new observations, better methods and instruments emerge, and theories are altered or replaced. New social challenges require new scientific knowledge. The task of a university is to create this knowledge and share it with society.
>
> How has research taken place in the past, and how does it take place today? How is scientific knowledge created? Why is it important? What did people know in the past and what do they know today? What relationship does scientific knowledge have with other types of knowledge?

This museum text, printed on an unassuming green, soft-finish museumboard, contains claims and questions that have come to infuse modern life and are increasingly hard to answer in a common-sense way that satisfies most people. Different compositions of these same ideas are echoed throughout the publications of those responsible for research and education in Norway (and many other countries). In the *10 year plan for Norwegian policy on research and higher education* (Norwegian Ministry for Education and Research, 2014; 2018), we find an innovation-heavy version. The idea that *grand societal challenges* are to be managed though the operation of an innovation, research and education system is a core idea on which not only the functioning of universities, but the prosperity and security of the nation and the stability of humanity's future depend. New scientific knowledge and technology produced, the strategy claims, will help deliver us from societal predicaments and an uncertain future. Norwegian U's 2019-2022 strategy outlays three main strategic areas through which they will do this shaping. These include ocean research, global challenges (like migration, health and inequality), and 'climate and energy transition'.

A block's walk down the hill from the Natural History Museum is the Climate Center, the place with which we will spend most time in this thesis. High up in a building that houses many of the social science departments, wedged in below the Geography and above the Social Anthropology departments, the center occupies a mountain-facing side of the building. A long hallway feeds six large offices to the outward side of the building, each shared by two or three of the Climate Center's researchers, except for the last office to the North, where the Director sits, and the last room to the south, a small, bright conference room on the corner of the building where all the Climate Center's home-hosted events happen. On the interior side of the hallway, a lunch room, a meeting office, and a room in which five masters students have a workspace. In contrast to the dramatic view of the dark rock and patches and plant life on the faces of mountains visible through every window, the interior is the same linoleum floored, nondescript university-building styling found all over Northern Europe. If visiting when no one was around, there would be little reason to imagine the amount of activity and laughter that happens in waves here week to week. Little in the building suggests the scope of the crisis people who work here discuss constantly in their day-to-day work.

A visitor would be unlikely to conjure up images of the office dwellers' exciting expeditions to the field. Visits to Addis Ababa to interview city planners in sweaty offices. Gathering data inside a Norwegian city government as locals march in the streets and set fire to toll booths to protest road tolls. PhD fieldwork interviewing the poor and electricity deprived in Indian provinces. A year in the Canadian tar sands getting to know indigenous people, trying to grasp their place in the 'assemblages of oil' spidering out across a blackening northern landscape.

Instead, a visitor would be much more likely to imagine the more mundane activities that go on here. The countless hours when nothing happens apart from the clicking of keyboards, many of which I was present for during my fieldwork. The servicing of emails. The writing of academic texts (where the average observation note would look something like: "peers at screen through glasses. Removes glasses and rubs center of nose.") The buying of the same vegetarian baguette for lunch several days in a row.

Relative to popular images of science, there is little evidence of how scientific knowledge is shaped here. No lab equipment, no specimens, no hi-end technology being constructed. No specialised apparatus (apart from a very large video-link LCD screen with speakers and little cameras attached, part of a culture of 'low carbon meeting'.) We can see that some knowledge-shaping happens in public–one section of the hallway wall is covered with debate articles, opinion pieces, and other media texts written by people who work at the center.

The books lining shelves in offices give the visitor some clues. Geography, social science classics, urban planning, sustainable development, eco-criticism, environmental history, the history of electricity, re-thinking science, contested energy spaces. Jane Jacobs, David Harvey, Bruno Latour. A printed and highlighted executive summary from an Intergovernmental Panel on Climate Change report. Posters line the walls in several of the more lived-in offices showing past conferences, workshops, symposia. The posters' imagery is unusually vivid for academia. A red sun dipping below blue-lined contours of mountains in a digital landscape, a collage-like image of people sunning themselves by water in a hyper-real cityscape of the 21st century imagined by a 1980s German futurist. More like posters for art exhibitions than for academic events.

Entering the Climate Center for the first time was an anticlimactic experience. The linoleum floors in the building looked almost exactly the same as those in my home department at Uppsala. I hadn't expected NASA, but I wasn't ready for just how much it felt like a completely normal university building anywhere in Europe. Expectations to the contrary were entirely the author's, and on the first day that imagination met with a reality likely found behind many interesting organizations' external image–procedural, day-to-day work. I was given a guest office with similar furniture to that in my home department. The major difference was the view–the mountains that wrap around The City clearly visible. I'd be interviewing people, attending meetings, walking around observing. I had no interviews until the following day and had already walked up and down the corridors several times, meeting people. After about an hour of sitting idly taking notes about the building, and my thoughts about what it was I might be investigating, the realisation that this might be a slow few weeks or even months occurred to me for the first time. It became clear rather quickly that while there were big issues and societal predicaments being navigated here, there were times when it happened slowly and, from where I was sitting, looked like work in most other offices.

At the Climate Center, work starts at around 8 am but times of arrival vary. As academics in a Scandinavian university, people's start and finish times are flexible. Those who have children are gone by 15:00 if they need to be. No questions asked. Those who don't tend to stay a little longer, and occasionally do something together after work. A walk in the nearby mountains, or pizza and beer a restaurant down the street from the centrally located social sciences faculty building. Sometimes on Fridays everyone joins, but those with kids tend to disappear after the first beer.

During most lunches a lot of laughter fills the lunch room, even in cold November. There is a ready familiarity among members of the organization. The lunch room contains long grey couches, a half-full bookshelf (the big-letter

title of Jared Diamond's book on the fall of civilisations, *Collapse: How Societies Choose to Fail or Succeed*, was most visible), wall-length whiteboards and a low central table. On the wall is a reminder of 'Cake Fridays' with a photo of the Director leaning down, pulling a loaf of bread from the oven. Each Friday a different member of staff is responsible for baking or buying. On a few Fridays I recall a lot of joking about cake, and how important it is for holding the place together. (Anyone familiar with Scandinavian workplaces will recognise the emphasis on baked goods and preference for flat hierarchies).

Members of the Climate Center interacted as a relatively 'flat' organization, in which everyone is involved in its running and can initiate their own ideas. A newly recruited research assistant told me she was still adjusting to a place in which the response to ideas from senior people was 'sure, let's do that!'– for her this was not a familiar experience. The Climate Center felt like a 'young' organization. The Director, Johannes, turned 40 during the period of my fieldwork. However, there is a wide range of ages in the group overall. The group *feels* young, an organization only recently formed. But in addition, there is a lot of humour, and a sense of play and experimentation in the air. Attending several of their events–a conference and a two-day workshop–behind the scenes there was always a lot of joking among the group of organizers, and a willingness to turn playfulness into something useful. Near the front entrance to their building is a basketball court built onto the street in a walking-only section, where children from the school next door play at lunch times. Climate Center employees have been known to have a pick-up game there on occasion. Usually it is occupied simply by people walking past–in this part of the city, the university, a school, Natural History Museum, cafes, restaurants and residential apartments and other businesses are all found together on a hillside that rolls down to the city center.

In many ways the Climate Center appears the same as the university around it. It occupies the corner of the faculty building five floors up. A few standing banners and posters dot the hallway, announcing you've entered the center's territory. But keep walking and the hallways carry you into the rest of the social sciences building. Get off the stairs one floor up or down and you'll end up meeting Geographers or Social Anthropologists going about their business. Which looks very much like what people are doing in the rest of the building's standard academic researcher environment: long hallways of offices, some shared, some not, containing sit-stand desks and shelves of books, and, during daytimes and occasionally at night, researchers clicking, typing, staring at screens (sometimes multiple), shifting positions in ergonomic chairs with adjustable plastic armrests that are supposed to help support shoulders.

4.3 A description of the Climate Center

Activities and affiliates

The Climate Center is a university-based research center in large Norwegian research university. It carries out research across multiple themes within and relevant to the center's focal field of *climate and energy* research. It is an initiative led from the Faculty of Social Sciences. A main goal of the centre is to produce "actionable knowledge about "how to achieve a rapid transformation of society" in order to "meet climate challenges". The center carries out and publishes disciplinary, interdisciplinary (collaboration across scientific/academic disciplines) and transdisciplinary (collaboration across academic and non-expert disciplines) and research.

The Climate Center employs professors, researchers, PhD Fellows (externally funded PhD students), and has an office for master's students whose thesis supervised by someone at the Climate Center. Officially, it is made up of 53 people including staff and affiliates, and on a regular day one finds anywhere between 7 and 20 people at work. Recent recruitment has brought in researchers from mixed disciplinary backgrounds across the social sciences and humanities such as psychology, economics, political science.

The center also Organizes various public facing events, including a climate and energy research conference *Fossil Free Futures*, and has convened meetings with local government, industry and civil society actors around climate policy and challenges.

Administration and positions

The center is administratively anchored in a social science university department, Geography, which provides it administrative and formal structures. As is common in university-based research centers, people cannot be directly employed at the Climate Center, they must have positions based at the Geography department or another department. If a project receives funding for positions, for example PhD positions, the department will likely accept these new positions. However, when it comes to more permanent or long-term positions like lecturer or professorship positions, Climate Center members need to seek positions within university departments if they wish to stay at The Climate Center (continued affiliation is still possible from another department or university).

Funding and opportunities for people to stay on at The Climate Center are something on the minds of the leadership and more senior members of the group. A 'filter feeding' effect is created by the constant turnover and

researchers moving in and out of groups in academia (Hackett, 2005), a continual training and letting go of scientists as their employment contracts begin and end as funding is secured or runs out, or they simply find positions elsewhere. This means that for people to have the opportunity to stay on, and for the group to have more long turn continuity there must be new positions created, and a strategy for getting them in place. In order to bring in new members, and retain people beyond existing contracts, Climate Center researchers look for opportunities to create new positions for PhD students and post docs at the Climate Center. For example, the ZeroCarbon multi-stakeholder research project application to the national research council (discussed in later chapters) was seen as a way to create positions and opportunities for existing Climate Center members, along with new PhD positions.

Funding sources and stakeholders

The center studies problems and issues related to climate and energy in Norway and internationally. Research projects are funded through a range of different sources, and the funding sources change as the collection of research projects attached to the center changes year to year. To give some examples, projects have funding from various sources including the national research council, various EU sources such as Horizon 2020 and the European Research Council, independent and state Norwegian philanthropic organizations that fund research, their university's philanthropic agreement with the state energy company, and some ongoing annual funding directly from the Norwegian government.

The Climate Center, and the Climate Laboratory research group that is part of it, has initiated projects with various local stakeholders in government, industry and civil society. Examples are energy firms, municipal governments and climate NGOs. The researchers also participate in and/or give talks and workshops with many local actors and events, from architecture firms' events, to local government theme days. These relationships tend to develop based on research project requirements or arise through invitations.

Strategy

The Climate Center's official strategy is represented in the document 'Strategy 2020-2022: Actionable knowledge for sustainable transformation of society'. The opening paragraphs give a full picture of many aspects of the center's image:

> Climate change is one of the greatest societal challenges of our time. While we have acquired substantial knowledge about physical climate changes and to

> some extent their impacts on society, new knowledge is needed on how to achieve deep, rapid and sustainable transformation of society.
>
> Climate and energy transition is one of three priority areas at Norwegian U. The Centre for Climate and Energy Transformation (the Climate Center) was established in 2016 by the Faculty of Social Sciences as a hub for interdisciplinary research with a basis in the social sciences in this area (Anonymised source).

Several key claims are outlined in this short text, and that run through the strategy: climate change is a great (or grand) societal challenge; we have the (natural) scientific knowledge to know it is a crisis; we need new (social scientific) knowledge about how to transform society because of this challenge/crisis; the Climate Center's work is carrying out part of the university's strategy; the Climate Center is the place where the social science of climate is produced at Norwegian U.

The strategy ties thus together climate change, a vision of a radically changed future, the mission of the university and the social sciences to explain the Climate Center's purpose. The Strategy continues, outlining the challenges the Climate Center is set up to meet: i) Rapid reductions in greenhouse gas emissions, and ii) the sustainable transformation of society. We told also about the challenge of emissions reduction when considering the Paris Agreement on Climate Change and the IPCC's various reports stating that we need drastic action to stay below 1.5 degrees of warming. It also links to the broad UN sustainable development goals, claiming mitigating climate change will be necessary to achieve them. The challenge of the 'sustainable transformation of society' is needed to deal with the climate problem, which the IPCC (IPCC, 2018b) provides multiple future scenarios to illustrate. All these scenarios, the strategy argues, require:

> substantial social, business, policy and technological innovations, and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems.
>
> Such drastic changes will entail a transformation of society, which the IPCC defines as altering the fundamental attributes of a system, including value systems, regulatory, legislative, or bureaucratic regimes, financial institutions, and technological or biological systems.

The Climate Center's "purpose" is then framed in relation to this urgent need for transformation:

> The overarching goal of the Climate Center is to produce actionable knowledge that can inform policy and practice about how to achieve deep, rapid and sustainable transformation of society to mitigate climate change.

On the Center's website, this is accompanied by several other sub goals:

> Actionable knowledge: Producing high-quality international publications with user-relevant research questions, communicated in ways that engage with decision-makers, societal organizations and society at large.
>
> Problem-oriented research: Creating knowledge relevant to societal challenges, often by involving stakeholders throughout the research process.
>
> Interdisciplinary knowledge hub: A social science-based interdisciplinary knowledge hub with regional, national and international visibility.

According to the strategy, through their work the Climate Center helps bring about a vision of a future state in which society is sustainably transformed. This work includes actionable knowledge, partnerships with non-academic actors, and the Climate Center's ideas and outputs being increasingly visible and spread widely.

The strategy document, a visual representation of which, adapted from the document, defines Goal 1, "Actionable knowledge" as to "Design, conduct and communicate research in ways that make knowledge relevant to societal challenges, often by involving stakeholders throughout the research process." High quality research publications will be produced. This knowledge will be 'relevant to key societal transformation within selected priority areas'. Integrating stakeholders into the research process makes research more relevant and insightful and leads to it being more likely that 'research-based knowledge' will inform decision making. Finally, the Climate Center Strategy says actionable knowledge also means communication of research findings in reports, policy briefs, debates, and social media.

The description of Goal 2, "Problem-oriented research", covers the type of research the Climate Center aims to do–which projects and partnerships the Climate Center wants to establish, and which researchers it wants to recruit. "The Climate Center will initiate and conduct problem-oriented social science research of a high international quality in collaboration with researchers from other disciplines and with the involvement of public and private users when appropriate." The Climate Center will build capacity by recruiting senior and junior staff. A priority is to recruit a 'critical mass' of senior staff, who will take the lead on initiating and coordinating 'interdisciplinary- and social science-based climate and energy research at Norwegian U', and apply for research grants at high levels. The Climate Center also actively maintain

existing and seek out new partnerships with other research environments and 'public and private sector organizations' and NGOs, with which to collaborate and write proposals.

The text on Goal 3, "Interdisciplinary knowledge hub" gives a picture of the Climate Center's existence as part of a network with other actors: teachers, students, practitioners and other researchers and research organizations. It is a meeting place, a network, and provides interdisciplinary education. It also gives seed funding for climate and energy-related activities within the university. "The Climate Center will strengthen itself as a broad, visible and interdisciplinary knowledge hub regionally, internationally, and on social science research in climate and energy transformation." This covers the Climate Center's role as a part of the research and education community at Norwegian U: seminars, courses, supervision.

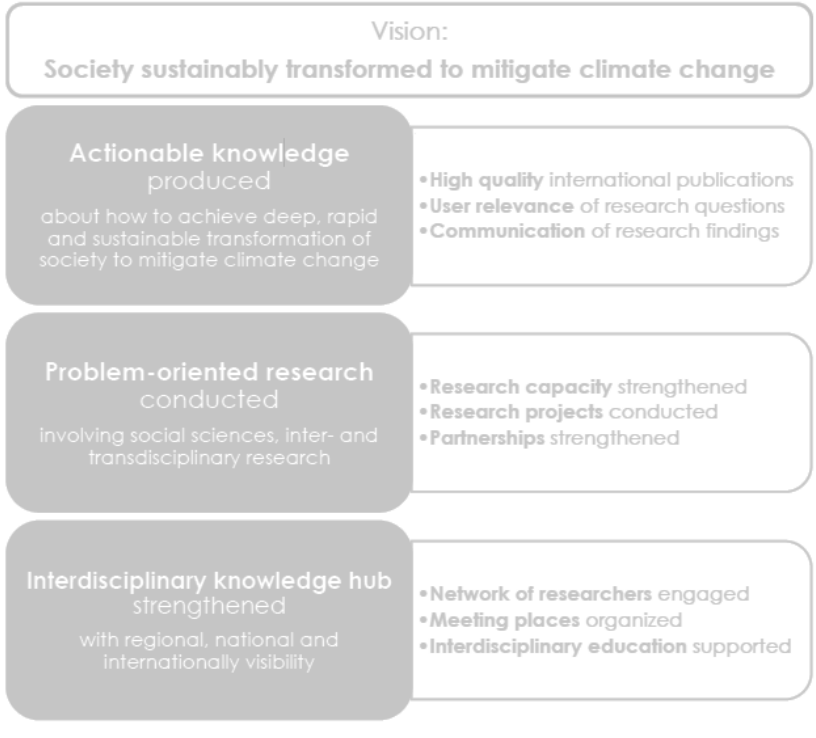

Figure 2. the Climate Center's vision, and goals for achieving it

The strategy document then moves into discussing 'competence areas' and 'priority areas'. The latter include 'core priority areas' and 'applied priority areas'. Competence areas are existing competences of affiliated researchers and collaborating partner groups at Norwegian U. These include Urban

governance and politics; Public Perceptions and policy preferences; Energy transitions; Law, governance and economics; Systems analysis; Climate systems, impacts and adaptation.

The strategy says the Climate Center will carry out research on priority areas of knowledge needed about "how to achieve deep, rapid and sustainable transformations". These are areas in which the Climate Center will "strengthen its competence and conduct innovative and interdisciplinary research", including Climate mitigation pathways; Effective and equitable policies; Complex societal systems. Applied priority areas are selected areas where the Climate Center's competence can be applied, for example in collaboration with other actors and projects. These are Energy transitions; Urban development; Sustainable transport and mobility; Sustainable land use; Climate effects on society.

Leadership and management

The center Director, Johannes, runs the daily work of the center, consults with the scientific advisory committee for advice, and reports to the steering committee. A Leadership Group is appointed by the Director to help run the center. At the time of my fieldwork, it consisted of the Director and Karl, the research coordinator at the Climate Center. The Scientific advisory committee meets once per year; however, this committee has not been formalized (as of 2018-2019). It consists nominally of "3-5 internationally recognized experts and can be supplemented with 1-2 highly relevant stakeholders". It advises on and contributes to the development, strategy, goals, and international visibility of the Climate Center. In 2019 it consisted entirely of department staff, as the broader committee was still being formed.

The Climate Center is part of the Social Sciences Faculty at Norwegian U. The Center is "part of one of three priority areas at the university, 'climate and energy transition' which is led by the faculty of Mathematics and Natural Sciences and for which overall responsibility sits with the group of deans"(Anonymised, 2019). The center has a Steering Committee led by the faculty dean, which meets 2 times per year. The Committee is composed of various academics from both the social and natural sciences: representatives from the Faculty of Social Sciences, the Faculty of Mathematics and Natural Sciences, the Department of Geography, another Center for Climate Research, and a university school of economics. They have responsibility for the overall goal developments and achievements of the center (although this 'responsibility' is an oversight function). It "approves strategies, budgets, plans, progress reports, recruitment advertisements and ensures anchoring of the center within the University's priority area climate and energy transition." The Climate

Center Steering Committee has the overall responsibility for the centre's professional development and the achievement of its objectives.

The Climate Laboratory

The Climate Laboratory is a research group which was started two years before the Climate Center was launched and provided a 'bottom-up' basis for the Center today. The Climate Laboratory group now exists as a part of the Climate Center. The Climate Laboratory describes its purposes and aim as follows:

> Geography is essential to understand the interconnected challenges of energy and climate change. The *[Climate Laboratory]* connects research on the geographies of energy, climate and society. The aim of the lab is to generate an engaging academic and intellectual environment to stimulate high quality research on these issues.

According to the accounts of initial members, which we look at in more depth elsewhere, central aims of the research group were to find a way to connect geography to the climate and energy field, provide a platform for doing this without appearing threatening to other research groups at their department, and move towards doing "societally relevant" work. At the time of writing, it runs several activities: a bi-annual research conference, an ongoing project studying European cities as actors in climate transformation, a "long-term project on the geographical flow of ideas and practices surrounding urban transformations" funded by a local philanthropic organization, part of the center's aim to be an "internationally leading research group on urban sustainability transformations". Two PhD fellows were part of the Climate Laboratory group, as they were hired into it as the first new members of the Climate Laboratory, with money granted from a philanthropic partnership with the university. And two other post-doc researcher positions were also funded as part of the Laboratory's activities.

Publication

At the Climate Center, people publish in journals that focus on geography and energy transitions. As PhD students and recruited researchers from different fields start to publish papers, the range of journals by field should expand. PhD students often retain partial supervision from someone in their discipline. For example, a PhD student with a psychology background studying individuals' views on climate change had a supervisor in the psychology department, as well as one affiliated at the Climate Center. Intended publications were in psychology as well as climate and energy focused journals.

Since the time of the Climate Laboratory in 2016 to the time of writing of this thesis in 2021, the research group at the Claimed Center produced 77 peer reviewed publications, according to their own records. Articles were published in the journals listed in Table 4. The table includes all papers published by both people who are at the Climate Center full time, and affiliates who may be positioned elsewhere but carried out projects in their capacity as Center affiliates.

Table 4. Peer Reviewed Journals in which Climate Center members and affiliates have published, 2016-mid 2021

Name of journal/publication [number of articles published if more than 1]	
Annals of the American Association of Geographers Applied Energy Bulletin of the American Meteorological Society Cities Climatic Change Comparative Politics Cosmos: Proceedings of the Singapore Academy of Sciences Current Opinion in Environmental Sustainability [2] Energy Policy [2] Energy Research and Social Science [7] Environment and Planning C: Government & Policy Environment and Planning D: Society and Space Environmental Innovation and Societal Transitions Environmental Politics Environmental Research Letters Environmental Sociology Frontiers in Psychology Geoforum [2 articles] *Geografiska Annaler*: Series B, Human Geography Global Environmental Change [2] Global Transitions [4] Human Geography Humanities and Social Sciences Communications International Journal of Urban and Regional Research	International Public Management Review Journal of Climate Risk Management Journal of Comparative Policy Analysis: Research and Practice Journal of Contemporary Asia Journal of Development Studies Journal of Energy History Landscape Research Local Environment Nature [4] Nature Climate Change *Naturen* Progress in Human Geography Public Understanding of Science *Retfærd* *Samfunnsøkonomen* South Asia: Journal of South Asian Studies [2] Sustainability The Extractive Industries and Society [2] Urban Planning Urban Planning 5 Urban Studies Weather, Climate, and Society Wiley Interdisciplinary Reviews: Climate Change

Teaching

Center members teach mainly in the department where the center is administratively based. But they also teach subjects related to climate and energy, and have introduced, with the help of some master students, a 'student-driven' course on innovation and sustainability. Most of those employed full time at the center teach at the geography department, or at other departments in the social sciences faculty.

Initiating cross-disciplinary roles

The center actively seeks out ways to collaborate across disciplines, but also to base its thematics in other departments through professorships and formal positions. For example, in 2019-2020 the Climate Center initiated and found a partner for a professorship that would be administratively anchored at other departments but based at the Climate Center. It was a professorship with a Department of Administration and organization Theory that was focused on climate and energy issues. The center also distributes smaller grants to stimulate research and education activities around relevant themes (broadly, climate and energy) within the university. The center's own affiliates can apply, as can university staff from other departments.

Student-driven initiatives

Members of the center have helped initiate what are now student-driven activities–a course and an annual conference. The course is called 'sustainable innovation and is Organized by members of the Climate Center and run by two students. A yearly student conference has also been started up by members of staff and students who have a small office at the center.

Fostering 'societally relevant' and 'transformative' research

A goal of the center is to cultivate a special relationship to societal (non-academic) actors in their work (e.g. at the Center they are to produce 'actionable knowledge' and carry out research that is 'societally relevant'). Terms like *co-production of knowledge* and *transdisciplinary* are technical terms used by researchers at the center that refer to this relationship. The center states in official communications that it must work innovatively in order to address climate change, and more generally that research needs to address "societal challenges", and that to do so requires challenging norms and standardised ways of working. Further, that they employ trained critical and reflexive capacities in this work, which are important parts of their expertise.

The social engagement ambition of the Climate Laboratory and today the Climate Center is a work in progress. The collective vision of the center in both its epistemic goals and wish to influence decision makers, policy and politics, is something the center aspires to develop further. As a transdisciplinary research center that positions itself as societally relevant and interested in 'catalysing transformation' on climate and energy issues, in theory it needs to be able to do the work of inter- and trans-disciplinary research *and* deliver on the 'societal transformation' that is part of their center's mandate.

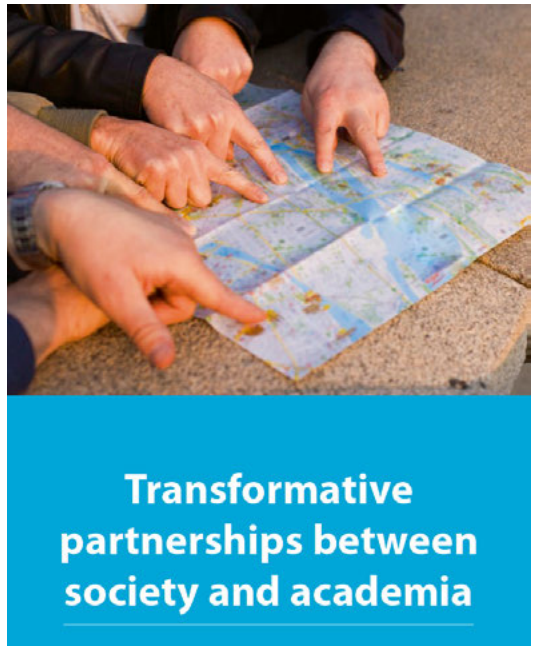

Figure 3. Cover image and text from Climate Center promotional booklet

In the below excerpt from a news article on Norwegian U's website, the Director is interviewed about sending representatives to a United Nations event in climate change. He elaborates the center's aims and the way in which they frame the problem.

> We are engaged in societal crossroads, trying to better understand how to meet the ambitious goals we as a society have set for ourselves in terms of sustainable transformation […]
>
> The need for more research to find solutions and how society handles climate-related problems is at the core of the Climate Center. Being in dialogue with

> societal actors improves the research we do and makes our work more relevant to decision-makers.

The center pursues interdisciplinary research projects with other academics from different disciplinary departments both within and outside their university. They also pursue transdisciplinary research projects in which they collaborate with non-academic actors on research projects.

A flyer (Figure 3) made to represent this approach shows the collaborative intent of the center and promotes partnerships within and outside academia as a means to addressing societal challenges. On one page, this approach is laid out succinctly:

> Global challenges call for radical innovation in research, higher education, and governance. Many of our research activities are organized as partnerships between researchers and societal actors. By working together with a range of societal stakeholders–and our own students–we improve the quality of our research and generate knowledge that is relevant for society.

On another page, under the heading 'Leveraging Transformative Partnerships' the center is presented as a collaborative partner offering a service beyond and in addition to the traditional knowledge production activities of academia:

> Societal actors often partner with researchers in order to get answers to basic questions. But partnerships with academia can deliver much more than basic facts: they give access to networks, competence and may uncover unexpected problems and opportunities.

Similar sentiments animate the members' interviews with the media and the university communications crew, particularly around the awarding of the prestigious philanthropic grant and around the time of the center launch. For example, this statement from the Director in a media interview in 2018:

> The need for more research to find solutions and how society handles climate-related problems is at the core of The Climate Center. Being in dialogue with societal actors improves the research we do and makes our work more relevant to decision-makers (Anonymised, 2018)

So far, the above chapter's description will sound familiar to people who have spent a little time around university environments. The center is very much a part of the university and department that surrounds it. But, as a former faculty dean told me during my fieldwork, a center like this has "a life of its own". It also differs from, and tries to differ from, its surrounds in important ways. As with many groups, organizations, and social settings, the specifics–and how people navigate and construct them–are not easily graspable on first glance.

They can be investigated through talking, observing and participating. They have to do with a story about what people do, what it means, to what end they are doing it. The next chapter describes processes and elements relevant to how the center in its present form came to be, and looks at challenges, concerns, aims and opportunities that animated its members along the way.

Chapter 5
Seeking Societal Relevance

5.1 Chapter overview

This chapter offers a description in the form of a roughly chronological narrative which describes change processes that proceed, was underway during, and continued after the time this study was carried out. It traces the development of the research group and center, key events, and offers people's reflections upon them. It is framed as an 'establishment' story. In a course-grained sense, three chronological points in time ground the empirical story here 1) When a research group is being assembled to work on climate in a societally relevant way 2) when a center is established and has recently been launched, and 3) when the two have been merged for approximately one year.

5.2 Creating a research group - climate, geography and a critical edge

The Climate Laboratory was started by researchers looking to find meaningful and exciting careers for themselves, and make their research societally relevant. Many motivations went into its beginning. When the two researchers who started Climate Laboratory met, one was a new PhD fellow, and one, the current Director, was a post-doctoral researcher. They got along well. They started a conversation that would continue over the coming years that included their ambitions for geography, for their department and for their own work. Early on, it spawned the idea to start an alternative research group, which would then turn into Climate Laboratory. In accounts offered by the founding members, they offer a number of motivating factors that lead them to do this. The geography department they were positioned within was not what they wished for in their future careers. They saw the research being done there was not 'socially relevant', at least not in the direct sense they wished it to be (this we explore further later) nor was it a particularly exciting place to be for them.

Both the researchers had just returned to their university departments after several years living abroad, one in 'developing' countries, one in South America and the other in Oceania. They were met with the reality of university life in a relatively standard Nordic university department. As they saw it, they wanted to be doing exciting work, and wanted it to make an impact on society. And this required breaking from the situation they were in. But to do this, political and structural questions concerning the existing structure of the department were also at play. In their view, the department was comprised of established research groups who competed for resources, and there was little room for other activities outside these groups' work.

They wanted to diverge from the department without 'rocking the boat' too much. As they developed the idea for and early activities of the research group, it was important to members to find a way to do their own thing in an environment in which they perceived there was competition for resources and their ideas about how to do 'societally relevant' research might not be accepted by others. This meant finding ways to start working in the direction they wanted to, carefully. According to the early Climate Laboratory members' accounts, trying to change this configuration would be a potentially risky political move. They looked for ways to do something new without upsetting this order. Rather than attempting to add additional research group, they started talking about making an informal group formed around a common interest. An initiative they ended up calling the 'Climate Laboratory' even though it had no lab and no instruments. It was a 'fuzzy' label no one would feel too concerned about. One of the early members, speaking to an audience at a conference in 2019, related it in a story told in a humorous tone

> **Bjørn** When I came to the department of geography in 2015 […] It was a very dull and lonely place. And deep down along the corridor, in a very small office, I found a very sad, and a very tall post-doc called Johannes. [Audience laughs]. And I was introduced to him. Someone said, 'this is the new PhD, and this is the old post-doc at the department'. And we sat down. And I think we both agreed that [the department had] a lot of potential. So, we started out, we tried to say ok how could we make this work? We couldn't make a research group, because that would be in competition with all the other research groups at the department. We can't do that. Ok let's make a laboratory! Yes, let's make a laboratory. That's not scary that's just fuzzy. People won't understand what it is [...], right? So, we made the Climate Laboratory. A very cool name, with no content. [Audience laughs].

The making of the laboratory allowed them to start working differently without creating what they imagined would be a threat to their colleagues. To start to diverge from what others were doing while fitting in with their departmental context

> **Johannes** So that gave us more free hand I think, to do, to say, OK we are just, this is just an initiative. We want to create collaboration and strengthen geography, make us more socially relevant. Things that everyone would agree to. If we had said, we want a 5th research group in the department we would have been seen as a threat to the others. So, it was basically, that was basically the idea we had. It was sort of a frame to do whatever we wanted without being put into a category of being a threat. (Interview, 2018)

They also sought a more a collaborative culture in their department that they perceived as missing and important. As referred to in the Director's reflections during an interview focused on starting up Climate Laboratory

> There's not that much interaction and there's not that much collaboration between different people in the department. And I think that's quite common in many academic or university departments because, well the way academia is set up, you know, you are supposed to collaborate with people outside [your department], and, but it becomes [pause] ah, I was looking for something that was more sort of interactive with people around me. So, when we got this opportunity to first establish a research group in Climate Laboratory and bring in more people to work together on some common things, I was very happy to do that. Because, I mean, it's more fun to go to work [laughs] and also, I think the research becomes better. (Interview, 2018)

In their account, these conditions seemed to prompt self-questioning over what kind of career would be meaningful and rewarding. They wanted to find a way around only focusing on publication, metrics and a more 'standard' career progression in academia something the two other early Climate Laboratory members echoed in interviews

> **Johannes** I was a bit tired of these standard academic departments where you basically don't interact very much with other people. Like have a group and collaborate much more closely with people and be much more outward looking rather than just publish another paper. Like, ah, during my PhD I was really focused on publications. I published and published and published. My PhD was 6 papers. And I did 4 or 5 papers alongside it. So I think that must be like a department record or something.
>
> **LA** So you don't sleep very much?
>
> **Johannes** [Laughs]. So then I had sort of done that, I sort of, is that what I am going to do with my life? Just pump out papers? So when I retire, I can look back: oh, I published 200 papers? No, that's...no. I still think publishing is important but not just, it is not really rewarding enough to just publish lots of papers. And then I met Bjørn. He started as a PhD student. And we started talking about these things. And he is also more sort of interested in doing more than just publishing the next paper, so […] I had all these aspirations, but I think he was kind of the one who really pushed me […] you know? The

> opportunity to do something different. And someone to do that with. (Interview, 2018)

As the founders recount it today, they felt a focus on societal relevance and impacting social change was absent from the approach to research and even education across much of their traditional university. Moving into climate and energy research offered both the potential to do research with societal relevance they were looking for and was highly suited to geography as a discipline. The early Climate Laboratory group thus started to perceive a future for their research careers and their field in climate and energy. The value of this vision for them was located not only in the value system of academia as they experienced it, but in the extent to which they could make a contribution and impact on society, something they envisioned. From where they were standing, the latter seemed to offer a way to work-around the logics of the former. Creating a space for research that could connect to and have impact on society would allow them to work outside university structures and culture and create something new. Or would at least be a way to distinguish and themselves from that system and align with something else closer to their personal epistemic aims and professional vision of work and career. This mindset is still very much present today in the culture and vision of the center. Broadly characterised it is about balancing being inside the academic system and 'out there' in society. Later on this would have different consequences once the Climate Laboratory group had been absorbed into the Climate Center. Funding policy and university expectations pulled them towards certain kinds of projects that were not necessarily what they had in mind at Climate Laboratory.

Over the next two years, Climate Laboratory group formed and convened research and education-oriented events climate-related, societally-oriented events. Like the first Fossil Free Futures, a bi-annual conference that continues today. They also secured several grants, ran a research seminar series in the geography department, and engaged in public debate. Throughout all of this, they continually emphasised the connection between their work and social and policy issues related to climate change and energy transition. Below this period is described more precisely.

Climate Laboratory as an idea had started to function as a platform and thematic direction for their individual research and other activities. Before and during developing the idea for Climate Laboratory, the current Director had started talking within the department ideas about connecting geography research to climate and energy policy questions, linking them to the city level. He had made a proposal to a strategic fund at the university, a philanthropic partnership with the university funded by State-owned oil and gas company Equinor (then called Statoil) and is overseen by a board populated by three

Equinor members and three university representatives. It gives out annual funding to multiple projects "to stimulate basic research and education within strategically important subject and competence areas for both [the university] and Statoil". This money was used to fund the Director's ongoing research and essentially kept him at the department. The dean of the department had been concerned department would have "lost" him as they had no position available. When this grant was received in 2015, Climate Laboratory was already in the works, and that year it began as an informal group within the department but with a logo, webpage and vision. The funded project was brought under Climate Laboratory group. Their own description started to shape a new direction for their research, and started draw up new focus on climate, energy and social change.

> "Our energy system is the major contributor to climate change. At the same time, society is shaped by the way we produce and consume energy. Modern energy sources are rarely visible in our everyday surroundings, yet they enable our form of life and make possible most things we take for granted. Understanding how we are 'energized' is crucial to understanding why societies are the way they are, and the possibilities for change.
>
> Geography is essential to understand the interconnected challenges of energy and climate change. The [Climate Laboratory] connects research on the geographies of energy, climate and society. The aim of the lab is to generate an engaging academic and intellectual environment to stimulate high quality research on these issues." (Anonymised).

They started filling Climate Laboratory's as yet "cool name, with no content", as one founder put it, with activities. It is during this period that they were joined by a third member, a new PhD Fellow at the department, Solveig. The Climate Laboratory group started building visibility and influence locally. They publicised their events, blogging about them, doing interviews with newspapers and the university's communications team. They published an article arguing for the adoption of the idea of 'the 10-minute city' in the local newspaper. In the article they write that it was "hard to imagine that we will cope with climate and energy challenges without more compact cities" and described the idea of a city in which, by design, one could get virtually anywhere in ten minutes time. That year, the Climate Laboratory group also wrote several Op-eds for newspapers and websites on climate issues. Mainly talking critically about the oil industry and its place in the Norwegian national identity and economy. Around this time their efforts at societal relevance were starting to bear some fruit. As Solveig recalls

> The Prime Minister was giving the starting talk at this conference. And she was on a huge stage and all of a sudden on the two big screens there was the, an op-ed that Johannes and Bjørn had written about the 'ten-minute city', and

> the importance of the ten-minute city. And she started talking about the ten-minute city. With this blow-up of the op-ed on all the screens. And that I think that was the first time that I saw something from the Climate Laboratory actually used outside.(interview, Maria, 2018)

They also started to engage their departmental colleagues in collaborative work. The same year the two Climate Laboratory founders Organized a three-day field research trip in a neighbouring municipality on which they bring researchers from their whole department to consider a concrete case related to climate change–the damage to a city due to flooding. They met locals and municipal employees and discussed problems stemming from climate effects, and then convened the geographers in a location where they spent a few days working what they could offer to this problem. This was seen as in a positive light by those who attended and the department and embodied the collaborative and socially engaged research they were aiming for. This, as they recalled in interviews, marked an important increase in positive attitude internally in the department both towards Climate Laboratory and towards collaborative work in general. It was an early intention to foster the kind of atmosphere conducive to collaboration in order to shape the kind of work culture the founders wanted. This trip and its climate change focus was also recorded and publicised in the city newspaper as part of a series of articles on 'grand challenges'. They had started to build visibility and a voice for Climate Laboratory within their department and within their local region. And started to seek out engagement with social issues and actors in their work.

Around the same time in 2015 the university started processes to form a new strategy that aligned with the Climate Laboratory's thematics and focus on social engagement. The university adopted a new strategic area "climate and energy transition" (*klimat och energi omstilling*) as one of their three strategic goals, which remains in now in Norwegian U's strategy document 2016-2022 (Anonymised, 2018). This was the result of a Norwegian U University Board meeting which the PhD co-founder of Climate Laboratory had been invited to help to facilitate. After attending this meeting, he saw clearly that the university were moving to prioritising climate and energy issues. In his telling, this gave them further motivation to make Climate Laboratory, and to do it quickly to out get in front of the university's new strategic goal.

Later, their having developed on their own their Climate Laboratory group then lead to them being asked to give input into the formal process that was already happening and that lead up to creating the Center. They were engaged into this process early, and able to make changes that added language and a more critical/interesting angle on the proposal, and which then later brought resources to them. When the university created its strategic goal and they were

able to capitalise on this and align with top down efforts, while at the same time trying to go their own way.

The following year a prestigious grant from a philanthropic foundation awarded to one of the Climate Laboratory founders changed the Climate Laboratory group's trajectory significantly. It is awarded to emerging researchers in The City and surrounding region that are seen as having potential to raise the international profile of science in the region. It helped him and the Climate Laboratory group to establish new a new research project, hire new PhDs, pay for a part time professor, fund post doc positions, a research assistant, and change location to a larger section of the social sciences faculty. It also gave the Director a full professorship at the department.

Before moving to the other thread of this history, the initiation of a social science-oriented climate research center that absorbed Climate Laboratory, a few final relevant issues are worth describing here. The early members were rewarded for doing something interesting and critical and different, but that also seemed to align with what various funders and the university wanted. In creating a distinct and divergent group that was relatively autonomous and informal, the Climate Laboratory had become known as the group working on climate transition issues. This then allowed them to be recruited to advise on a more formal and abstract process that was aimed at bringing in resources to the university. Abstract in the sense that it was aimed at expanding the university's work in to a particular area–climate transitions research with a social science component - but without a detailed or specified set of themes or demonstrated ways of doing it in practice. The bottom-up efforts of the Climate Laboratory, and their critical approach to research on climate seemed to have been an important ingredient for the initiation of the center. It is not possible to say if it was crucial, however, one imagines that without this already-active research group that was developed outside the formal groupings of their department, it would have been unlikely that the department, and the researchers who had become part of the Climate Laboratory, would have been selected as the setting in which the research center and its various activities and partnerships would have been placed.

The career stages of the two first founders when they met seem to have been important here in the overall development of the center. One was a well-published post-doctoral researcher who had spent time in South America doing his PhD with a strong focus on social justice questions and had been with the department through masters and PhD studies and knew the inside of the department well. And the other a PhD student, also having studied a masters at the department, but having left for many years before returning with a substantial experience in communications and marketing in civil society and the private sector. Had they not been at these stages in their careers, the timing

windows may not have worked out. The Director was at a stage where he could possibly become a professor and thus make the applications he did, and the PhD student brought his past experience to a four-year PhD that overlapped with this period in the Director's career. And as we have seen, given their history, to seek out engagement with justice and social impact in their work.

As referred to earlier, in 2016-2017 there had been some interest at the faculty level to promote the idea of an interdisciplinary center for climate transition with a social science component or focus. Through a series of events, it ended up being placed at the geography department and with the Climate Laboratory group as a basis for its beginning–the research group leader becoming Director of the center, and the group becoming the body of staff within it. New positions were announced and filled soon, and the center began to expand. In the next section, this process will be described.

Being a member of Climate Laboratory and working in alternative ways, "outside the structures"

The Climate Laboratory had started to present itself as a research group that would produce knowledge on climate and energy. Constructing the Climate Laboratory also provided a basis for, over time, connecting the group's climate-oriented policy priorities with funding sources available in higher education and research at the local and national levels. At the same time, it was also a project to move towards a new professional identity and working life. Especially early on, they were aiming to respond to a number of issues they had identified in their department and academia in general, and in their own working lives specifically.

To an outside observer, the Climate Laboratory group's purpose was creating a new 'intellectual environment', a research group that made connections between geography and a new research area, climate and energy. As shown earlier, their mission statement positions Geography as "essential to understand the interconnected challenges of energy and climate change" and aim of Climate Laboratory was "to generate an engaging academic and intellectual environment to stimulate high quality research". They aimed at three different elements of this, "Contested energy spaces" which focused on the social-politically disruptive elements of climate and energy, "Urban transformations" which focused on cities as actors in climate and energy transformations, and "Local responses and solutions" which focused on the responses of government authorities to climate and energy issues. As we have seen, they also initiated a number of other activities around these themes. These can be seen as efforts to construct an image of expertise in a new field, displayed for

several potential audiences they wanted to recruit to their cause, from peers to funders.

From the inside, Climate Laboratory's culture was seen as aligned with the values and vision of those who started it and those who then joined in the first round of recruitment. It was founded on the idea that they could do something different in a department they wanted to be distinct from. Doing this was a way forward in a department and a university system that in their perception was not necessarily leading them to meaningful careers. A means through which they proceeded was initiating work that was relevant to and engaged with society, particularly on climate issues.

Climate Laboratory was a shared enterprise in which all could contribute. Members felt they had created a space that in some ways worked outside of the structures and limitations of academia. Central shared ideas, not necessarily written into strategy or defined, were in the air: being a 'critical' research group, working with a critical and alternative approach in contrast to (what they saw as) the standardized practices and careers of those around them, putting the 'tools' of geography in dialogue with society, and working with societal actors across boundaries. As the group grew, there was an informal and friendly atmosphere cultivated, with hallway conversations being a significant part of people's working lives. Climate Laboratory members felt they were doing something different to the rest of the university. They had cultivated a space in which they were free to think differently and try out new ways of doing research, outside the restrictive and institutionally prescribed ways of operating. They were also free to speculate and play in creative ways that were not always linked to work but created an environment conducive to breaking from norms.

This is exemplified in this account from Maria, a research assistant and early member of Climate Laboratory, with whom I spoke in 2018 as the shift from Climate Laboratory to Climate Center was happening. She contrasted the Climate Laboratory to the rest of the university: they would often just have fun, or get into free-flowing discussions that may seem silly to outsiders, referring to a 'special' feeling of freedom and distinctiveness from the repetitive and restrictive structures of the university. In this interview account Maria offered an illustration of a broader point she and other Climate Laboratory interviewees made about the atmosphere of (or belief in) a kind of freedom from the structures and strictures of academia, an autonomy that was a fundamental part of work at Climate Laboratory. She also pointed to two sets of relationships important to work done in the group. The first is the close emotional relationship to and collective identification with members of the Climate Laboratory team. The other is their relationship to the university itself; the atmosphere and close social relationship being something cultivated as

distinct to it; “emerging independently of those structures” (interview, Maria, 2018).

Maria had been supervised in her masters by the now-Director and had worked on several projects with Climate Laboratory group, taking a high level of responsibility for a research assistant in much of her work. In the following interview exchange, she captures this spirit of being distinct:

> **Maria** It feels like the Climate Laboratory research group was a bit apart from the rest of the university. Maybe more like how you imagine university should be or would be.
>
> **LA** Yeah? Like, how so?
>
> **Maria** I think that when I think about universities and like, how like, historically how they were created to be, I imagine them as being more radical and kind of questioning larger things in society. And then studying at a university you kind of realize that it's more about writing the applications for funding good. So you get that, and you get to kind of just keep doing what you do until you retire. And you do some courses for students. Like, you just, you don’t really change anything and you don’t really ask big questions. You kind of just find your niche. You stay there and you kind of, apply for funding to keep going in those structures. And I think I’ve seen Climate Laboratory as kind of breaking with that.

She elaborates further:

> **Maria** Yeah, I feel like said it's not necessarily a realist or like, I mean, it’s not a realistic thing for many people that it is an option, like, it is not. But I think, like, the group that we have is really trying to see beyond. And trying to envision, like, alternatives that are not often envisioned in society. And I think it has been really cool to, like, I have been inspired to think a lot of new thoughts just by being there and kind of not accepting established truths in the same way as before.
>
> **LA** Yeah. And so you, you feel this is quite different to what is happening in most of the rest of the university.
>
> **Maria** Yeah and I don't know the rest of the university that well, but even like the geography department, which I. But I think they're also mostly older men just doing the same things that they've been doing for the last 40 years. So, yeah, I think it's also like the age composition and they're relatively new to the field. (Interview, 2018)

The Climate Laboratory had become a group with strong social bonds, mode of participation, and an identity that included being an alternative and critical

group, different in some important ways from their department and linked to a specific field–climate and energy issues.

5.3 Launching and expanding an interdisciplinary research center

When I visited the field in 2018, change was in the air. People were facing an exciting new set of opportunities, and also the dilemmas and challenges that change brought with it. The Climate Center had been formally launched in late 2017, and now around half a year had gone by. Members of the Climate Laboratory research group had continued with their work, the PhD students had been taken on before the center launched still had many years to go, and two initiators of the research group also continued in their roles. One of them, Bjørn, had just defended his doctoral thesis and was applying for post-doctoral positions. The other, Johannes, now a full professor after receiving the prestigious philanthropic grant that included installation as professor. The research coordinator (who had been employed through a position offered by the university faculty to help with setting up the center) had continued with his work and was busy expanding the scope and size of the center.

At this point, members of the Climate Laboratory group perceived some tension between the culture and values of their group, and the direction the new center seemed to be going in. They saw themselves as divergent, distinct and different from their surrounding university context, and as trying to be innovators in their field. The center seemed to reattach them to the culture of their university and department. This is explored later in the Analysis in chapter 7, but first, the establishment of the center is described.

A vision for a center, forming

Multiple actors and processes lead into the initially vague vision to have some kind of research initiative for 'climate transition' based in the social sciences. These include grants from philanthropic organizations, prominent scientists, a prominent local natural science Climate Center, university faculty leadership, a cross-faculty group, new university strategy and old policy, and receiving central government funding.

Centers are found all over Norwegian U, which is home to 52 of them. They are also found all over the research and higher education landscape in Norway. A large amount of the government research funding goes to the kinds of projects that centers and institutes apply for and run. Indeed, 30% of all R&D spending in the country is within universities (Norwegian Ministry of

Education and Research, 2013). The Norwegian Research Council even funds through competitive mechanisms its own high prestige centers, like Environmentally Friendly Technology Centers, applied for by the Climate Center's management team in 2019 in the ZeroCarbon application explored in Chapter 6. As discussed earlier, centers are organizations in which researchers gather together around specific thematics that may be particularly salient in the society and/or politics of the time. They can also facilitate collaboration by theme rather than discipline and allow for the pursuit and gathering of funding around research, education and intellectual interests that may arise among groups of researchers with different specialties. They are a formal entity within the university environment and tend to be anchored in university departments, but are allowed to draw in funding and projects of their own, and to have their own strategy and vision.

At Norwegian U, the idea for a center that eventually became the Climate Center arose and–as one member described it–'floated around' the university for a few years. The Climate Laboratory group were involved in developing the idea at certain points too, without necessarily seeing where it would lead, let alone that they would be in charge of it. A loose group formed and started working to make the center idea happen. That included the Dean of the Faculty of Social Sciences, the former head of a natural-science Climate Center, a climate-psychology researcher from the political science department who was also an active politician, and the now-Director of the Climate Center. Early documents show that the initial idea was for something more dispersed, like a network spread across departments. However, the now-Director of the Climate Lab advocated for a dedicated center in one location. This is relevant to the development of the center, as inter- and transdisciplinary research environments seem to require face-to-face interaction over a prolonged time in order to form cross-disciplinary connections and learning between members (Turner et al., 2015).

While there were incentives and pressures coming from the university and research funding environment to create some kind of climate research initiative in the social sciences, the early Climate Laboratory group's personal qualities and experiences seem to have been a crucial factor in Climate Laboratory being selected as the place for the center to be based in. Early on, the Dean of the Faculty of Social Sciences had been quite involved and had picked up the cause of having some kind of center for climate research. He was interested in the faculty being part of climate research and was also interested in keeping the now-Director of the center as there was no permanent position to offer him. According to the former Dean, this was because they could publish, knew how to talk to people, and how to "make things happen". The work they had done in establishing the Climate Laboratory and convening its various

activities and relating to local actors and processes had not gone unnoticed, and that came with advantages and expectations. In an interview, he put it so:

> organizations like ours are often moving slowly. And at the same time as there are so-important [societal] challenges. And you need to do the job properly. So it's a combination between, I mean, what you should be involved in, and how to deal with it to make a proper result. I mean, that is that is always a balance. That is why I would say that when it comes to processes like this with the Climate Center […], that persons are so important. I mean, that they're able to pursue this in good ways. And also be kind of platform builders or organization builders because when you invest in something, you need it to be done properly. I mean, you don't you don't want to invest all this money and then after some time, it turns out that there was money wasted. (Interview, former dean of faculty, 2019)

A prominent scientist and former Director of a natural-science-based Climate Center with a long-standing international reputation also played a role in the start of the center. He had been involved in negotiations to build a social science section into their existing center. A nationally well-known academic, his support seems to have been crucial in making the idea legitimate. He believed in the idea, and he had done advocacy work to various audiences including travelling, along with the Dean of the social sciences faculty, to meet politicians at the national level about establishing a social science center at Norwegian U for climate change research. The Climate Laboratory group were consulted and contributed to the ideas they brought with them. Later in 2017, this paid off when the idea for a center they had put out and that had "floated around in policy circles" for climate transition in the Western Norway region had been put on the table in a political negotiation and had been funded, giving the center some annual funding directly from the government budget. As Johannes explained:

> The Climate Center is a parallel story in a way, with Climate Laboratory. Because as Climate Laboratory developed, we got to know that there was another initiative to establish a The Climate Center at the faculty. […] and then were approached by the Dean [of the social sciences faculty] and he said 'Listen, we have this meeting with the parliamentarians in Oslo. We have this presentation of our ideas. Can you please take a look at this because you are the guys working on this? We are only promoting [that] Norwegian U has a capacity for making this center.' And then we saw 'Ah! This is not good enough'. And so we did quite big changes in the document. And then we sent it back to them and they presented it to the parliament. Which then, a bit further down the line, resulted in a permanent resource allocation from the parliament to us. (Interview, Johannes, 2018)

However, in 2015, things did not go as planned. Towards the end of year, the Faculty of Social Sciences had formed a working group on climate transition,

a group at faculty level including senior researchers from each department and administrators, to discuss how to make a social science climate research initiative. They were certain that it should be linked to the existing natural science climate research center. However, this did not work out. That center's partners and funders had little interest in social science, and the idea that had been discussed, developed and written about in the minutes of the meetings of the working group, collapsed.

> And then people were kind of let down, or something. I was kind of happy. Because I thought, we'll just do it ourselves! (Interview, Johannes, 2018)

This rejection of the faculty group's idea to attach a social science center to the existing center failed, but it had already helped to legitimise the idea of such a center. This was an important outcome for the development of the Climate Center as an independent center that would build on and absorb the work of the Climate Laboratory group.

As previously mentioned, in December 2015, the now-center Director received a prestigious award from a local philanthropic association funded by a wealthy industrialist. The foundation gives money to promising young researchers from across the disciplines of Norwegian U, up to three people per year. Natural science and technical disciplines are usually favoured, and this social science entrant was unusual. The grant offered enough money to hire several new staff–2 PhDs, one and a half post-docs and a part time senior professor and included co-funding of the same amount from the university. Crucially, it included a permanent professorship for the applicant. The project was focused on European cities as actors in climate and energy transition. When he won the grant, the Climate Laboratory was promoted within the university's media, and in local news media, as the place in the university that the project had emerged from. Their research group had produced a winning and prestigious application. They were responsible for bringing new capacity to the social sciences faculty, to research climate change and cities in the context of geography and were visible bringing money and reputation to the department. Climate Laboratory's expansion in reputation and resources made them the candidate group for the creation and anchoring of the idea of a center that had been 'floating around' for some time. They were offered the opportunity and the Director took it. Already in its inception, there were mixed emotions, as the center came with expectations:

> But then when I got this big project from the City Research Foundation, that was a big push towards the center because then all of a sudden there was quite a lot of activity on this theme. And kind of a group here that could carry the center. So that was a big step forward. And then the Faculty of Social Science decided to establish the center, but that made me little bit nervous. Because we really didn't have any money outside of my own project. So that was a huge

> task to build a center without any extra funding for it. But the faculty was like: ah, they'll probably manage. (Interview, Johannes, 2018)

The faculty had agreed to give them a center, but no additional funding came with it. The faculty did, however, offer them an administrative position they could post and fill–a research coordinator for the center. This would turn out to be influential in helping the establishment of the center and influence its direction, a process now underway. The research coordinator had a mandate to set about shaping the center. He brought experiences with him from his professional career that shaped how he went about this. Immediate actions were setting up a steering committee board from across different departments, adding other groups of researchers to the Climate Center in addition to Climate Laboratory (at the start of the Climate Center the only new staff was the research coordinator and a new communications person, no researchers), and securing external funding which required adding more people with seniority to make applications and recruiting non-academic actors to work on common projects.

The culmination of all this effort with a quick expansion of resources and a new organization was an exciting time for the Climate Laboratory group. It also meant the organization was in flux. As the Director reflected in an interview in 2018:

> So it's been, the past few years has been weird and wild in a way. Because for a couple of years I was just saying here we need the center, we should have Climate Laboratory, and we didn't really get anywhere, and then boom [clicks fingers] everything happened at once. And here we are trying to cope with this [laughs]. Write papers and do field work and hire new people and establish a board and establish a culture for this center and how do we work together. And try to do everything at once. (Interview, Johannes, 2018)

An expert in "building" a research center

The Climate Center, as we have previously seen, built upon the work of the Climate Laboratory, but was its own distinct entity. It came with new expectations, rules and possibilities for collaboration with internal university groups and external societal actors. The faculty had offered to approve a research center at the Geography department, with Johannes as the Director, and essentially would merge the Climate Laboratory with it.

The research coordinator, Karl, set about building up the center in collaboration with the Director and the rest of the team. He was very much part of the group and attended all meetings. In interviews he reflected on what was important to him and what he had set himself to do in his role. His accounts are interesting to contrast with the accounts of the Climate Laboratory group at

that time about what is important and valuable to consider in the growth of the center. (My aim here is not to point to conflicting views as anything revealing about individuals, but rather to highlight the different outlooks of people with different biographies, formal roles, and ultimate ends in mind as they went about their work in that moment). This contrast is useful in showing how different and sometimes contradictory imperatives were pursued. The critical and divergent group was experiencing change as the research center was expanded.

In early 2018, the coordinator had been busy. In the prior months he had helped work on the early stages of two research proposals, including the Zero-Carbon application which involved meeting industry and government partners. The research coordinator was there to expand the center and make it successful. This included many pragmatic tasks in creating a 'proper center', for example:

> Since I came here I have been able to gather a steering committee, we have a reference group, we worked on the strategy. So we spent some time on that, basically to rig ourself for becoming an organization with a proper structure.

In addition to this structuring and taking on required rules, one main task was expanding the center's research focus, which included expanding the group and the number of disciplinary specialties within it. He also wanted to keep the innovative spirit of the prior group alive.

Having previously been a researcher in biomedicine and Public Health, he had then spent over five years working within the "management of research". He had worked at the Research Council of Norway for several years, and then also in the Norwegian Development Agency. He saw the center as a way of building upon the hard work and expertise that already existed amongst the Climate Laboratory group. However, the strategic priorities for the growth of the center were different to that of the Climate Laboratory group. Success was about drawing in research funding, expanding the team and widening the research scope.

> **LA** I know that you are soon expanding. Or the Climate Center is, and you have new people coming. And you have more growth as you mentioned yesterday. What are the things that you would like to maintain during this sort of change that is coming up?
>
> **Karl** Well I think it's very valuable the resources we already have here. We have a very strong group here with some brilliant and dedicated people working on. You know, cities and governance. So obviously that's, if you are talking about the maintaining part, that is something to maintain. The enthusiasm, the willingness to think innovatively […] So I think that when it comes to

> expanding. Its, aah. That we can probably cover more research areas and have a broader set of expertise in the center. To maybe have stronger components of economy, psychology, natural science. That we can be a little more diverse than we are now probably. (Interview, 2018)

At that time in 2018, the growth of the center was a key priority for him (and for others including the Director). He saw his pragmatic work as primarily about building up the research organization:

> The reason I came here was because I became interested in climate change as a very important and urgent challenge and ah, both the opportunity to work on that, and the opportunity to work in an academic environment and also building something.

His approach was to take the center through the stages of growth a research center was meant to go through. In the following exchange, I ask him to reflect on the growth of the center and whether it might impact the social integration within the center. He emphasizes growth, flexibility in activities, and the necessity of moving through stages of building a proper center.

> **LA** You said yesterday that there might not be an 'optimal size'. But let's say for example the funding was continuing to be increased every year […] do you see that changing the way people interact with each other? Is that something you've considered?
>
> **Karl** Yeah, I don't know. Right now I think um, in that sense I don't think there is any limit as to how big a center could be. If you are growing and getting excellent people in that's demonstrating your success. And maybe then depending on your size you can also change the way you are working […]
>
> But at the same time I don't think I have allowed myself to think too far ahead yet. Because in essence I think we are ah, maybe it's good sometimes to, reflect upon what it could be, but, aah. At the same time we need to go through the different stages. So I think initially for us it's really to, it's definitely the point to grow beyond what we are now. And it's definitely to grow partnerships. Beyond what we currently have. I don't think we are. We are not challenged by being too big. Put it that way. Yeah. And we also have to define of course our role quite clearly. What is it compared to other centers? (Interview, 2018)

He sees expanding resources and personnel as an important measure of success, and offered an example, the center at which he studied for a MSc in public health, that illustrates how a center could be flexible with its activities and focus as it grows, starting out as one thing and ending up another. The growth of the center was a priority and it needed to proceed through a process - "go through the stages" - that included building relationships and defining its position.

The special feeling of Climate Laboratory was clearly important in multiple ways, but it was now undergoing change. As a research assistant at the center put it, Climate Laboratory's culture would be "hard to replicate" in future because it was so "based around individuals". This posed a problem for the future of Climate Laboratory, now that the Climate Center had been introduced. We could expect a close-knit group in the process of reorganizing to feel threatened or at least concerned by such a formative shared experience ending. The group would not be as it was before. This happened at the level of strategy and vision, for example the way they would include other actors in and outside the university in their research activities. It also introduced new management procedures for recruiting new members and other requirements the center brought with it.

One of the Climate Laboratory group members described a shift in 'growth strategy', from incremental to rapid. The idea of growing incrementally in members and partnerships, based on need and the building of a new type of critical research base was the goal of Climate Laboratory as he initially saw it. This had been altered by the imperatives of being a formal university center that was growing rapidly and making strategic choices that were attentive to university expectations and research funding opportunities.

A shift in who we are

The absorbing of the Climate Laboratory into the Climate Center caused some internal conflict and unease about threats to the Climate Laboratory group they had come to strongly identify with. But not only regarding their research activities that faced outward. Internally, people experienced tensions over the way the group related to each other. The Director explained to how they could no longer rely (only) on the developed norms and social relations of the Climate Laboratory group as a basis for decision making and defining identity. Particularly as people identified strongly with the shared development and direction of the Climate Laboratory group, and felt this changed participation in decision-making, and in their ability to rely on shared or assumed values like the tacit understanding of being critical. Climate Laboratory interviewees indicated that after Climate Laboratory was absorbed into the Climate Center, some things about the group were either hard to maintain or were no longer working. (However, it should be noted that there remained a generally positive atmosphere at the center, with these issues invisible to the casual observer).

It seems that there was a point where personal relationships alone were no longer acceptable as the glue that held things together. Several of the Climate Laboratory group related how it had become harder to have an overview of what was happening in the center. And how the feeling of being engaged together on a common project was diminishing, at least relative to the way it had

been with Climate Laboratory. The feeling of a shared experience and mission became harder to maintain. Although these sentiments of loss were often accompanied by a comment that 'this would be good in many ways for the Climate Center' that pointed to increased impact and more money. While these changes were seen as problematic and contentious at times, they were often in interviews reasoned as 'natural' process. Becoming a center was a kind of next step in an evolution, even if problems that came with it were unfortunate, they were necessary or even inevitable.

Concerns about change

With the launch and growth of the center, the Climate Laboratory group were concerned about what might change, what they might lose, and what they should hold onto in the process. The initial group was something a small group tried to do and managed to succeed, it was fun and creative and able to be 'critical'. Now growth of the center put that at risk.

> **LA** It seems when you are saying that something might be lost in that growth? Is it something to do with […] meeting and always being able to coordinate? Or something more?
>
> **Bjørn** It could be based in a lot of places. I think it's probably that with growth it also comes responsibility. And more seriousness to our abilities as an organization or as a center. And the Climate Laboratory initiative was very, very 'on the heel' in a way. We just did it. We said to ourselves this will be not a research group, because that will challenge the existing research groups it's going to be a laboratory. It's not a permanent staffed group. It's an emergent capacity of you know, researchers coming together to have fun. I think that is definitely the things that attracted the current staff of the Climate Laboratory. Jennifer and Kristin and Solveig and myself. That was really what urged us to go on, but now when we are turning towards being a much bigger [center]. And we *are* the Climate Center, because we are part of the Climate Center. (Interview, 2018)

Retaining the ability to be critical and to innovative was important as the center grew bigger with the Climate Laboratory a part of it and participating in its activities. In this interview dialogue, one of the initiators of the Climate Laboratory outlines a rich complexity of concerns that he has about the tensions of, on the one hand, seeing themselves as (and having seen success as) a critical and relatively autonomous group, and on the other, their success in establishing the center which would entail new responsibilities and formal relationships.

> **LA** […] being smaller and being a different kind of group is part of 'staying critical'?

> **Bjørn** I think so, because it's easier. And of course, it comes with less responsibility. To be small right? And that's the old story. Small and [sighs] irresponsible. That's one of the synonyms. And the oxymoron of being big and critical is something that we need to value and cherish. We need...we have to take with us both the critical aspect...well there's two things. The critical aspect that we need to bring on. And the second one is the creative one. Creative as in not 'think outside the box' kind of creative. But creative as in developing new methods, new ways of interaction, new ways of involving students, new ways of involving stakeholders, new ways of creating conversations. Those two things are what we need to hold onto. (Interview, 2018)

These "two things we need to hold on to" being critical and being creative (innovative) are important for people at the Climate Laboratory and Climate Center and return throughout my interviews in the way people frame their work. Here they are seen as being challenging to maintain given the growing and formalising Climate Center. In the Climate Laboratory members' accounts, being small meant autonomy and freedom to be critical, and less responsibility. Getting big means having less room to criticise, more responsibility and being pulled towards conforming with the system. Thus, he says, the "oxymoron of being big and critical" is something they need to focus on. In an interview, Maria compared them to another high-profile Climate Center, weighing up the idea that, on the one hand, if that they wanted to be big and have impact, they would have to become a bigger organization. But on the other hand, being smaller let you try things you wouldn't otherwise be able to:

> **Maria**: I think we are still a very small little brother. Yeah. Yeah. After Monday when the IPCC came with the last report [late 2018] you know there has been a lot of newspaper articles and discussions etc, etc. but I have not seen a name from here involved […]so I think if we want to be that kind of an actor we have a way to go. We have a lot of work to do. I am a big sister. But I can see in my kids that being a little brother is also a good thing. And I think that's, I think we shouldn't underestimate the sort of the room a little brother has for testing things. Mmm. Testing things. Trying to […] pull the strings a little bit further, when you are a little brother, I think. (Interview, 2019)

Some tension emerged between the group and the center. There was a need to stay free and critical and to keep the Laboratory group's spirit, and a need to gain responsibility and resources through expansion. The special feeling of the climate group and its distinct identity was echoed by other interviewees and was evident to me in the way the close group interacted when I had visited in 2017, and again in 2018. With the start of the Climate Center, this was put at risk. The research group was being pulled in a different direction, making different kinds of connections than they had previously.

> **Maria** Especially I think the Climate Laboratory group feel like there is a certain kind of an atmosphere within that group. Which is quite special. And it is

> really, it has a very critical edge and it is really young and urban and dynamic, and it has something to it that is really, it's kind of radical but still has a very high academic level. So, and then when the Center came along, it seemed like it was more about inviting the right kind of stakeholders and men in suits. And more official. (Interview, 2018)

The launch event of the Climate Center had been for some of the Climate Laboratory been illustrative of such concerns about change. They had developed an identity–a distinct and coherent picture of who they were, with some shared values and ends–which was challenged by what appeared to be their new status as part of an interdisciplinary research center that was offered and approved by the faculty, with new expectations upon it, and would be built out with different values and ends in mind. They perceived a cultural change happening that was disruptive and, in some ways, threatening.

> **Maria** I think it became very apparent after the [Climate Laboratory-run research conference]. Because those were two days where we were so pleased with the debates going on and topics raised. And it was a very like, preaching to the choir conference at the same time. Because it was a group that, they really agreed on a lot of stuff. But it was I think we all found it to be very, very interesting and inspiring. And then straight after, because we just hired [the research coordinator] before that. So he was kind of left alone with putting up the Center's official launch, which was going to be the day after the [Climate Laboratory-run research conference]. Maybe you were, were you there?
>
> **LA** I was there. Yeah.
>
> **Maria** Because that was kind of a breach. […] And I think we all came like out straight out of the [conference] bubble and having kind of that mode of thinking. And then we got to this like really, really official opening with politicians and no room for debate. And the food was all meats and just it was really. Yeah. It was completely different. And I think that kind of put people off and it scared people a bit, because we were now going to be part of that. And yeah. The characteristic seemed really different. (Interview, 2018)

The group members, amongst themselves, seem to have discussed this event at some length. Although I did not formally interview them about the discussions immediately afterwards, I was present an immediately afterwards and spoke to some of them and observed conversations. The reactions to the launch event were varied, but there appeared to be some consensus among the group that it was a stark contrast to the discussion in the conference they had just attended, and that there were important things at stake.

> **Jessica** I think the center is doing many good things, but there have also been times at least from an outside view the integrity could have been questioned. For example we had this launching ceremony. There were mostly men, and

> then representatives from an oil company and two other actors that were really trying to kind of more, direct the research. And these claims were not met critically. There was no space for the researchers in the room to critically ask things. So I think that gave quite a bad impression. And it definitely became a moment in our history which I think some people really reacted to. And I think some people didn't. At least it became very fruitful for our internal development because it became this reference point which we could then use in our conversation, where we wanted to go. (Interview, 2018)

"From a research group of friends to a professional larger organization"

With the initiation of the center, the way in which people were recruited to the group had changed. Whereas the initial research group had more of the character of a community of practice (Wenger, 1999) in which people were participating due to common interests, problems and developed more intimate social bonds, the center was more formalised and brought with it new decision making rules and other structures.

Just before my field visit in 2018, a process had been completed in which new recruits were decided upon: several PhD positions had been advertised, which were funded from the same philanthropic grant money, they had been interviewed for and a final selection had been made. Some research assistants who were Climate Laboratory group had made applications for the positions but had not been accepted into them. Whereas previously recruitment to the group had been based the decisions of the initiators and discussed within the group, now the decisions were done through a more formalised process with a board assembled from with their department and faculty. Group members expressed different views on this. Maria, the research assistant who had been part of the group for several years, did not get a PhD position. For her, this was disappointing on a personal level, but she also offered ambivalent reflections on both the recruitment process and how change presented challenges to the group's values. She was overall positive towards the new recruits but points out the concerns within the Climate Laboratory group about "losing something" and being a part of now-formalised processes changing their group's composition.

Johannes also reflected on this formalisation process as the Climate Laboratory become part of the new Center in which he now was in the role of Director, while of course also being one of the initiators of the Climate Laboratory. His reflections here are worth showing in some detail, as we can see him encountering some tensions in this period of transition in which their informally-begun critical research group is being merged with (but also remaining an entity within) a faculty approved interdisciplinary center of

which he has now assumed leadership. It had started to become challenging to operate as a group that made shared decisions in democratic fashion:

> [To make decisions] by consensus, the more we grow and the more resources that we get, I find it more and more difficult to do it that way. I mean, one thing is that the people are on temporary contracts. So I think there's a realization both for me and for other people in the group that at some point it's going to be in a position where they some will be able to continue to work here or continue to work in the university and others might not. And that depends on decisions that we've made, on what sort of projects to focus on. Who is included and who is not included in certain activity, who gets opportunities. And so it's becoming more complex to sort of use that sort of flat hierarchy and flat and structure to operate this. (Interview, Johannes, 2019)

The temporal realities of academic contracts and individual careers meant that rationalised procedures for decisions were needed. Decisions that were once taken on the basis of participation in the group, like about allocations of resources, now needed to be clearer and more objective. For the Director, this was something he was trying to guide the group into. It was a stage in a development process they were now part of.

> […] when we try to grow beyond sort of a small group of friends that we had in the beginning, we also have to have a certain level of professionalism in it. So that we have, instead of sharing the same, being part of the same projects, so that people's initiatives are what decides who gets the resources, we have mechanisms that give equal opportunity to people we work closely together with. But also other people from the university that we don't really know that well. So we had [seed money] grants, for example. Where we ended up saying, well, there's this one guy who applied and we've never seen his face before who had a strong application and we granted him money. There's another application from within the [Climate Laboratory] group, which was a much weaker projection. We didn't grant money to that. So that's kind of. We're trying to move into that, where it it's not based close relationships, but it's based on mechanisms of a sort of measure of 'objectivity' in quotation marks. To me it's moved from a small research group of friends to more of a professional larger organization. (Interview, Johannes, 2019)

This move towards formal procedures created, as other interviewees also indicated, turbulence for the Climate Laboratory research group. Tensions arose in this shift from a group of friends to a larger organization.

> I think, the key challenge now, because some people came into this early stage and they felt this is something that they were really sort of like a part of. Part of the leadership, part of the decisions. They identified strongly with it. And now it's more of something like it's a bigger an organization. There's a board where they don't even know the people who are on the board. Decisions are made on funding that they're not part of. And in a way that has to be like that

> because we can't continue operating as a group of friends. But at the same time, it's a kind of a transition process which has certain problems, certain painful experiences. (Interview, Johannes, 2019)

Just before my arrival to the field, the Climate Laboratory group had had a meeting in which they discussed these "painful experiences". Emotions and opinions had been in the air about the changing way the group interacted and made decisions. Whereas many of their prior meetings had been positive, enthusiastic and collaborative, this one had been less pleasant. Their group's feeling of togetherness and consensual decision making was being challenged.

> We really didn't get that far processing it. But several people sort of put forward things where I thought, well, that's hard to deal with that. People mentioned that they felt. At certain times felt a bit left out, and that decisions were made in meetings where they were not part, which is absolutely true. And there's sort of this contrast between people's expectations of what it means to be part of this and what it actually means to be part of this. (Interview, Johannes, 2019)

This "contrast" of expectations points to tension between the values and ends of the initial Climate Laboratory group and those of the newly developing center; one a group that had developed a sense of self based on being divergent and different with more intimate internal social relations and an espoused critical political stance to doing the same as those actors around them, but were now in an organizational setting that was changing. The center was to be a "proper research center" and that meant different decision making procedures, structure, diversity of recruitment, and different stance towards collaboration with other actors. But, as we have seen, it was not only the group's relations and composition that was undergoing change. It was also the scope and direction of the research setting they were now part of.

Losing a feeling of closeness

The participation of the whole group was a key part of the Climate Laboratory group's culture. People felt empowered to try out their ideas and make them happen, regardless of professional position or role, and there was concern this would be hard to retain. Both senior members and more junior members, like the PhD fellows and research assistants, were able to use their own initiative in doing work in a way they perceived as unusual in academia, contributing to the feeling of working outside the university norms and university structures. This was productive in terms of creating unique ideas (e.g. for research projects, educational offerings, events and communications). At the same time, with pressure to draw in funding, the university hierarchy had to come into play; more senior people would be needed. One PhD fellow, also a Climate Laboratory member, points out this tension:

Jessica I think a struggle at the Climate Center is that the expansion is quite built very much around junior positions. I think that you might need to consider a balance between, like we don't have that many people with a PhD at the Climate Center. Definitely not at Climate Laboratory. And of course to do something at the university such as getting research funding and external proposal things, you will need chief investigators that have a PhD. And you need to have people with like, experience. And I think another challenge at the Climate Center at the moment is how […] within the university to take certain decisions formally, to have formal power in the system, a PhD is often quite important.

And I feel that what the Climate Center has allowed me and other people to do is to also make a... well, we have lots of informal influence and get to do lots of interesting stuff anyway. Which I think, and [the Climate Laboratory] is great, I think that's also like, talking about how research organization can be different, I think what the Climate Center really encapsulate is that everyone is being seen and listened to. I hope everyone would agree with that to certain degree. And if they don't agree I don't think they have seen how bad it can be in other places to be honest [laughs]. I think that everyone is invited to come with ideas. Ideas are quite celebrated. That does not mean that everyone comes up with as many ideas as others. But still I think there is this openness, and everyone is invited to shape the organization in different ways. (Interview, 2018)

One early member of the Climate Lab described that with the reduction in importance of the Climate Laboratory group, and an increased focus on new growth of the Climate Center, her work was defined more by her own project and position; the individual rather than the collective.

Solveig That's one of the consequences I think of the Climate Center growing is that information flow becomes very different. And I think for me, I went from 'one of everyone else' in Climate Laboratory, into a 'PhD candidate' in the Climate Center. And it was kind of a, it was aah, I've been reflecting on that lately. I went from one of a group where everyone had to pull, into a part of a center where if I wanted to, I could just "No I have to just work on my project." I'll just kind of, close off". Not close off, but kind of shrinking my part. Which is also natural because the puzzle has grown. There are more actors involved.

LA Like, your responsibility, or?

Solveig Yeah. yeah. But also information flow and what you can influence and not influence changes when institutions grow, and you become more hierarchical and have more governing bodies or entities. Yeah. Then you go from a central figure into one of many PhDs.

LA And does that, have you seen the consequences of that shift for your work or for how you feel here?

> **Solveig** Yes it becomes more, in a way, the change has for me has been more of seeing this more as a job. Yeah. Less a huge common project and more as a job. […]
>
> **LA** In what ways?
>
> **Solveig** In the negative parts it's kind of you lose a little bit of, I don't know, control or a little bit of, yeah. When we were Climate Laboratory like we were six people. And if anything was to be done everyone had to participate in a very different way than at the Climate Center. And aah [pause] I really liked the common idea of having Climate Laboratory, and the common idea of 'we're doing this together'. And I think there's parts of it we still have at the Climate Center. And I think most people will say that it's really there but for me it's shrinking. Yeah. It's becoming more of 'I'm going to finish my PhD'.

This dynamic and concerns about it was only brought up by the Climate Laboratory group in interviews, with new Climate Center members not having reason to feel this difference. Further, concern about career paths threatened the close and supportive nature of the group and its identity-claims that defined how they were separate from the department and different. The change in culture can be seen in this Climate Laboratory PhD fellow's account, in an interview five months after the launch of the Climate Center:

> I think that Climate Laboratory [sighs], we're trying to, well, work closely. We try to have, we tried to create, an atmosphere where we can learn from each other. Where we work together. Which is not kind of lead by as much competitive instinct between researchers as you might see in certain places. But of course those, as an organization those things will still emerge. And of course we see some of those things already. Like people might anticipate potential competition about positions already like five years ahead or something like and that might influence how we work together now. But I think it's good if Climate Laboratory could also institutionalise, or that we could retain, some naivety. To be a bit naive in those things, and just try to work together and help each other and support each other in what we do. That sounds like common sense. But it's not really common sense if you, like, if I look at other university departments where I've been involved […] I would say quite a lot of competition between researchers is going on. The reason we don't have much of that at the moment is probably because we are young. So one thing we try to do is to keep Climate Laboratory young. (Interview, Jessica, 2018)

This discussion about 'institutionalising the group's naivety' can be read as a question of how to keep important parts of the Climate Laboratory group's identity against the norms and rules of the university; demands which did not fit with group. In the above example, the drive towards competition for limited resources seems to have started to become a concern within the group once again.

One early member of Climate Laboratory felt that, as the Climate Center grew, his contribution and seniority was no longer recognised by the team. Whereas in Climate Laboratory's close group of friends his role had been clear, the new recruits (new PhD fellows, post-docs, administrative staff and senior affiliates) did not have this knowledge. And it was not reflected in his formal position; he was only just beginning his post-doc. Having been one of the early members he had been influential in building the ideas and the culture and still felt responsible for maintaining the culture and social cohesion of the group. The subtle and perhaps unintentional loss of his position/role in the group with the shift from Climate Laboratory to the Climate Center made him uneasy, with his contribution not necessarily being recognised or rewarded in the new hierarchical system. Not understood by new people who relied on formal roles to understand the group structure. The laboratory group new these things tacitly, but this history was not known in the same way to new members who saw themselves as recruits to a new center.

> **Bjørn** Because being an old junior, as I am, I find that a bit challenging. Because now I feel that my stakes in both the Climate Center and Climate Laboratory are much higher than most of my colleagues. But I know at the same time that my status is not higher. Because I am a post-doc, same as the colleague in my office and now comes a new post-doc and they have certain experiences. They are younger than me, but they have certain academic contributions. That I don't have yet. And it makes it difficult for me to take what I feel is one of… to take responsibility for the collective, to make sure we keep the critical edge, to make sure I see everybody as... because I feel that is part of my responsibility and I know that they feel that it isn't my responsibility.
>
> **LA** For you to sort of, look out for them?
>
> **Bjørn** Yeah because they don't see me as a natural discussion partner, as a senior. Because I am not a senior in their view. And that we get people that are not, they don't know the genesis of Climate Laboratory they don't know the genesis of the Climate Center. So in that respect I feel that I, ah, that there should be something done with… yeah. I hope that it wouldn't be too long before I have a different position in the center. Because it's a bit hard to be in between all of that.
>
> **LA** Yeah, maybe that's also related to the size of the organization and new people coming in.
>
> **Bjørn** Yes... it is. And of course the price you have to pay of building up a collective that is quite flat in structure compared to more traditional hierarchy. (Interview, Bjørn, 2018)

These examples indicate that as the informal group became more formal and professionalised, issues of hierarchy and new members (recruited via

impersonal, formal channels) started to put strain on the informal social relations that had been essential in generating the groups' identity and early success in enrolling people to their cause, building a distinct research program and attracting funding. People's roles were changing. People who were once central and leaders were now part of a larger organization with more, and new, people. Members of the Climate Lab appeared to feel a loss their previous authority and position that arose in the informal context, in going from flat hierarchy to a more traditional academic hierarchy. People became aware of their lack of formal seniority and status. PhD fellows who were central people in a flat hierarchy are now only people doing their PhDs again. The post-doc who was a respected leader is now just a somewhat junior post-doc again. There was a feeling that the magic that had emerged out of the group culture disappeared.

Incremental growth to fast expansion

> That was the tension that you know, took place when The Climate Center developed. And I was, I guess […] whether or not The Climate Laboratory should develop incrementally or, fast. And my idea was always incremental growth that happened more as we went along. But then suddenly–you know, again with my theoretical background–the 'catalysts of change', you know, suddenly made a twist. And we got different kinds of alliances, different kinds of funding, different kinds of approaches to our own idea. And suddenly the idea changed. (Interview, Bjørn, 2019)

While Climate Laboratory was aimed at connecting to a new field from geography *and* making an alternative research environment, several things happened that interacted with this idea. First, the now-Director of the center was granted his professorship and the prestigious starting grant. Then the idea for a center was put to them and they accepted it. It may be that the Director always was interested in taking such opportunities, his co-founder was interested in more building a critical research school over time, than a center that could bring in money and expand a lot. Two things are relevant here. First, the quick expansion caused by these changes. And second, the subsequent development, with the arrival and effort of the research coordinator, of the center's strategy to be targeted at a wide range of thematics and partners and funders. Climate Laboratory's initial ideas were still in play but were now interacting with the center and its new mandate, pressures and possibilities.

5.4 What comes after

> I mean when we talked now, I spent a lot of time on how did I get the money, and how did I convince the 60 year old men to support us. But now we are here. And what do we do now? And what do I do? And how do I make the most of this? (Interview, Johannes, 2018)

After the Climate Center was launched, the Climate Laboratory group merged with the center. The center goes broad in scope and ambition, while the Climate Laboratory group continues to do smaller things (a dynamic expanded upon in the following chapter).

Formally, the Climate Laboratory research group continued to exist as its own entity but as part of the Climate Center. When I left the field in 2019, it was still a research group that people at the Climate Center identified with, and some activities were still carried out under its name as the funding for projects continued. This included an urban climate and sustainability project that had funded the early PhD positions, and which had been part of the Director Johannes' bid for the philanthropic grant that gave him a professorship. This funding, though, was approaching its end. The Fossil Free Futures conference and other student-driven educational activities started by the Climate Laboratory group also continued, now to a greater extent under the banner of the Climate Center. Efforts at maintaining the Climate Laboratory's website and generally communicating about the group had for the most part shifted focus to the Climate Center. Between 2018 and 2019, Bjørn, who had been a performing an unofficial coordination position for the Climate Laboratory group, put his post-doc on hold for a one-year political position with the regional government as a climate advisor. Strategy had been and was being developed with the Climate Center as the organization in mind. A mixture of small and large scale, university-focused and societally-focused projects and activities were now pursued simultaneously. The leadership group pursued a research application to large scale consortia-project, with such applications considered a normal part of building up a successful and well-known center. But at the same time, the group continued to work on various smaller activities, like advocating for reduced air travel within the university and creating a digital tool for that purpose, and pursuing collaborations with local artists.

The next chapter takes a closer look at and contrasts different approaches to pursuing research activities. Different approaches that lead the research group/center down different pathways that entail weighing up different kinds of risks, knowledge production priorities, and questions of who members of a group are and want to be. Members encounter different tensions in considering which way to go, and how.

Chapter 6
Pursuing Research and Transformation

6.1 Chapter overview

The chapter provides a window into local practices. It looks at examples of the group investing in different pathways for research. It also looks at various examples of efforts to pursue societal engagement and the activities that are carried out in the process. These are accompanied by people's reflections on challenges and tensions that arise.

6.2 Pursuing plural pathways for research

In 2018-2019, the Climate Laboratory had different pathways open to them in terms of how to carry out research. They had put in a lot of work to establish their research group and the center, building relationships with actors locally, and creating a profile for themselves. Opportunities to invest in new kinds of research opened up, and different approaches seemed to be on the table, so to speak. Those approaches tended to be either smaller-scale projects with slower, more natural organizational growth that allowed for autonomy and focused on local and open-ended projects, or, alternatively, larger-scale projects with faster growth driven by injections of funding that entailed more external control of work but were also more visible and connected to other influential actors. Below, this chapter explores members' accounts of how they pursued these different and, in some ways, divergent pathways.

This contrast of different pathways or approaches to pursuing the various ends of the organization and its members is referred to in the quote below from Johannes, the Director. In it, he contrasts some practical examples of their work relationship with the municipality government with the application to the Norwegian Research Council to create a multi-stakeholder environmental technology center.

> With the attention we have drawn to ourselves the past few years, they know well who we are. And invite us in if they feel it's relevant. I think what we still need to prove, at least in a bigger way than we have so far is how that relationship is useful for us and for them. Like, we have been in a lot of meetings where we say let's collaborate. But I still think we haven't really been [pause] concrete enough in what we contribute. What do we deliver? What do they expect from us? What do we say that we can deliver? How does this relationship work?
>
> We have tried a lot of different things. Everything from lecturing to writing reports on specific, gathering data on specific things. And I think all of it has been sort of useful. But. Yeah. I still, yeah. We need to keep building on that to be, to have projects and activities that are even more concretely useful for us and for them. That's vague, I am sure. But. I feel we have a close relationship. We are part of some of their projects and they are part of some of our projects. But still that relationship is limited to us going out and giving a lecture, you know saying this is what science says about this. Or, um, doing a survey on something. Presenting results. I think though that there's more there to be explored. So that's what we will kind of keep building on I think.
>
> And, aah, that's kind of the bottom-up way of building that relationship with partners in society. Where this would be more of a top-down approach with the FME if we got it. It would be more like–ok can we have a tonne of resources within the next 8 years and we will deliver this and this and this. They would be in the board to check if we delivered all these things. They would have promised resources to us. It would have been more of a formal big thing where we had to sort of define in advance the things we wanted to deliver. Now we are kind of collaborating in a low intensity way and seeing where it takes us. Which might be better. Who knows?

In this account, the group can pursue bottom-up, "low intensity", open-ended collaborations on the one hand or pursue a top-down, "big, formal thing" with set deliverables on the other. The group has pursued both kinds of work in different projects and at different moments. The following section explores each of these approaches to research.

Examples of smaller-scale efforts

During my time in the field in 2018 and 2019, members of the Climate Laboratory related to me in interviews different examples of how they work in practice to do the "societally relevant" work they were pursuing. These were projects they had created themselves through their own initiative, and were often done in collaboration with local actors who wanted some expertise on the social and policy aspects of climate. These projects stand in contrast to the kind of large-scale research projects that we explore in the next section. Below, several examples are described.

Bjørn offered some examples of research projects, and reflected upon why he wished to work this way, and how this related to the different visions he had for growth of the center. In interviews over 2018-2019, Bjørn related to me several examples of research projects he had initiated. One involved himself and a research assistant creating a board game that would be distributed around the city. The board game would involve participants having to make decisions, consider trade-offs and face dilemmas around energy and transport questions. Responses and interactions during games would be recorded as data. Another example was a formal position he took as a political advisor on climate and energy policy within the city's municipal government which he also treated as fieldwork to get an inside view of the workings of government on climate policy. It came about also as a response to an external opportunity. He was offered a position as an advisor in local government on climate policy. He took time off his post-doc to do this work and acted as a political advisor during a time of some controversial politics around climate policy in the city. Returning to his post-doc fourteen months later, he was ready to rethink the project, and use the experience he had just had of being inside a city government as fieldwork of a sort, what he called "bold fieldwork". This approach to producing knowledge through research required making connections and relationships locally, gathering material over time to build a picture of the dynamics of local governance.

For Bjørn, it was important to be able to work independently and "stay critical", and "not become just another boring research center". And such projects as those he worked on exemplified this. Having left for a one-year period, he returned to the Climate Laboratory/Center just as the large application to the research council had been submitted and the group was awaiting the outcome. Reflecting on this, this application stood in contrast with the ends he was pursuing, and that thought the group could and should be pursuing. It was important to "make up the road as we go" and not fit into predetermined frames:

> To be honest, I would, to me, the idea of the school and the idea of the education and the research and the holistic approach to research and society. I feel is. Shouldn't be dependent on that kind of funding where you make [uses an ironic tone] 'grand schemes' and you pre-define all your collaborative parts. And all your issues and all your work in packages and blah. Well to me, that's not how we collectively produce knowledge. (Interview, 2019)

Jennifer, a PhD fellow, related reflections on several of the smaller-scale collaborations with regional actors she had been part of. One involved meeting with the city government and creating a climate plan based on a climate budgeting method. She and a post-doc researcher, and a visiting professor spent time with members from the city government and helped them shape their

climate policy. This initially open-ended meeting turned into a formal ongoing relationship, and the Climate Center was after that listed as a formal part of developing climate budgets for the city.

Maria, a research assistant, recounted some examples of smaller-scale projects she had been directly involved in. One was being an advisor to a municipality on a Smart Cities project they were working on. She and the Director had initiated it, and she was able to give advice as they saw her as an expert.

Sara, a PhD fellow and early recruit to the Climate Laboratory, recounted a collaborative project with the municipality in which she saw herself as being involved in influencing change locally. This happened when she was "working at the systems base level" on "side projects". One example she gave was when she set up a workshop with some small local counties that were trying to develop climate and energy action plans, then wrote a report about the workshop which included insights from literature she saw a relevant. The counties revised their plans and communicated this to the national level, and the report was used to do this. This came about through informal channels and as a ground-up initiated activity.

> **Sara** It was an idea from, was a lunch discussion between me and one representative from the county. Yeah. And then I brought it into the project that I had with people from [the] Law [department] and they thought it was a good idea. So it became like a tiny little part of a bigger research project that they have. So we've got some front funds and we've got some hours that I could spend on it and the same from the county. And we made this workshop, two day workshop.
>
> **LA** That's the kind of thing that. Where you think you guys, where it seems that you have influence in the action part you are talking about?
>
> **Sara** I think this kind of a mix where we cooperate with other actors and make something that's valuable both for them but also for us because we. It's a very different way of gaining access to data and research data and it's a different kind of data than what you get from doing interviews for example. So you get a different kind of information. And in very many cases, new angles. And so it's useful for both parties, it's useful for research, and that's useful for 'he actors participating. And I think that's it's a very good direction for the Climate Center. When our main goal is to create actionable knowledge we have to sort of. We have to be enough in contact with the people who are going to perform the action. If we are going to make the knowledge or produce the knowledge or however you may term it, to further that action. We should do those kinds of cooperations. (Interview, 2018)

In Sara's account, it is through this kind of 'side project' activity, smaller collaborations that arise informally and are carried out between the Climate

Laboratory/Center and others, that the group is able to influence local action. Their capacity to produce actionable knowledge hinges on these. The direct involvement in local processes and activities meant that they could be sure they were not producing work that would stay only within the academic system and be irrelevant to the local situation and thus remain unused. Such side collaborations produce usefulness and thus the potential for influencing change.

Jonathan, a post-doc with a diverse academic background and experience doing energy research in developing countries, offered me several examples of how he went about producing societally relevant, actionable knowledge through more ground-level work. Asking him about how and when he sees himself producing actionable knowledge, he offered several examples that further illustrate the kinds of activities that the research group cultivated locally.

In early 2019, during my field visit, Jonathan had sought out collaborations with a local artist to complement the small conference on accountability and energy transitions he had Organized. The artist had approached him during an earlier workshop Jonathan had organized and said she was interested in perhaps collaborating in some way on a climate related art project. This eventuated in an exhibition at the city's art museum that was showing in 2019 during the fourth field visit I made. A visit to this exhibition was part of the schedule of a conference Jonathan was organizing. The artist had created an exhibition about visualising energy use, and had used the multiple colours found in the marketing imagery of the UN Sustainable Development Goals. This was a way of communicating with the public locally, to communicate about energy transitions, an issue that Jonathan believed "not that many people feel they are equipped to talk about". Further, during one day of the exhibition he was approached by a local art critic who wrote an article about the work, and who had been speaking about it with a group of other art commentators in the city. These were 'unpredictable' connections that arose through trying things out.

> You can't predict that. I didn't know this group existed from before. I didn't reach out to them. So it's only through practice and trying to do things that you identify where those linkages are. Or when some artist came up to me during the workshop and said 'hey I just want to say that we are interested in substantive collaborations and we should discuss this sometime'. Don't know what comes out of that yet. But just the fact that there is something. (Interview, 2019)

Later in the same discussion, he offers examples of actionable knowledge in practice that happened when he was on a trip he took to Portugal, in which he intervened in different ways in a public event in which the Government was

consulting with the public and promoting renewable energy. He was able to do several things in this scenario that for him illustrated actionable knowledge. In the first, he was able to speak to a state minister and make a connection for future collaborations:

> I was sitting within arm's reach of the secretary of state for energy. So the guy after the minister. The political head if you like, but the most powerful decision maker in that sector in the country really. And you know the Director general for energy and geology, so the most powerful executive official. Which is, in the energy sector, not necessarily the same as the most powerful in terms of directing things because a lot of it is politically modulated. But I was able to tap the secretary on the shoulder, pass on a flyer about things we do. Line up an appointment to meet with some of his advisors at the ministry. (Interview, 2019)

In another, he was able to ask several questions about energy scale, infrastructure and equity into the public meeting that he saw as having an effect of expanding the conversation in positive ways. His presence and voice made a difference in and of itself:

> To them, having somebody come in who doesn't even speak the language but who's been studying them and identifies those things as key bits to put a finger on and hold them accountable for. It enlarges the discussion locally that people might not be having on such explicit terms. It shows that there is not just an appetite for that kind of change but that people are looking at Portugal from outside Portugal as well. (Interview, 2019)

In addition, after the proceedings, the president of a local university approached him and said they should meet about possible collaborations, he tells me. In this account, being present in public forums and intervening in spontaneous ways is part of achieving the ambitions of actionable knowledge and societal relevance.

Having the freedom and possibility to engage in open-ended activities was a source of value here. What may appear from the outside to be attending a conference in one's field, is here framed as a valued and significant contribution to knowledge; framed as a potential to try things, experiment and learn, while connecting with politicians and industry figures and influencing the discourse and individuals thinking in a country's energy sector. Actionable knowledge, in this account, is pursued through messy and "fuzzy" processes with a good deal of open-endedness and a reliance on the actions of the individual researcher in the moment, in an unfolding and somewhat indeterminate situation:

> So that's one kind of way actionable knowledge could be seen. It's still a bit fuzzy, it's still a bit all over the place in terms of you know, where am I going with this? What did I actually do? Again it's a bit like with the workshop: do I know exactly what the outcomes are? No. Do I need to know? No. Is there value in doing it? Yes. Are there better ways of doing it? Yes. And we learn those ways by mucking about and trying to figure out where to go. (Interview, 2019)

He reflected on the value of such activities in contrast to collaborations with more 'rigid', predetermined requirements. In fact, it was in working with a non-academic over time, and then including her in an art-based research project, that had led to a research application he had just made that would be different to a standard one, unclear in its outcomes and valuable because of that:

> That's an interesting set of questions. When do you engage? Who do you engage with, what makes it meaningful? If you have someone who really wants to integrate you in to their program and says 'this is what it will look like' then that actually might turn out to be a very finished product. But it might not be a very meaningful engagement because the terms of engagement are too rigid to start off with. So what would you build off of it? I don't know.
>
> Whereas this collaboration, I wrote the artist […] into a 25% position for 3 years on a project we submitted a bid for 7.5 mil kroner to Swedish research council yesterday and if that comes through she'll be based in [Norwegian city] and we'll have people in [Sweden and Norway] taking trains and busses to get there a couple of times, getting to know each other in that space. And in the third year doing public exhibitions in [Sweden and Norway] on something they have been participating in for 3 years. And I don't know what that will look like but I know it will be something really worth doing. So this workshop and the working together with somebody outside of academia if you can say that, or rather adjacent to or cognate to academia. That lead to a push to try to integrate that kind of cross sectoral collaboration in a formalised framing like a research grant proposal. (Interview with Jonathan, 2019.05.29)

In these accounts, Jonathan made sense of activities and collaborations that he initiated or was central to carrying out in practice. They were constructed as pathways for research that can appropriately produce the kinds of knowledge and action the group was aiming for.

Taking on a big application

Over 2017 and 2018, members and affiliates of the Climate Center invested considerable time and effort in making an application to the Research Council of Norway. That involved months of work, many types of activity and multiple rounds of writing and applying. Building upon the earlier urban

sustainability research project and philanthropic grant they had received, the Climate Laboratory, now part of the Climate Center, was able to be part of a competitive application to be the group leading this, eight- to ten-year, multi-stakeholder, cross sectoral 'center' offered by the Norwegian Research Council. This is a Research Center for Environmentally Friendly Energy (*Forskningssentre for miljøvennlig energi*), or FME. There was no way the Climate Laboratory could have done this the previous year. They had neither the reputation nor the formal ability to apply for or manage such a project.

The application was a huge undertaking in terms of time and coordination that could have resulted in a mega-project that would last 8 years and involve up to 16 industry, government and academic partner organizations. It involved assembling a stakeholder group of interested industry and government partners and talking to them over several collective meetings in 2018-2019. Members of the Climate Center formulated a focus area–zero emissions transport for the region–that would fit with the requirements of the Research Council's call, which focused on environmentally friendly energy. It then involved persuading stakeholders (user partners) to come onboard and put in either money or in-kind contributions. It also then involved an intense writing period leading up to the deadline. The center could capitalise on work done in just a year or so during the development of the Climate Laboratory to present a socially relevant and connected, transdisciplinary and climate and energy focused research environment. One capable of engaging in research that included by design cross disciplinary work and non-academic actors.

According to the Research Council's (Research Council of Norway, 2020) own description, FME centers:

> […] carry out long-term research targeted towards renewable energy, energy efficiency, CCS [carbon capture and storage] and social science aspects of energy research. The centres selected for funding must demonstrate the potential for innovation and value creation. Research activities are carried out in close collaboration between research groups, trade and industry, and the public administration, and key tasks include international cooperation and researcher training. The centres are established for a period of maximum eight years.

The research funding mechanism of FMEs was designed to align with Norwegian climate policy objectives (Research Council of Norway, 2011, p.3). Established in 2009, it prescribes ways of organizing environmentally-oriented research; FMEs "bring together Norway's leading research institutions and key players in private enterprise, the public administration and various types of organizations" in expertise clusters that unite the "strongest players within a specific area" (Research Council of Norway, 2011, p.3). These interdisciplinary centres "are meant to integrate academics with industries, private

companies, regulating bodies, governmental organizations, and research institutes, to trigger a clean energy transition and pursue environmental innovations" (Silvast and Foulds, 2022, p.50).

There has been a trend in research policy towards funding interdisciplinary collaborations in Norway and internationally, and the increasing expectation that such collaborations will provide epistemological and technological ways forward for achieving sustainable societies and addressing sustainability problems, like those around energy systems. The Norwegian Research Council, the major funder of research in Norway, has increasingly emphasised contributions from the social sciences and humanities. At the time of writing, a main priority for the Research Council is to ensure that the social sciences and humanities are elevated in general across priority research themes, and expand the role of social sciences and humanities in solving societal challenges–climate and environment, technology and migration being three areas selected for funding (Norwegian Research Council, 2022). Measures to be taken according to the Research Council's 2022 'Portfolio Plan', which lays out the agenda for its activities, include: ensuring that that they carry out research that contributes to moving the research frontier, offer attractive and predictable career paths for researchers, have improved "research infrastructure", follow best practices for "open research" and deliver research that is crucial for dealing with societal challenges (Norwegian Research Council, 2022).

Against this backdrop, integrating the Social Sciences and Humanities to the FME environmental-technology focused centres has increasingly been expected (Silvast and Foulds, 2022). In addition, in 2011, a new category was opened under the FME scheme to fund centres explicitly based in the social sciences and humanities–although the majority of FME centres funded overall continue to be those based in natural and technical science disciplines. Calls that opened centres explicitly based in the Social Science and Humanities FMEs have happened in 2011, 2016 and 2019 (Silvast and Foulds, 2022), with three granted in the first round and two in the latter, 2019 being the year the Climate Laboratory/Center made their bid. More recently funded centres, however, are all required to integrate social science and humanities into their interdisciplinary project teams of actors, regardless of their focus.

Silvast and Foulds (2022, p. 51) point out that FMEs as entities are different to other more familiar and/or well-studied organizational forms in studies of "single sites of expert knowledge" such as laboratories and research groups. They are rather "virtual networked organizations" that consist of a blend of virtual components and multiple physical locales at which activity does happen, but which is geographically distributed and semi-autonomously Organized. Certainly, harder to observe with an ethnographic intent; one cannot stand inside them in the same way. This, of course, makes them rather

different animals to labs and research groups, or university departments and institutes for that matter. A research group that establishes one of these will face changes to their organizational form and the nature of their day-to-day activities, along with challenges to their identity.

An important question here is exactly what role the Social Sciences and humanities play in these interdisciplinary, collaborative centres. According to one study which collected interviews from members of social science and humanities-focused FMEs, it was often the case that Social Sciences and humanities were expected to study the 'users' of the technologies or services produced by the FMEs, a kind of after-the-fact study offering insights into barriers and resistance to uptake. This also meant that technologies were already developed and deployed before Social Sciences and Humanities scholars were called upon to integrate knowledge in the overall interdisciplinary configuration. It also seems that, at least in their study, there were differing expectations about the social sciences and humanities researchers' role in innovation. User partners saw them as the ones who would be making new innovations, whereas they saw themselves as doing "research that would help frame innovations for the partners" (*ibid*, p.61).

This links to another important element of the FME scheme worth discussing here, which Silvast and Foulds (2022) also focus on, is what exactly it is that FMEs do (at least nominally) that is innovative or new, and how they do it. The authors offer a telling quote from a participant in the early FME centres that points to how those centres are new kinds of entities in the Norwegian research funding system, having coupled together previously separate ends and funding streams:

> In 2009, the FMEs were new, and research institutions had to find out how to organize them, And we discussed this after 4 years in one of the FMES that this is a hybrid: between center of excellence and research and a center for innovation, which are two funding instruments that had existed before. It was supposed to do both at the same time, producing high quality research and also producing practical solutions to climate change. (Silvast and Foulds, 2022, p. 64)

This organizational form offers the promise of producing both excellent research and innovation in the form of concrete technological solutions. Overall, FMEs have "worked as a way of conceptualising transformative change anew in interdisciplinary energy research" that develops specific relationships to policy (Silvast and Foulds, 2022, p.65). They involve multiple academic disciplines and heterogeneous industry and government actors in research and technological development around energy. Notably, NGOs and other civil society actors are generally not included. The authors suggest that the centres

function as boundary objects (Star and Griesemer, 1989), artefacts that allow collaboration across difference. However, it is notable that there are set parameters that aim to include certain actors over others, provide those actors with particular roles, and clearly emphasise technology development. We might more accurately say that they are ideologically or strategically designed boundary objects that aim to generate certain types of organization, drawing in various actors, including research groups such as the one in focus in this thesis, and enrolling them as part of a kind of 'macro actor' (see Czarniawska and Hernes, 2005). This macro-actor achieves certain things for the state by making material certain ideas about how research should be organized.

Let's now return to the field, and to the application members of the Climate Laboratory/Center submitted in the latter half of 2018, after a sleepless night and a last-minute confirmation from one of the industry partners in late 2018. The application was to develop a long-term, multi-stakeholder "centre" that would be comprised of actors across multiple areas of the region, and some internationally. Quite a different type o center to the Climate Center, and perhaps to the stereotypical kind based physically in a single university location. Stakeholders included the regional electricity utility company, an automated transport company, three city and four county governments, the business council of the city where the Climate Center is located, an organization representing 300 energy industry companies, a state-owned company that promotes and funds "environmentally friendly production and consumption of energy", a company that promotes 'cleantech' for maritime commercial hubs, a state-owned smart-cities 'hub' organization, an environmental think tank, the Norwegian Environment Agency, a large Scandinavian bank, a research institute for systems analysis, two research institutes for transport, a business school, Norwegian U, a foreign university, and another large Norwegian non-university research center funded by the state.

Communication to partners emphasised removing barriers and creating opportunities for electrified transport, and creating internationally scalable knowledge and solutions in doing so.

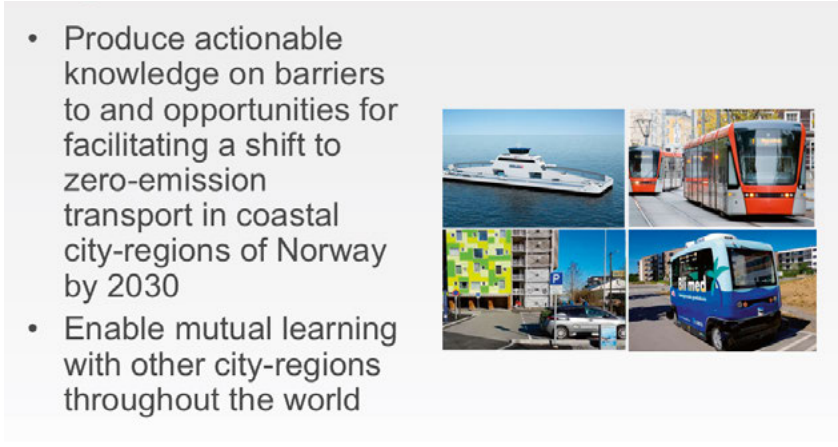

Figure 4. Slide from presentation prepared by the Climate Center and given to "user-partners" in the project

The application aimed at challenges related to achieving "zero emissions" in three different research themes: "mobility in cities", "regional transport" and "freight in urban and coastal areas". To do this, the Climate Center group had, through this application "mobilized a consortium of user partners" that would "take part in research and communication activities". A slide showing an public version of a presentation given to "user partners" by Climate Center is seen in Figure 4. The application's main thrust is summed up in a grab-quote on the first page of the application's body of text, under the heading "Part 1: Needs, objectives and impacts":

> The core idea behind ZeroCarbon is that Norway serves as the 'living lab' for a transition to sustainable transport in coastal areas. We will identify opportunities for advancing sustainable transport and for scaling solutions beyond Norway's borders–creating opportunities for industry.

The application emphasises the main activities of the "knowledge action platform" the center is intended to be. These are "communication, user partner-engagement, research coordination". The application offers a framework that integrates those three different research themes with four 'lenses' that the proposed 'center' would use to address the themes:

Lens 1, "Scenarios and zero-emission potential", would:

> Use a variety of modelling and scenario-building exercises, with both qualitative and quantitative input and output, to generate knowledge and visions for

> future development of the Norwegian transport sector in the context of a carbon-neutral society.

For Lens 2, “Identifying barriers to and conditions for change”:

> Using a combination of quantitative and qualitative research methods, including survey experiments, interviews, and policy analysis we will examine barriers and conditions as seen by authorities, companies and citizens.

In Lens 3, “Facilitating and unlocking change”:

> The goal [...] is to facilitate implementation of actions and solutions with user partners, including opportunities for industry.

And finally Lens 4, “Scaling and mutual learning”:

> Sets lessons and experiences from Norway in an international context, to understand potentials for upscaling and mutual learning, including opportunities for industry.

In the following sections we’ll explore this application and the proposed project further.

Making the application, making change

This process of making this application and the possibility of what it might lead to, raised a number of issues for members of the center that in some ways threatened the culture they had established. For one, the application had not involved many people; there were not the same kinds of discussions about it in the hallways that the Climate Laboratory group had always prized as part of their work. Usually, when they were working on things, they cultivated a feeling of doing it together. Now the Climate Center had been started, and there was pressure and interest to bring in new projects. Senior staff–the Director, research coordinator and a senior researcher affiliate of the center–worked on writing a big application. They worked exclusively, without any direct participation from others, on something that would bring about big changes to the group were it successful. It was not kept private–for example, progress was talked about in staff meetings. Yet this new type of working was perceived by some as not open to participation, which contributed to the feeling that the group was losing the sense of a common project undertaken by its close group of members that had characterised the Climate Laboratory research group. It took a lot of time and effort and was something the Climate Laboratory previously may have done and/or decided together. Some felt the process conflicted with their image of the group. The Director was aware of this tension between the research group’s participatory culture and some new

ways of working they were engaging in as the center expanded. He could see that on the one hand, it was not in line with the Climate Laboratory's culture of participation, but on the other hand, such work seemed necessary in order to take the group in a particular direction and to meet the expectations on them.

It is worth noting that, thematically, this ZeroCarbon research application was broadly in line with Climate Laboratory's interests. Relevant themes were often discussed during our interviews and informal conversations while I was there throughout the fieldwork. City transformation was a theme of the two PhDs that had started at Climate Laboratory on their first grant (from the university's philanthropic fund partnership with I). A 2018 publication in a peer-reviewed 'current opinion' journal for their field, shows four members of Climate Laboratory thinking through the "politics of rapid urban transformation" (Anonymised). In the article, they outline research gaps and lines of inquiry, with mobility and carbon emissions in cities and regions featuring heavily. Thematically, then, the ZeroCarbon application was familiar to the Climate Laboratory; taking it up is continuous with previous thematic work. The focus here is rather that, with this application, their group was being moved into a changed vision and way of organizing.

A sense of expectation, a sense of relief

While I was in the field in Spring 2019, the news came that the Research Council proposal had not been granted. After going through multiple rounds of writing proposals and organizing with stakeholders, going to interviews with the Research Council, and making it to the final few of the selection, the application is rejected and they do not get the project. This is met with a mix of emotions, both disappointment and a sense of relief. An interview with the Director Johannes immediately after he receives this news, and interviews with the research coordinator Karl and the other co-founder Bjørn, reveal different views on this project, including the process of applying for it, not getting it, and what happens next. The implications for the trajectory of the group are significant. While they may indeed still be granted such a project in future, for now they proceed with smaller-scale projects, maintain their organizational form, the Director remains able to focus on the group, and so on.

Back to the field in Spring 2019, before any news has been delivered. For the last few days, the Director and research coordinator have been anticipating the decision from the Research Council on their application. If it is granted, a whole range of changes will be triggered:

> We will become, we will have the sort of stamp, as being 'the transport center.' And I think we really have to watch out for the people here, who don't work on transport. And how they will, if they will, see themselves as kind of, aah,

> not working on the important thing. That their research has become second priority or second rate because it's not transport. So it will be a huge, aah, and we might even double in size. We might have twice as many people as we have today. We might move because we don't have the office space. There is a budget in the proposal to pay rent somewhere else, which we will probably have to do. Maybe will have to kick out the media studies people [who inhabit offices nearby] to make room for us. We need somewhere else to be. And that seems like a small thing but I realise how attached people become to the offices, and the hallway and the break room becomes part of it. Who has an office together. Things like that. Those are the really important things for the internal dynamic of the group. (Interview, Johannes, 2019)

For the Director, this was something that he had avoided thinking too much about, telling me in a Skype interview in early Spring 2019 that he was planning to deal with it when and if it comes:

> […] the whole rethinking of: how will this shape us? How do we shift our strategies? How do we structure ourselves to take on this huge task? That's something that will happen, will start the minute we find out that it is funded. So people are already asking me, where are we going to put these people. What offices etc., and I have no idea and don't really want to talk about it. But minute we get it we have to talk about it. It will have a strategic, rhetorical effect immediately. (Interview, Johannes, 2019)

It seemed that huge changes were not only possible but being actively sought out, through a serious investment of time and energy, while at the same time the consequences of these efforts were they successful were largely ignored for the time being. Yet it could be that this is a rather common situation in academia, and for research groups in general, once they have the capacity to make applications to such calls.

*

One month later, when the news came through to the Director that the Climate Center had been unsuccessful in their application bid, I was in the guest office where I based myself during my visits, with my small desk covered with a bag, computer, notebooks and pencils, typing away on some notes about earlier interviews that day. He had been waiting all morning for the news.

Earlier that same visit, I had been attending a three-day research workshop (essentially a small conference with international scholars attending) on Accountability in Energy transitions, Organized by one of the post-docs at the center. The Director had been there for parts of the conference, sitting in on some of the talks, and giving one himself in between other duties. I talked to him in between the presentations during a coffee break. He had been excited

about the possibility of being granted the application, telling me that if it is granted, he would go to Oslo that week and have meetings about the project. His career and the future of the organization they had been building would change dramatically. They would, as they had in 2017 with the launch of the center, move into a dramatically new phase of in the life of the group. Hearing this, I suggested that, if the project was granted, that I could come with him, following along to Oslo and sitting in on the meetings with him to observe what would unfold, perhaps observing something interesting about how this change would begin in meetings. He agreed to the idea. And then he was off to speak to other guests as the workshop continued. The anticipation and uncertainty of the situation around this moment was, for me, and what seemed to be both of us, palpable. Both of our respective professional everyday work would change significantly if this happened.

When news arrived that the application had been rejected, he conveyed to me his reactions to the news, his mixed emotions, offered an account of how and why they had applied, and what this meant for the group now. The application was a way of addressing certain risks and taking opportunities over others, now that they had not received it, other risks and opportunities came into focus.

> Looking forward I mean, for the Climate Center it would of course be amazing to get the [the application]. That would provide a lot of resources and focus. And it would really kind of prove to the university…take some pressure off of me to prove that the resources invested in this were well spent. Um. And so there are many, and of course it would provide some opportunities for the PhDs we have to become post-docs in a couple of years. So there would be lots of advantages of getting [the application]. And we would have close collaboration with partners–public and private sector. Um, so I think it would have been great.
>
> But. There would have been a downside to it which we now don't have to worry about. So I am trying to sort of focus on that. I think for the growth of the Climate Center as an institution, more organic growth is healthier. For the people here, for us, and for me as a leader of it. We kind of had organic growth until we got the government funding. And then we got this pretty substantial amount of money on short notice. And we are still not up to speed in terms of spending that money. And that means we will be bringing people in and um, there's, I wouldn't say they are not integrated, but we have less resources to integrate people organically into the group. I think it has worked well because they are all very social people etc. But there is definitely some disadvantages of growing quickly. (Interview, Johannes, 2019)

For him the application had offered an important pathway towards making their research work societally relevant:

> I thought, ok, this project... I would be forced to, or my incentives on me would be much more about being out there. So it would-be harder for me to sort of go back to these standard academic metrics of success. And I thought that could be a good thing. I haven't really thought it through really carefully. Just yeah, this would force us to be relevant. And maybe help us then to shift our own culture. Towards more. Yeah. To think very carefully, what research question... how can we phrase the research question in a way that would be socially relevant? You would have to be forced to do that quite often. (Interview, Johannes, 2019)

The project would allow them to do something "hands on" and fit within the 'actionable knowledge' aims of the center. But at the same time, the university's expectations had also been a factor he had been considering when making the application.

> I think the [project's] funding scheme is really good for us. It's about drawing user partners both public and private into a research activity, you get substantial funding to run that activity. And you get to focus on something hands-on. For me it was really something that matched the actionable knowledge part of our ambition. So that's the main thing.
>
> […] But of course there's also sort of ah, the expectations that we would apply. From leaders at the university who are not necessarily focused on the substantive things that could come out of it. Like this actionable knowledge, the things I am interested in. They are interested in, a university wants to get an FME. They want to put the resources into research groups, research environments, where they think something like that might grow out of it. So they don't put money and resources into something where it's just like 'Yeah, that's aah, I'm sure they will spend that money and do some interesting things'. They want to grow excellent groups. So we are kind of under pressure to show that that's happening. Of course I think the expectation works on a much longer time horizon. So I mean we just started The Climate Center, I just turned 40, just became professor. So it's not a problem for me to argue that we need more time. But still there are expectations there. I think if we didn't apply for the FME they would have also wondered, what? Ok what… why not? Was this a wrong investment of money? (Interview, Johannes, 2019)

The research coordinator had different reflections. He was not as emotionally invested in the process. Along with the Director, he and one other affiliated researcher had organized activities and stakeholders and written the application.

> **LA** How do you feel about the outcome?
>
> **Karl** Feel? [laughs] As I say it's hard to know because I haven't seen the review comments. So it's hard to agree or disagree about how we were assessed,

to put it that way. But I think my expectations have never been more than neutral.

LA OK… [indicates some surprise]

Karl Ha. I mean we tried to make as good a proposal as possible. But it is a competitive area. (Interview, 2019)

For him, the application would have brought changes that were part of going through the phases of being a growing center. The investment of time and resources in making the application was strategic, bringing new positions, publications, visibility, new relationships, and a thematic focus.

LA I was wondering, what about that [ZeroCarbon FME] project. What would it have brought here that you would still like to keep?

Karl Yeah I mean, in a sense you would get ah... It was a center; it was not a project. So basically we would have very quickly had, let's call it a sister center to the Climate Center, partially overlapped with it and partially was independent, or what should we call it. It would be structured as a project for 8 years. It would involve bringing in quite a few new positions in particular. Recruitment, PhDs and post-docs. And we would obviously be working on transport. So transport would immediately be more focused. The Climate Center is quite broad as it is. And transport would be a more focused area. Then the way we designed it there would still be some overlap. In the sense that we would have some shared resources and administrative resources and strong linkages. But at the same time, let's call it a separate or semi-separate center. So obviously that would put a lot of emphasis on sustainable transport. We would have active engagement with users. We would have obviously enhanced publications in that area. So that would be a very visible field.

LA Right, and that's important to you now to have visibility in a certain area?

Karl Yeah that's what we are discussing now. We are in the process of writing up a strategy. We have been doing that for some time. (Interview, 2019)

Bjørn, who had just returned from his time in government which was also for him time in the field gathering material, saw this as an opportunity to return to what the last few years of effort had really been about in the first place– establishing a critical and 'transformative' kind of research, based in their field but pushing it into new places.

The application had been representative of a path forward that was constrained and dependent on meeting funders' expectations, and in some ways did not match the values of the group and what they were trying to achieve:

Bjørn [What we do] shouldn't be, dependent on that kind of funding where you make [uses an ironic tone] 'grand schemes' and you pre-define all your collaborative parts. And all your issues and all your work in packages and blah blah. Well to me, that's not how we collectively produce knowledge. It should be done in a much more, you know. I don't know how. But to me, that is that is a way of growing that is so dependent on the funding system that we have built up. That to me it's just a fucking waste of time. We spend months and months and months of paid work to write proposals that you have a seven percent chance of getting. And you don't. And you make the project according to how the funder defines a good project. To me, that is. Come on. We have to find different ways of funding. We have to find different ways of collaborating with actors. So that we can do research without being slaves to a system that we don't like.

LA And that system is then very removed from the reality?

Bjørn To me it is. To me. I feel. You know, it doesn't have to be. But I feel like that it's turning research into very, very functionalistic, target-driven ways of doing research. Which of course has its place, in all this. But I think that it's. Tends to be too narrow and too tunnel visioned. (Interview, 2019)

Alternative, critical and independent work was really what was worth pursuing. An approach in which they maintained autonomy and open-endedness. Yet, there always remained the question of how to fund this, far less clear than the other approach that the Research Council application represented.

LA Where do you get money then for that kind of different thing?

Bjørn No idea. But. One way of doing it would be, for instance, to take on a permanent position in a state institution like the university and then do the activity. Be activity based, not funding based, right? Like if I see a system where. Being permanently placed in geography and then having students and introducing the students to the idea of the Climate Laboratory, not the funds of the Climate Laboratory, but the idea of the Climate Laboratory. The idea, the theories, practice and the activities that we can do. And then start from there. Maybe some of our collaborators would come along and say 'this, we would like to do this. We will set aside maybe a, for a position that could be ours or we can fund something or we can do something together, that we will bring in.' Where the funds are just part of the way we collaborate on an issue. For instance. Or it could be foundations that you make contact with, or maybe you can meet a collaborative that says, well, 'this is this is really what I want to do, let's establish a foundation'. Right? And, you know, these kind of things […]. Trying to also make up the road as we go. Or not try to fit in prefabricated versions of collaborations, or where to work together. (Interview, 2019)

Again, the focus here is not on pointing out differing outlooks on the same events among these specific individuals, or to show people pursuing plural

and sometimes contradictory aims within a group. Rather, the aim is to show how pursuing different strategies for research in practice and investing in different research pathways, makes different kinds of outcomes possible and precludes others. The dilemmas of weighing up different kinds of risks in pursuing epistemic and organizational success come to the fore for the members of the group. For example, being autonomous and free and critical, but having no money, or having much funding but being in a project with predetermined outcomes and set requirements how to on organize and collaborate.

Seeing new career pathways

It was clear that the Director's ambition of responsibility had increased significantly since the days of founding the Climate Laboratory. The Climate Center brought new considerations about who to collaborate with, external pressures and perceived expectations, and incentives for new activities.

In a series of interviews over 2018-2019, he often discussed weighing up different ways forward for the research group and/or his own career, the two of which were of course interrelated. We discussed how taking the path that the application entailed would change his work and his relationship to the group, and he gave reflections about what he thought about all this. That path risked pulling him away from the buzz and creativity that had been created at the Climate Center, taking away his time to do the actual craftwork of research and writing, and teaching. Nevertheless, as we have seen, he and two others wrote up an application that would drastically change the group's trajectory through the higher education system, altering their form and purpose considerably, and triggering changes to his ability to be the group's leader.

Winning the application would have distinguished Johannes as a certain type of academic and opened up his career to new possibilities he had not previously aimed for. The expectation was that he would have little time for being Director of the Climate Center and for the kinds of duties he was carrying out at the time. He expected to have a fundamentally changed career that would offer little time for research:

> If we get it and then I become the leader of the FME then I will do that for a number of years and afterwards its um, I mean, I look at other people who have led mega-projects like that and who never go back to being a normal professor […] if we get the FME and we go into that path and I don't screw up completely, and I don't make a radical choice about 'ok enough of this kind of leadership thing'. Then I probably will be in those kind of positions for the rest of my career, probably. (Interview, Johannes, 2018)

The application was seen as opening up new avenues for achieving the societal relevance the Climate Laboratory group had talked about as a central aim from the outset. In the beginning of the Climate Laboratory, this had entailed finding ways to make the work they did from within their department more linked to regional and local problems, and to debates in public discourse. Once they had received the Innovative Research Foundation grant and founded the center, this same aim of being more societally relevant remained. From the Director's perspective, he now had the platform and opportunity to help them get beyond the academic metrics and have more direct involvement in society:

> There are different metrics of success. But a lot of it is geared towards the baseline measurement, publication and impact factors. I am thinking about this myself. Because now I got this professor level, and there is much less of an incentive to focus on that metric of success. So I did my [inaugural] professor lecture. And ah, basically what I sort of put out as a question in the lecture: Sort of, OK, I have 30 years. If I don't quit or retire early, I have 30 years left of my career. So how do I want to spend that? And so now, I have this position. Do I don't have to rush to get a number of papers published. I don't have to. So how do I want to spend that time? So that's about figuring out what kind of metrics of success do I want to use for myself? You know. And I am very much drawn to societal impact, societal relevance. Contributing to important things in society. (Interview, Johannes, 2019)

Going down this path would have shifted members' careers, particularly that of the Director, and likely the research coordinator (the other leader of the membership team at this stage). The Director expected that it would have taken most of his time, and that he would from thereon probably never be a "regular professor", spending all his time running the new large-scale project and being recruited into high level strategic groups at the university due to the financial heft and status of the project.

> **LA** What do you think people will be expecting from you [if you get the FME] that is different from the way you are leading The Climate Center now?
>
> **Johannes** I think that's more of a, I think it's expected more to be a public role. Engaging in debates etc. And I like doing that. I do it to a certain extent already, but to do that even more. That's one thing that's expected. It will be much easier for me to make excuses to not go to staff meetings and to do any kind of committee work for the department. Or anything like that, it's not a goal for me to not be part of that. Yeah to me it seems like that's another league of people. Who run these kinds of big projects. You are expected to be more part of strategy committees, things like that, for the university. I have been a couple times, And it's not really what I want to do. At the same time it's interesting to be part of that kind of strategic development. But I see that people who have led those kinds of projects are really expected to contribute at the top

> level of the university. Strategic thinking, strategic development. I think that's something that will be expected.
>
> But then it really comes down to what do I want to do. And I still see myself as someone who is mostly interested in the substantive stuff. What I most want to do is, I don't know, want to write a good book or something. But if you manage these things there is much less time for that. I mean I think if we get the [Research Council application] and it goes well, I will probably get a bunch of good paper publications co-authored with others. But not that kind of, sitting down and really thinking about what is my academic input here? What do I want to contribute to the academic discussion? It will be more like leading a bunch of article projects, publishing things with other people. But not the autonomous intellectual type. Which I still haven't abandoned. At least in my head! [laughs]. (Interview, 2019)

Such an application can thus change the trajectory of careers, and of a developing research group such as this one. While in the end, they were not granted the project and so we cannot see empirically these changes, the Director being occupied with a doubling of staff, and the coordination of 16 partner organizations, among numerous other responsibilities would certainly have reduced writing, teaching and supervision capabilities. It is not clear whether he would have continued publishing research outside the bounds of the project. For example, it is not clear that a research paper the Director and a co-author submitted to a leading Geography journal for publication in 2020 (a year after the Climate Center's ZeroCarbon project application was denied) which used empirical data gathered during unfolding climate protests in the local region, would have been published at all had he been tied up in organizing the RCN-funded project. This cannot be verified; however, it is plausible. This is an indication of how certain career pathways and the forces that shift them can alter the course of scientific knowledge production. And do so in ways that have bearing on the capacity of such local- and change-oriented research groups to study and influence local events in the climate field.

Comparison of group, center, proposed project

Table 5 summarises characteristics and changing organizational conditions outlined in the above section.

Table 5. Contrasting research group, research center and proposed ZeroCarbon project

	Climate Laboratory	Climate Center	Proposed ZeroCarbon Environmental Technology Center for Sustainable Transport
Type	'Informal', group (perceived as not officially sanctioned, an experiment)	Formal, organization (officially approved, rules and guidelines, here to stay)	Formal, networked group. Developed based on initial 'informal' meetings with stakeholders, and then formal agreements offering financial investment and or work hours
Name	'Laboratory'	Center	Center, regional networked organization, across The City's region and some international partners
Members	2-3 core members	10-20 employees plus 20+ affiliated researchers	40+ employees
Cause	'Mission-driven'	Individual, project-driven	+ Large scale project-driven
Partnerships	Partnerships and collaborations in-person, non-contractual–through e.g. research projects, personal relationships, participation in public events	+ Seeking to increase partnerships with contracts and formal ties	+ Large $$ partnerships, with commitments from industry and government 'users'
Idea of growth	Growth of organization planned to occur through relationships based on project and need	Growth of organization through funding injections and awards	(Estimated) Growth of organisation by up to double employees, work carried out across multiple networked locations

Idea of interdisciplinary work	Establishing interdisciplinary research conceived as through linking to other external expertise as needed	Establishing research across disciplines conceived as 'in-house'. Interdisciplinarity through hiring people of varied background, as well as external partners	Contractual and long term relationships with non academi actors working on research and technology/service development
Funding sources	Funding from philanthropic fund (100% funded by and 50% board members from, I) and later City Research Foundation (philanthropy)	Additional funding from Norwegian Government budget (6mNOK/yr.)	Additional funding from Norwegian Research Council and the 19 'User Partners' in project (cash or in-kind services) if funding is granted
Decision making	Decision making carried out in a small group, flat hierarchy	Decision making still carried out in flat hierarchy, however some decisions delegated to steering group and boards	The Climate Center plays a coordination role for the organization and network. Decision making power and channels unclear
Emergence	Brought into being by a few people who 'just did it'	Brought into being as an outcome of several processes, Climate Laboratory being the location for placing the 'idea' of a center that had been talked about since 2015 by several people in leadership positions at the university	Brought into being through an intentional application to a funding call that required a year of negotiating and persuading 'user partners' in industry and government
Mission Statements	"Understanding how we are 'energized' is crucial to understanding why societies are the way they are, and the possibilities for change. […] connects research on the geographies of energy, climate and society. The aim of the lab is to generate an engaging academic and intellectual environment to stimulate high quality research on these issues."	"..an initiative at the Norwegian U, led from the Faculty of Social Sciences. The goal of the centre is to produce actionable knowledge about how to achieve a rapid transformation of society to meet the climate challenges."	"…Norway serves as the 'living lab' for a transition to sustainable transport in coastal areas. We will identify opportunities for advancing sustainable transport and for scaling solutions beyond Norway's borders–creating opportunities for industry."

6.3 Exploring "actionable knowledge"

The term 'actionable knowledge' often came up in interviews and in the fieldwork. It is a term in wider use in other academic and professional fields, however it has a local meaning and relevance for my participants. It appears to have been picked up in local use for the group around 2018. An examination of the Climate Laboratory's website including a regular blog written by members which covered their activities only turns up one instance of its use, by an affiliated researcher in mid-2018. However, it was used regularly in Climate Center documents and in meetings at the Climate Center. The term is used to denote several different things locally, and it has, according to some members, and internal and external sense making function about the group and their work.

During the period of my fieldwork, this label was being used in official documents to explain the Climate Center's work, such as the Climate Center's new strategy document. For example

> The overall goal of the Climate Center is to produce actionable knowledge about how to achieve deep, rapid and sustainable transformation of society to meet the climate challenge, in order to inform policies and practice.

Actionable knowledge was also being discussed internally amongst members, who had different views on what actionable knowledge meant for them as individuals and for the group, and what was appropriate or not. Actionable knowledge was now part of the ongoing efforts to understand who they were as a collective, with individuals relating in different ways to this label, and the expression of that difference being a way of talking about who the group was as a collective.

Actionable knowledge is a concept that can be used to refer to certain kinds of research. It refers to the way in which knowledge is made and what happens to it, denoting a recursive relationship between the producers and users of it. The way members use it locally, it seems to work as a sense-making concept which helps to shape meaning around many different kinds of activities and assist them in achieving (but also in interrogating) a sense of who they are. It seemed also to address demands to be perform as academic knowledge producers but also be actively engaged in societal change.

At its most general, accounts of actionable knowledge offered by group members refer to diverse activities that have to do with generally engaging with the society outside the university. This happens through the group's own enterprising efforts to work differently or be "societally relevant"–and not through

standard academic forms of work output such as journal publications or teaching.

As the Director explained, it is in his simple working definition "research that is produced and communicated in such a way that it is relevant to people in Society, stakeholders and decision makers in society" (interview, Johannes, 2018). A PhD fellow described it as a way of producing:

> Knowledge that can be relevant and applied at some point. But also that the way we do the research is this way of working with stakeholders so that we ensure we are relevant from the beginning and not only present it to them after it the research is completed. (Interview, Jennifer, 2014)

It also referred to an understanding of whom the research/knowledge is for. As the research coordinator explained, it was "basically knowledge that was relevant for some type of user" and was about impacting "policy and practice", but also "about how you conduct your research" so that it is clear in advance that you will produce something relevant (interview, Karl, 2019).

Actionable knowledge was about research produced in relationship to and in practice with other actors outside their organization within work tasks and projects. In the quote below, a senior member of the center points out the distinction between research with 'impact' and actionable knowledge:

> **LA** So if it's related to climate change, it's 'actionable', in a way?
>
> **Karl** No, I think actionable and the way others use this term is a little more about this co-production. Working closely with decision makers. But I don't think that framing necessarily accounted for that we have picked the most important climate measure. It could be actionable to get more people moving, to enhance the number of bikers in The City, but maybe that's not the biggest climate measure. So I think in my head there is a distinction. If you talk about *potential impacts*, maybe you would measure that against some other areas. But when you talk about *actionable*, that's more about how closely you work with decision makers throughout the research process. (Interview, 2019)

Hence, actionable knowledge requires a direct relationship with societal actors.

Actionable knowledge in practice

Members offered differing examples in accounts of doing actionable knowledge in practice. Overall, they fell into two categories. One, forming direct working relationships with local actors, in which the Climate Center researchers were able to influence discussions and actions of others. One

example is meetings with local city government in which they were asked to help form the city's climate policy. In another, a PhD researcher was present in meetings in a neighbouring city and was treated as an expert advisor on electrified transport, influencing ongoing discussions. In a third example, a post-doc researcher travelled to Portugal and joined in a public hearing run by a National government ministry (part of a series of such events around the country) focused on renewable energy. In his account, he offered a detailed description of how he intervened, asking pertinent questions, speaking with officials about their ongoing work, having a performative impact by simply being there representing outsider views. In a fourth, a public event was organized and led by members of the Climate Center that brought together over 100 people from various sectors to spend a few days working on climate issues together.

Another, perhaps more conservative, form of actionable knowledge in practice was more simply communicative. This involved disseminating knowledge about their research outside of the university sphere. Interviewees offered accounts of giving lectures to local school children, giving talks at a UN event, writing opinion pieces for the local newspaper. The research coordinator put it this way:

> If you want to be actionable, then part of it is to find ways to communicate. I mean if the purpose of this center had nothing to do with actionable and was just doing basic research maybe the communication part was not so important. But if we are saying that the knowledge is actually there to, that it's important that knowledge is also informing policies, then you are putting some larger responsibility on communicating research. And part of communicating research is that you can't insist that you are only gonna read our original paper. It has to be some way of translating the knowledge to a wider audience. (Interview, Karl, 2019)

A third form referred more to a research approach, including the societal stakeholders or users of research in the whole research process. In forming research questions, relationships with stakeholders, knowledge dissemination and communication, all as part of the project design for research. It "involves the whole research process" and requires that the group "start by thinking about social implications, contributions to society, rather than contribution to some literature debate" (Interview, Johannes, 2018).

In addition to these accounts of actionable knowledge in practice that refer to work activities, actionable knowledge played a role in the ongoing process of achieving a sense of collective identity, which we will explore next.

A sense of who we are

Actionable knowledge was also an idea that served as a way of bringing the group together, through generating an ongoing conversation about "who we are" and "who we should be." This ongoing discussion was a part of the process by which the members of the Climate Center came to distinguish the group against other actors within the university. When the Center was formed, new recruits were brought in who were intentionally "not the same" as the members of the Climate Center. The recruitment process actively sought diversity in disciplinary background. In addition, the Center now had many affiliated researchers with varying rates of participation who also needed to have a sense of 'we' with the Climate Center members, which included the Climate Laboratory group. The concept of actionable knowledge helped to bring the center together and was a strategic part of the overall process of becoming societally relevant researchers.

> I feel that I am having this idea that we should work, focus on, social relevance. Like, I do think we have a research environment now drawing people in where that's becoming part of the culture. Where that's becoming part of what's accepted as a norm. And that we have advanced discussions about how to operate in that space. But just the fact that we see that space and we see that that's where we should be. And we highlight actionable knowledge. And we talk about what actionable knowledge means. Not everyone agrees. But we are talking about what that means. I think that's quite valuable to me. That's a role that I. That's somewhere I feel that I have achieved something. (Interview, Johannes, 2018)

A new post-doc to the center saw actionable knowledge as an important defining concept for the group:

> I think it's really an important part of the centre. That creating knowledge that is directly relevant to policy and to what's going on now is sort of a core part of what people here do. And it's not the only thing that drives research, but it's something that people who are doing research generally under the umbrella of the Climate Center are. This is one of the things that they strive to do with their research is really have something concrete and practical about the present. […] And so, I mean, there's a lot of places in social science where that's just not a part of how people approach a problem. Or how people formulate a problem. […] Also, you know, it's not the only thing that people here are trying to do. But it does seem to be one thing that everybody at the Climate Center and everybody roughly affiliated with the Climate Center is. (Interview, David, 2018)

In one interview, the research coordinator crystallised the internal debate over the term and its meaning for members:

> Yeah we have had many discussions. We even had a seminar where we discussed the concept of actionable knowledge. Let me put it this way, for some people this is very clear. And even something that is almost like a branding thing. That makes us distinct. And for others it is a confusing thing: what does it actually mean? And for some it's even a bit, ah, a discouraging thing. Because they feel that, is it something that, is it only directly policy relevant science they are gonna do? Are they gonna be excluded if they don't do anything that immediately leads to some type of action? (Interview, Karl, 2019)

In the above account, actionable knowledge is constructed as a subject of some disagreement or at least differing interpretations. Those different understandings include, 1) a brand that makes us distinct, 2) a confusing concept people find it hard to grasp, and 3) a positive claim about who we are, but one that might be exclusionary given the diversity of work happening at the center.

Between different and divergent kinds of work

A PhD fellow, Sigrid, when asked about actionable knowledge, saw it as risky:

> My problem with actionable knowledge is more the 'ready to implement' thing that we talked about yesterday [in the strategy meeting]. That if we are only to produce knowledge that is ready to go, ready to use, we might end up with selling something we don't have. Selling false gold. Because it's never really ready to implement. (Interview, Sigrid, 2019)

Karl also discussed risks, and the dilemma underlying maintaining independence while producing actionable knowledge. In this account he relates a recent group meeting during a retreat for the whole organization in which they discussed the goals and identity of the new center:

> And we had one session where we discussed actionable knowledge. And what it meant and so on. And that was one of the.... yeah, some were concerned that we were becoming too much of activists. And that's not the role of scientists. So I think. But at the same time, let's call it my view, would be that maybe the urgency of the climate challenge means that you need to engage more than what has traditionally been done by the scientists. Because you can't necessarily wait too long for knowledge to be picked up or to influence some type of action. But of course the risk is that if you are no longer viewed as doing rigorous science and having some kind of independence and credibility, that can undermine what scientists are doing. So I can see that trade-off. (Interview, Karl, 2019)

For members of the group, producing actionable knowledge also entailed navigating between different work domains. On the one hand, it means in practice engaging with stakeholders and societal actors; making efforts to do work that

is societally relevant. But still the need to return to making theory and doing more insular academic work persisted, and needed to be addressed.

> So what I'm trying to say I guess is that like actionable knowledge could be, it means that there's several activities at once I guess. And it would also, and I think there's room within actionable knowledge to do some scientific, nerdy, theoretical things that are not really accessible for everyone but really speaks to a field and a small group of people. And that's fine as well, as long as you also keep the bigger picture in mind. (Jennifer, PhD fellow, 2019)

Pursuing actionable knowledge was important for the group, to meet their aspired-to identity. But it was always tempered with being part of a community of scholars and needing to so "nerdy, theoretical things", to get really focused on writing papers and engaging with theory, the non-relevant stuff.

> I thought it would be, my thinking has been I really want research and the university to be closer to society. And public debates. Actual decisions in society. But then we keep getting drawn back into you know, we want to just get this paper published in a high ranked journal. That means we have to kind of draw into ourselves in a way and be very specific about academic theoretical methodological things. Less societal relevance. We keep getting drawn back into the academic bubble. For better or worse. (Interview, Johannes, 2019)

Interviewees often discussed the how efforts at producing actionable knowledge, and facing the tensions inherent in doing it, distinguished them as an organization. Doing actionable knowledge was often constructed as way for academic researchers to create a legitimate relationship to societal issues beyond the university. This was contrasted to the implied problematic position of the researcher who does not seek societal relevance. In the following excerpt, a post-doc is elaborating on actionable knowledge and engaging beyond the university:

> We've had enough academia, sit around with very little to show for it. And you could argue that there's value to that and that's fine and there's value to art for art's sake as well. I have a part time contract at the humanities faculty. At a center for the study of the sciences and the humanities. And I spent the last few days mostly in workshops discussing philosophy of science. From Habermas to Heidegger to the positivists and their subsequent critique. I don't think that's without value, that kind of critical reflection needs to inform our practice. But if that's all we do we could be very well informed without really being vehicles for change in society.
>
> And I think that's a shame because academics are some of the smartest and best-informed people. And we have the luxury. We don't have the luxury as society. But we do have the luxury as academics where we are paid public servants who can sit around and twiddle our thumbs and think great thoughts.

> And have the resources at our disposal to do what we will with those. And I think it's [actionable knowledge] a good thing to do with them if we want to give back to the kind of society that makes it possible for us to have that privilege. And if we don't think that we are accountable for that, then we should be held accountable for it. (Interview, Jonathan, 2019)

Here again the professional, insular theorist 'thinking great thoughts' and doing little is contrasted to those who try to produce actionable knowledge relevant for society. The two identities and their respective set of values are contrasted. In this account, one is accountable to society and 'gives back', and the other is not and does not, at least not in the appropriate way. Working as an academic is constructed as a work that is detached from the real world in a problematic way, and that working to connect one's work to societal issues is the way to become the appropriate academic.

Explaining us to others

Producing actionable knowledge was also seen as also an attractive idea to external actors. Certain research calls, for example, required demonstrating how the research involved working with 'user partners' throughout the research. After the initiation of the center, actionable knowledge began to be used to describe the group's work to external audiences. It was at that point being used as a way to make sense of the divergent goals the center was seeking to achieve based on the expectations of various stakeholders. In an affiliate meeting in 2019, the first major meeting for all affiliates, the Director used the term to explain the group's work.

Actionable knowledge can also be seen as a concept that helps those new to the center to understand 'what people do around here'. For example, in introducing both new recruits and people who want to collaborate with the group. It is a way of framing the group's wok that helped retain a sense of identity as the organization was formalised and growing. The group could no longer be relying on just a group of friends to do this sense making about who they were together, nor could they have control over our recruitment process and only recruit people who are 'like us'.

Actionable knowledge retains some of what the Climate Laboratory was about, but turn it into something everyone can understand, a distilled idea. In particular, it captures a stance to research and to how research is conducted that points to the science-society relationship, the societal relevance that the Director and the group set out to introduce to their department in the beginning.

6.4 The transformative social scientist

In a particularly illuminating co-authored text (Anonymised) we find the Climate Laboratory researchers, at that point having recently become part of the Climate Center, reflecting on their work. It is a 'perspective' paper; an editorial piece published in a central journal to their field. This is central journal for this emerging field and its tribe: social science researchers focused on climate and energy issues. It was published under the names of all members of Climate Laboratory. In this article we see them *defining for us what it is they do, and who they are*. The article develops the idea of *transformative social science* and seeks to illustrate it through examples from work practices. In doing so, it portrays a type of knowledge expert, the *transformative social scientist*. A close reading of the account of their work present in this text can tell us much about what they see as important, relevant, and key struggles.

In this 'perspective' essay, we can see a presentation not only of an academic discussion about research practice, but of work done to shape identity, strategically crafted to speak to their field but also to position them at the front of it. They discuss common professional practical and intellectual concerns, and in doing so position themselves as exploring new territory with new techniques. Throughout the paper, an apparently divergent and even radical version of what social science is and what social science can do is presented.

We can read this as a crafted, collective account of their working lives presented for an audience of peers. The paper offers an account of the work they do, the tensions and challenges researchers at the Climate Center face, and what they think is worth presenting to fellow practitioners. As I will discuss later, it also does work to construct and define their work tasks and professional identity as a group. The text was first sent to me by the Director after our first meeting. In several interviews with him and three others, it was often referred to in answering questions about how they see their role as academics and engaged in transformation; 'Have you read the article we published? That explains it quite well...'.

In the article, they use the tools of the social scientist, including labelling, forming typologies, and reflexive analysis, not (only) to create a piece of empirical research, as would be the normal way of things. In this case, they turn this towards themselves. Labels are used to make claims about who the group is, and their future. Typologies are used to 1) set up a range of actors whom they are not, whom they are distinct from, in order to relate the space/need for becoming something else, and 2) do sense-making about their own work, making sense of several projects and collaborations and framing them in such a way as to provide understanding. Reflexivity is referred in the article as not only a tool in the social scientists' epistemological and rhetorical repertoire,

but as a trained skill and practice that addressing contradictions and paradoxes they meet that could threaten their legitimacy and authority.

The article frames the social sciences as moving into new territory in the climate and energy field and positions the authors as the ones to answer the problems raised in practice:

> The social sciences are increasingly called upon to engage with how decision-makers and stakeholders tackle climate and energy challenges. However, creating or taking part in these new arenas is not unproblematic, and arguably, social scientists have not properly reflected on what types of engagement are most useful. (Anonymised)

In the paper (Anonymised), they next identify 3 "stereotypical roles or ideals that scientists fall into". These are: "Spokesperson" for the harder sciences. Acting as a "bridge, intermediary or boundary object" to translate science into digestible form for other social actors. "Uncritical co-producer" interested in ideas like co-production and design thinking as ends in themselves, enamoured with practice and forgetting the normative component to climate and energy research. "Highly critical but entrenched": the radical academic, chained to the desk and fairly useless when it comes to "actual engagement and collaboration", more interested in talking to their tribe and engaging in disciplinary turf wars.

In this telling, these are the common identities that researchers at the Climate Center contrast their work against, defining themselves as doing something else; redefining the relevance and work tasks of social scientist in climate and energy problems and questions. The three stereotypes presented at the start are then contrasted against three new 'modes of engagement' formulated by the researchers at the Climate Center, namely that they 1), "produce and situate actionable knowledge, 2) "critically reframe discourses", and 3) "connect actors and processes".

For each of these modes, claims are made about the capabilities of social scientists that sees them move beyond the stereotypes presented earlier and into these new modes. For example, in the same order as the above list:

> […] producing contextually relevant knowledge about sustainability transformation pertaining to institutional structures, cultural resources, societal paradigms, and much more. Using this competence in producing and situating actionable knowledge must be an important tool in the social scientist's toolbox. Such prospective engagement is where the social sciences can make a distinctive contribution by intervening in circumstances that are customarily driven by techno-economic approaches.

> […] presenting visions, ideas and perspectives that enable actors to see things in a new light. This can in turn widen perceptions of what is politically possible, create new imaginaries of the future, or reveal how predominant ways of thinking overlook particular interests or injustices.]
>
> Social scientists can connect fragmented processes, using knowledge production to tie disconnected policy networks, governance agents, or stakeholders together. Connecting processes can help bring actors and networks into new arenas, and engender new capabilities to facilitate action and overcome path dependency in policymaking.

These claims and the overall paper position social scientists, with their 'social scientist toolbox', as essential workers in the challenging task of politics and governance of climate change. Not only as scholars and university researchers–traditional 'knowledge producers'–but as a group who have a unique skill set valuable to non-academic social actors interested in achieving 'sustainability transformation' and developing new policy and practice. They broaden their claims to expertise, and extend their professional roles to well beyond the academy.

They go on to present three examples of their work. The first project is a collaboration with a regional authority, assessing their climate and energy planning so they could be more effective in reaching energy targets. The municipality wanted their planning to be 'more science based. The Climate Center group "surveyed municipalities, analysed integration of climate goals, and co-Organized workshops, and produced a report". In the second project, they consulted to a planning process in a small municipality to get rail access to their town; 'sustainable mobility' which would bring about many new inhabitants and jobs. The Climate Center looked into "which kind of planning schemes, policies and mobility solutions" could help bring this about. They "helped frame ideas through workshops and meetings". In a third project, they partnered with a physical sciences research institute to try to downscale climate data for a municipality's planning process.

Next, they distinguish themselves from other professions. In a section entitled 'Venturing outside the comfort zone' they discuss the challenges of having been:

> […] placed into the (sometimes problematic) position of public experts on local sustainability issues and invited into multiple collaborative science-policy relationships.

They go on to discuss how this is a difficult position to have been put into, finding themselves in a 'messy landscape' of different knowledge producers who have different ways of working and acting. This landscape was hard to

manoeuvre within, they write, filled as it was with differing expectations and ideas of what research does and should produce. Other actors already do both basic science and tailored knowledge products better than they can:

> While physical scientists are often able to deliver more concrete facts (i.e., facts that have an associated sense of certainty in a generalised way) than social scientists can, consultants and NGOs often develop knowledge that serves particular interests or values in a more specific, more strategic way.

Where would a critical social scientist impact fully fit in? they ask. Their challenge is here presented as a problem of "finding a constructive and critical position" or "manoeuvring this 'expert' position" among a landscape of knowledge production where "objectives and tasks overlap and underlying interests are often unclear".

All of this is done in the context of certain threats to their expertise and insecurities about their identity. They refer to many aspects. That their training has not prepared them for the work they need to do; that actors they work with expect things they cannot or do not want to deliver with their methods–for example, 'hard facts' on energy savings or a contribution that could be used directly in lobbying; that they have agreed to contribute to non-academic processes, which might mean doing things that don't match their own research and career path; that they, as critical scholars, realise quick fixes are a problem and often have justice conflicts they may not agree with, but on the other hand they must back some solutions. They also present us with a range of questions that construct certain issues as key to their continuing work. Two issues in particular stand out as central:

> How do we anchor our integrity as academics and scientists while maintaining openness to working with actors we are only partially familiar with and solutions we are only partially knowledgeable about? […]
>
> How do we balance this activity of trying to *change things* with the fact that the legitimacy of our place in these collaborations comes from our supposed objectivity?

6.5 Conference activities

The Conference Train, academic conference and climate action?

On the final afternoon of the Fossil Free Futures conference, a keynote slot was devoted to discussing "an experiment" the Climate Center researchers had called the "conference train". Climate Center researchers had hired an entire

train carriage that travelled to the City the afternoon before the start of the conference. Figure 5 is a photo from iside the carriage. The journey was part of the official program of the conference, with conference related activities aboard the train. Participants were invited to join the train journey, travel together and experience an early start to the conference. Activities and discussions began aboard the train. Those aboard the train were mostly people who had an interest in train travel as an alternative to flying. This included a UK-based climate change professor, the Karl the research coordinator, and several conference attendees including researchers and teachers. The effect of the event was to evoke the feeling of a gathering of a social movement. Some held handmade signs with pro-climate, anti-carbon messages. Some speeches were read from a megaphone. Later, on the final day of the conference, the experiment was presented as a demonstration of changing travel patterns; a way for the group to demonstrate how they 'walk the walk' on carbon reduction for climate change. It took the conference itself outside of the university and onto the actual public transport system.

Figure 5.'All aboard the conference train!' the Climate Center invited 'researchers and students to transform academic work cultures in favour of low-carbon travel solutions' (the Climate Center, 2019)

A workshop on energy transitions–placing university research out in society

The two-day research workshop on energy transitions starts at 9AM at the public library in a basement room which holds around 50 people. Orange and yellow seats lining an auditorium-style space curve around a spacious, sunken

front-stage area at floor level. Jonathan, a post-doctoral researcher at the Climate Center who did much of his PhD work on energy transitions in India, stands at the front of the room, setting his speaker mike on his head as people wander about drinking coffee and chatting. He's tall and wiry, and full of energy. His attention seems everywhere, he's caffeinated, and a little shaky. The workshop he's spent months organizing is coming together.

Before the workshop begins and the academics take the floor, he tells us there is to be an intervention from a local school. A group of school students around 6 years old walks into the room, carrying signs and props. They make their way down the stairs and to the front of the room, where the open floor is wide enough for around 20 students to take various positions across what is now obviously a stage. In smaller groups they perform little vignettes about air-pollution, saving the trees, over-hunting, saving nature ("Take action!" the refrain between lists of ways you could save nature) and other topics. They had made their props and costumes, and some were shy. Having finished their performance to much applause they walked out and up the stairs, presumably back to school. Our host speaks in full sentences that turn into full paragraphs that tend to go on longer than one is ready for. His speech is dense with concepts. He tells us about why he developed the idea for the workshop:

> The aim was to think about energy transitions not only from a decarbonisation perspective, but also in terms of an opportunity to enhance social equity and to see energy systems as perhaps the biggest generational opportunity we have to really transform one of the most definitive sectors in society, a sector that's linked with several others, like land, like forest. A sector that's very close to people at different scales, very much, from being within the household or buildings like this [one], to large scale infrastructure and investments that are debated in society and sometimes not debated, but are paid for through public funds, more often than not.

We then get a round of introductions from the academics present. All are from the EU or North America. The presentation of academic research papers then begins. Each participant presents another's paper and then summarizes their suggested edits, followed by the author taking the mic and responding. Peer review and editing in real time. The pattern continues throughout the day: review, summarise critique, respond. As the first round of papers continues, it is clear that the issues the crowd at the workshop are interested in are a wide and diffuse a set of social, political and technical issues. But, it is agreed, that are rooted in the real world, are urgent to solve and carry moral and ethical weight. The issues and problems are located in electricity grids, government offices, nature reserves, Indian villages. The 'energy sector' traversing the world.

This two-day intensive research workshop with the theme of 'accountability in energy transitions' contained elements expected in an academic conference. But it also featured elements that illustrate how Climate Center researchers orient and organize their work in relation to non-academic audiences.

On the academic side, the workshop blended elements of a conference like keynotes and academic paper presentations, with an on-stage critical peer review process of the texts in which academics from multiple countries presented and discussed research they would use as material for a book. It closed with a far-reaching panel discussion on the relationship between research and climate policy.

Later, the day after the workshop, the Jonathan, who had organized it, walked me into the center of the city. The workshop was planned so that it would finish the evening before the 17th of May, the Norwegian National Day, so that participants could join in the festivities on what is the most exuberantly celebrated day of the year in the country's calendar. As we walked into the city center, having finished a late brunch with the participants who stayed on, he spoke to me about the conference, about the book, about what had worked in the workshop and what hadn't. Eventually we reached the central tram stop, in an open place by a central square, where I was to jump on and take my several stops to get back to my accommodation, squeezed in with the masses pouring on and of the trams going into the crowded city. He stopped me at the edge of the park that bordered the tram stop and pointed to a lone poster taped to a wall facing the crowds streaming back and forth. It was a poster advertising the workshop, the university's standard academic poster template looking distinctly out of place in this busy walking street area. He'd taped it there as an invitation, he told me, to hopefully bring some members of the public into the workshop and to extend his and the Climate Center's activity outside and beyond the university. (However, I had seen none during my attendance at the conference.)

There were several other parts of the organizing of the workshop that he wanted me (and presumably other audiences) to note. For him, choosing to hold the workshop in the public library was a way to intentionally show that they were interested in attracting and engaging with the kind of person who visits such an institution–a member of the public, not an academic. In a different project parallel to the workshop, he had helped create a public art exhibition with a known Norwegian artist that was being displayed in the City. He integrated viewing and interacting with the exhibition in the schedule of the workshop. During an afternoon break on the first day of the workshop, we thirty or so participants were presented with an installation that had been installed on the ground floor foyer of the library. Part of which was the 'Idea Box for Energy Transitions', seen in Figure 6. The Idea Box asked for

people's (the public's) thoughts and ideas about climate and energy transitions. The artist had come for the presentation, and gave us a formal introduction to it and her collaboration with the Climate Center. She was curating the works in the library as part of a larger carbon-and-energy-themed exhibition.

Figure 6. The energy transitions Idea Box installed in the public library 2019, one of a range of artefacts installed that related to the theme of energy transitions.

The full exhibition was located a few blocks away in the city's Art Center. It used the colours of the Sustainable Development Goals; the bright, candy-like spectrum of the UN's trendy framework. She had taken inspiration from energy usage data from 'Project Drawdown', a global climate change 'information and insight' non-profit group, and the UN Sustainable Development Goals. He had been in ongoing conversations with her and helped in conceiving the art works. The exhibition opened the week of the workshop and workshop attendees visited for a tour.

Who are we/should we be accountable to? Considering the "Norwegian yellow vests" movement

Now we return to the conference on accountability in energy transitions at the City public library. During a lecture on energy transitions in Norway, the Director of the Climate Center, Johannes, was delivering a lecture on carbon reduction policies in the transport sector in Norway, covering in some detail the translation across contexts and the effectiveness of policies enacted by the

government to curb traffic in cities. It was a fairly standard academic talk until, partway in, he began a discussion on a series of local protests and begins implicating himself and his research team in the discussion in ways that offer some insight into the constellation of conditions and concerns which he and the research group consider questions of identity.

In this part of the talk, he referred to what he calls the "Norwegian yellow vests movement", a local movement in present in several Norwegian cities in 2019 that formed in response to traffic policies that sought to limit cars in city centres by introducing road tolls. The use of 'yellow vests' draws a parallel to the protest movement in France of that same name (*gilets jaunes*) that formed in response to rising fuel prices due to environmental policies introduced by the government. The Norwegian protests were smaller and more concentrated to several cities but were nonetheless still antagonistic to the government, for example, with reports of the new tollbooths being burned down in one city. After the protests, a surge of new single-issue candidates led to many being elected to government claiming they would end such transport policies. In short, this was a highly visible political protest current at the time of my fieldwork that directly opposed policies brought in under the label of carbon reduction to address climate goals. These were policies that researchers like those at the Climate Center, with their focus on societal relevance and branding themselves as climate researchers who seek collaborations with societal actors, would advise governments on, talk about with their students and, in general terms, align themselves with. In the following scene, recounting these events to an academic audience, Johannes considered challenges to the research group and its members' sense of who they are and what they serve.

In the below excerpt, Johannes points out that at the Climate Laboratory/Center, they help produce professionals such as those introducing the traffic tolls. He then uses the recent protest to consider the different roles the group needs to inhabit, and how this challenges their identity as an organization that is accountable to societal actors and their needs:

> They are trained by us. They have our ideas! And, that's where our master's students get jobs. It's doing this kind of thing. So that's maybe our main impact as scholars. And I meet them in the city center and they have electric bikes like me. And we agree on everything. They are very accountable to me! But. And we thought that was great! But then this happened. And then I thought, maybe they are not accountable to a lot of other people. Maybe I am not accountable. Norwegian universities are paid 100% by public money. Maybe I should be accountable to more than just people who prefer that kind of urban lifestyle."

In this account, on the one hand, they are actors in the climate debate, training others in a set of ideas. On the other hand, they are paid public servants that should provide value to society in general.

Chapter 7
Analysis

7.1 Chapter overview

This chapter analyses the empirical material gathered as part of this study, and that was used to construct the previous chapters. It develops findings in answering the research questions by making use of the conceptual frame as presented in Chapter 2.

7.2 Conceptual frame summary

This chapter looks at the empirical material with the help of the conceptual tools outlined in Chapter 2. First, we consider the *conditions in which tensions became salient* locally at the Climate Center/Laboratory. Some have called such conditions "triggers" (Gaim, 2018). These are changing conditions such as shifting goals, roles, or values (Smith and Lewis, 2011). Second, we consider the specific tensions which become salient locally (Andriopoulos and Lewis, 2009; Gaim, 2018), rising to the surface and requiring navigation (Jay, 2013). We see specific tensions that become salient in this transformation-focused sustainability research setting at the organization level, within work tasks and projects, and for individual field members. These *specific salient tensions* manifest at different levels and moments and are salient in the establishment of transdisciplinary research with its aim of "societal engagement". Third, we look at responses to these tensions. Responses can be *active or defensive* (Jarzabkowski, Lê and Van de Ven, 2013). Defensive responses attempt to get around the tension, like temporal or geographical *splitting*, favouring one pole and ignoring the other, or attempting to *avoid* the tension altogether. If tensions are persistent, such responses may only work in the short term. Active responses, such as *integrating* or *transcending* tensions (Poole and van de Ven, 1989), accept both poles of a tension, and can be more viable over the longer term than defensive responses.

7.3 Relevant conditions in which tensions became salient

Changing conditions and shifting cognition (Smith and Lewis, 2011), and new relationships between people (Clegg, da Cunha and e Cunha, 2002), can lead to tensions becoming salient locally. These conditions were relevant to tensions oftentimes appearing together in the empirical material. Several were often relevant at once–i.e., it is not as if one set of changing conditions necessarily corresponds to only one tension becoming salient, or responses. Conditions include: the group's reason for being; embeddedness in a university department; needing to relate to a diversity of audiences and stakeholders; becoming more formalised and professionalised; members' ethos and training; pressure to find new funding sources; research and higher education policy shifts. While this is not an exhaustive list, it covers many relevant conditions that were present locally and appeared relevant to the generation of tensions in the material collected about the establishment of this transdisciplinary research group and center.

The organization's reason for being

The Climate Center's purpose and mission involves pursuing academic ends while also pursuing a societal mission. One of its main stated objectives, "producing actionable knowledge" embraces a tension. On the one hand, the need to "produce knowledge" is one that all academic groups are tasked with; on the other, to make it somehow "actionable", that is, able to be acted-upon by some extra-academic user outside the university. The center aims to be involved in helping society transform, in working to "meet the climate crisis". They want to be associated with local and national impact on climate and energy issues; to be seen as a place that contributes substantively to societal change in this area. And one that works closely with industry, government and NGOs, and has a voice in the climate debate locally and internationally. At the same time, it aims to be academically excellent, publish in top journals, work on internationally connected projects. They need to operate as an academic center, fulfil academic roles, and produce value for academia. This includes research activities, teaching, taking critical or impartial stances on issues, engaging with the publishing system and so on. This diverse and sometimes divergent set of aims also surfaces tensions for individuals, as they try to relate to the organization's purpose and their roles within it.

Embedded in a university/department

University-based research organizations are dependent on the departmental structure of the university, but at the same time have "a life of their own". The

group and center are administratively anchored in and dependent upon their department, yet have their own strategy and aims. Sustainability research groups and centers are embedded in the departmental and disciplinary structures of the university. They are administratively anchored in their department and rely on it for many administrative functions, including handling employment contracts and funding grants. The Climate Center developed goals and approaches to research that diverge from those within their university context. For example, the department is disciplinary research focused while their group was interested in working on societal-problem based research. When they started the center and as they grow, it is important for them to be seen as part of their department and university, but their chosen field and philosophy to research diverges as they start to distinguish themselves as a group. Changing the relationship that their research has to society meant that many tasks, goals and values started to diverge from their surrounding organizational setting, yet they remain embedded within it.

Relating to various non-academic actors

This involves continually engaging with non-academic audiences, who come with their various expectations for granting funding, doing collaborative projects, engaging in academic/public events and dialogues, in disseminating knowledge. Each of these has their requirements. Pursuing new projects and further funding lead the organization to develop new relationships and face divergent expectations from their environment. Taking on management of the center further pluralised their relationships and responsibilities to various audiences and stakeholders–a necessary condition of societally engaged transdisciplinary research. How to appropriately fit in with the expectations of these stakeholders and collaborative partners became important. The organization needed to balance what members wanted to do with what partners wanted from them.

Becoming more formalised and professionalised

The establishment of the research center merged the initial research group and the formal university center. This process, which is common in academia, leads to tensions arising in working for what the group believes is important, while expanding and changing to accommodate and adjust to the requirements of other actors. The initial group was self-driven and in it for interest's sake. They made an interesting group and promoted themselves, were awarded some research grants and recognition, including a major prestigious philanthropic grant, and were eventually offered leadership of a center. However, the flip side of this progress was that the center became a more formal part of the university. It included the requirement for an administrator in a leadership role (the research coordinator) and formal oversight from the department.

Members' ethos and training

Members have passionate, normative views about working on problems of climate change and sustainability, and the cause of the climate movement, but in a university center the flipside is the everyday work of academia in their roles as academics. The Climate Laboratory group grew from the organizing of individuals who tended to be interested in the climate cause and the meaningfulness of making change in society, yet they remain a part of the academic system which can be quite insular, works at a slower pace, and demands a different kind of work. They see action on climate as a meaningful imperative, but they also are trained academics that value academic work and use their professional academic training, which does not necessarily offer clear ways to affect societal change, preparing them instead for scientific knowledge production and the norms of collegiality.

Pressure to find new funding sources

University centers are often required to secure their own funding sources external to the university from research funding organizations, like research councils, philanthropic foundations or commercial partners. This means needing to make efforts to continually initiate applications for new projects. Success here can change the organization, for example demanding fast expansion of the group, or the limiting of thematic pathways for research to those favoured by funders.

Research and higher education policy shifts

Shifting research policy trends towards grand challenge research often position research and higher education as a participant in politically mandated missions, incentivise or require engagement with non-academic stakeholders, and structure transdisciplinary partnerships into funding calls. Research and researchers are increasingly expected to be part of solving grand societal challenges, along with non-academic actors, in an "all hands on deck" call for action. These shifts build on a longer history of increasing calls for transdisciplinary research in sustainability fields specifically, and across many fields more generally. In the local setting in this case, Norwegian U responds to this with new strategic goals to work on sustainable development and grand challenges–one goal being "Climate Transition". Here the research system and the needs of society are meant to harmonize, yet contradictions and ambiguities remain. For example, how to align the aims of "critical social science researchers, who might point to the need for transformation away from modern, high-technology paradigms and social-technical systems, and constellations of for-profit actors developing 'green' technology? Policy changes based on such

open questions bring latent tensions to the surface, as competing demands pull researchers in different directions.

7.4 Tensions and responses in establishing transdisciplinary research

This analysis identifies local tensions and responses, grouped into two areas: 1) relating to the university and the higher education system and 2) relating to society and non-academics. The first area of tension, relating to the university, refers to the group's relationship to the university, and how their efforts to Organize in a transdisciplinary way are constrained/enabled by their embeddedness in the organizational context of the university. The second area concerns the group's relationship to society, in general and within specific projects. Within each area, two underlying tensions are identified and analysed, and response to tensions are explored.

Table 6. Tension areas, specific local tensions, and descriptions of each

Tension Area	Local tension	Description of specific local tension
1. Relating to university & higher education system	Consolidation *and* interrelation	Choosing which projects to take on–tension between consolidation, consolidating around a particular theme/actors/problem, and interrelation, working flexibly with diverse actors/contexts/problems.
	Maintaining group closeness and values *and* growing and formalising	Becoming more formalised and professionalised as colleagues, research group, research center–tension between adopting rules and structures of university while keeping our group's values and critical-change-orientation
2. Relating to society & non-academics	Societal distance *and* societal engagement	The question of relating to society as a member of the Climate Laboratory/Center–tension between views of roles that are both embedded in the ivory tower and engaged in current societal problems
	Autonomy *and* usefulness	Maintaining professional credibility in projects, with divergent values and expectations of different work contexts–tension between maintaining researcher autonomy vs providing useful knowledge

Two specific, local tensions are present in relating to the university, between the need arising from transdisciplinarity for both consolidation *and* interrelation, and between the need to grow and formalise the group while *also*

maintaining its closeness and values. Two further specific, local tensions are present in relating to society, between ideas of researchers' relationship to societal change as both distant *and* engaged, and within projects with non-academics between the need to maintain academic autonomy *and* provide usefulness to others. This is summarised in Table 6. This chapter concludes with an extended table that includes more detail on tensions, and responses.

Interrelated demands/elements that are divergent or contradictory, yet must both be addressed, trigger tensions into saliency. The tensions found are encountered by members in multiple different aspects and at different moments in their work. Although, as stated, they ultimately spring from the emphasis of transdisciplinarity on societal engagement. Establishing transdisciplinary research in this local case meant that these tensions became salient for members of the Climate Center in the process.

7.5 Tensions around relating to the university and higher education system

Here two main specific tensions arise around choosing research projects the group pursues, and around the group becoming more professionalised and formal while trying to maintain its values.

Selecting projects: consolidation *and* interrelation

This first tension arises around choosing which kinds of projects to take on, between a *consolidating* path or an *interrelation* path. Establishing transdisciplinary research presents competing demands to pursue, on the one hand, activities that lead to consolidation in the university, and on the other, activities that foster flexible interrelations with heterogeneous contexts and actors in society. This tension can be represented in the strategic questions: should they try to satisfy the university's expectations for big applications with high impact, and consolidate their funding sources and thematics around one area (consolidation)? Or should they remain flexible and open to taking on diverse, changeable, "critical", independent projects across many contexts (interrelation)?

These competing demands are present in the different pathways that various projects the Climate Laboratory / Climate Center have pursued. The ZERO Carbon project was an example of a project that had many aspects that would consolidate their transdisciplinary research initiative. It was long term (8-10 years), with a lot of funding, established relationships with a particular selection of actors who were contractually obligated to contribute working hours

and/or money, around a specific theme (sustainable transport). The project required considerable resource investment and took multiple engagements over the course of a year to get it together.

In interviews, the Director and research coordinator–who had done most of the work to prepare and make the application, and attend the multiple interviews with the research council–related that this pathway had many benefits that would stabilise and consolidate the center over the long run. It was about building up the center in a good way, and if you were continually growing this was always a positive sign (interview, Karl, 2018). It also satisfied what the center Director's perceived expectations of the university were: that they would apply for such prestigious projects and advanced types of funding applications. That would be a "return on investment" for the university having granted them management of a center (interview, Johannes, 2019). For him, this would be a way of both doing that and satisfying the group's transdisciplinary, sustainability-oriented ambitions to work "out there in society" with concrete problems in climate and energy (interview, Johannes, 2018).

However, interviewees also saw that it was important to be able to choose to work across diverse projects and interrelating across diverse contexts and problems. Projects including those they had already signed up for and those they would potentially take on. These aligned with the idea of more "organic growth" rather than the fast expansion they had been experiencing (interviews, Johannes, 2019; Bjørn, 2019). This kind of growth allowed them to pursue projects they really wanted to work on. These would likely be deprioritised if the ZeroCarbon project were granted. The attention being given to establishing and managing the center itself, including preparing the Zero Carbon application, had already meant they had barely had time to work on these various smaller projects the Climate Laboratory had brought with it (interview, Johannes, 2019). This diversion of attention was likely to continue if ZeroCarbon was granted, and in addition, it would mean the Director would be fully preoccupied with the project, rarely having time to focus on the Climate Center's various people and projects the Director was responsible for supervising and working with (interview, Johannes, 2019). The tension was addressed, and seemed to be temporarily alleviated, in an interview with the Director immediately after the ZeroCarbon project was not granted. Now that it had not been granted, they were free to pursue other kinds of projects that were not and would not have been compatible with given the consolidating path ZeroCarbon had been taking them down.

After having not received the ZeroCarbon project, Bjørn, an initial founder of the Climate Lab, was also relieved. He had thought that they had been diverted from what was important and wanted to return to their "original mission", rather than pursuing consolidating the center through attaching it to projects like

Zero Carbon. His idea was to rather keep developing a critical research environment with freedom to take its own direction and identity:

> I question all the idea of that kind of […] development of the center. Because to me, that is, that is a way of organizing and managing growth of a center for the center's own sake […] To me […] the idea of the education and the research and the holistic approach to research and society I feel is, shouldn't be, dependent on that kind of funding. Where you make 'grand schemes' and you pre-define all your collaborative parts and all your issues and all your work in packages and blah blah. Well to me, that's not how we collectively produce knowledge. (Interview, Bjørn, 2019)

Other members that had not been involved in the Zero Carbon application, worked on self-started and diverse research projects that often engaged local actors. For example, Bjørn's work with the municipality doing fieldwork inside the city government climate policy unit, what he labelled "bold fieldwork". Or Jonathan's collaborations with an artist, in which he highly valued the flexibility and uncertainty of the project.

> Part of it I think, you fly by the seat of your pants and you make it up as you go along and throw a few things up in the air and try to catch them and see how they land and you make of it what you can. Trying to pull in colleagues and say 'hey this would be interesting to do together. Let's see, you know, indulge me a bit. Have faith in the process, that it will get interesting' [..] If you have someone who really wants to integrate you in to their program and says 'this is what it will look like' then that actually might turn out to be a very finished product. But it might not be a very meaningful engagement because the terms of engagement are too rigid to start off with. (Interview, Jonathan, 2019)

The tension is also present in the development of the strategy of the climate Center. As the official strategy developed, the thematic interests of the Climate Center broadened relative to what they had been at the Climate Laboratory. The strategy showed the center crossing multiple different sectors and research fields, open to transdisciplinary research partnerships with a diverse range of partners, projects and problems. However, in practice if a big project such as ZeroCarbon was landed in one of these areas, it would by necessity shrink that strategic breadth and consolidate resources and goals around one area. A defensive response to this tension emerged in the empirical material and is explored below.

Defensive Response

Spatial splitting–pursue both consolidation and interrelation through different projects. A way it was addressed was to split the poles of the tension and have different groups pursue both kinds of projects simultaneously. This 'worked' in the sense that it was possible to do, at least temporarily. The research coordinator, Karl, had been specifically hired to do such institutionalising work and was setting about his task of "building the center" [Interview, 2018]. Meanwhile, the members of the Climate Laboratory continued taking on various new and existing local activities, as they had previously. A few of the management team pursued the ZeroCarbon project application, while other members focused on the local collaborations within their own research, post-docs or PhD work. As a whole, the Climate Center was pursuing both poles of the tension simultaneously, but they were *split spatially* across different projects. Divergent, oppositional ends could be pursued simultaneously in this way, at least temporarily.

However, consolidating and interrelating as we have defined them here (Russell, Wickson and Carew, 2008) will necessarily tear actors in different directions at some point. Tension will become salient and may be felt acutely by actors. The characteristics of some projects necessarily means that the ability to do other types of projects may be hampered or closed off completely. In pursuing projects that lead to consolidation, resources like attention, reputation and funding were consolidated around one theme, and this led to potential stability for the group, which was also good for people's career prospects. For example, it could provide security to PhDs and post-docs looking for future opportunities, and it built up the group's reputation with more visibility and impact [interviews, Bjørn, 2019; Sigrid, 2018]. It also gave the Director opportunities to pursue a high-level career as the leader of such projects, and he expected to "never be a regular professor again" [interview, Johannes, 2019].

But this path of consolidation risked closing off or hampering the ability to flexibly work across diverse projects. These latter projects happened because they had the flexibility to take on projects across diverse problems and contexts–an essential aspect of transdisciplinary research. At the same time, while these latter activities fulfilled the aspects of transdisciplinary research that fundamentally require flexible interrelation, that path too had its drawbacks. It would present challenges to the aim of making the organization stable and legitimate. For example, the kinds of critical and alternative research projects some members wanted to do were difficult to find funding for [interview, Bjørn, 2019]. Trying to avoid being dependent on the funding system and its present or mainstream framings of issues was a hard problem to solve for sustainability researchers who wanted to do critical science (see also Lövbrand et al., 2015) but also needed to populate a growing center with projects that needed resources. The Director also still faced the broader expectations of the

university and their department board, a common thing for leaders of research groups (Hackett, 2005). There was also the fact that building a reputation was hard when the impact and value of transdisciplinary project outcomes are notoriously hard to measure (Lawrence et al., 2022), presumably even harder when projects are smaller, played out over shorter time spans, or were less focused on standard academic outcomes. Publication statistics do not capture the work done in managing relationships with external actors and being involved in concrete problem solving.

To summarise, in establishing transdisciplinary research in their university department, the Climate Center experienced tension over which projects to select and work on, between those that lead to *consolidation* and those that fostered *interrelation*. A *response* to address this tension I find in my material is that they *split this tension spatially* in that they pursued both consolidation and interrelation in different instances/projects that were also done by different members or groupings of members. However, this was a temporary solution. When the ZeroCarbon project was applied for, the contradictory tension between these pathways surfaced again, and the group was torn in different directions. Ultimately it was not granted, and a much smaller version of the project was ultimately resourced and carried out with few partners and a shorter time frame. When I left the field in 2020, however, this tension was by no means resolved. To carry out transdisciplinary research, their organization faced demands of stability and consolidation to grow within the university, while at the same time they required flexibility and open-endedness to remain responsive to societal problems.

Becoming more professionalised and formalised: conform *and* diverge

The second, related tension around Organizing a transdisciplinary group while embedded in a university appeared as the group was becoming more professionalised and formalised. This change process happened as the group successfully took on more funding, responsibility and members. Here the tension is between on the one hand *formalising the group and adopting university rules*, and on the other *maintaining the shared group identity and relationships* they had built up in the Climate Laboratory.

Both were important but divergent objectives that appeared in oppositional tension with each other as the research group became more established. The shared identity and values-driven nature of the closely-bonded group, along with their execution of some well-realised and innovative ideas, played a role in making them successful in the first place. But through their efforts, many changes brought attention and resources to them. They successfully received progressively larger grants, such as the grant from the university's research

fund (co-funded by state oil company Equinor), and a philanthropic grant (from a high-profile research foundation) received by the Director based on the work of the Climate Laboratory group, which installed him as a professor and paid for new PhD positions. They were offered the opportunity to start the new research center, which added administrative layers like a board and the recruitment of new staff through formal processes rather than the informal community membership the Climate Laboratory had begun with.

Such changes were exciting for members, and the surface-level story of the center to me as an outsider when I arrived to the field in 2018 was certainly one of rapid success and growth. At the same time, these successes brought with them new rules and ways of working that triggered tension that was felt acutely as these changes started to conflict with the group's internal order and identity in some ways.

The merger of the critical research group of close collaborators and a formal center aiming to draw in funding and expand thematically, triggered tensions between maintaining their values and what the university requires of them. For example, Johannes observes:

> There's some basic things we need to maintain. That sort of collaborative atmosphere. We can't turn into like a big machine. At the same time, we need to be, to have it professionalised […] rather than being based on personal relations it has as to be based on certain practices and standards and norms. (Interview, Johannes, 2018)

As the interest-based, critical research group became part of the center, the close-knit group that depended on personal relationships, was critical of mainstream thinking, and passionate about making a difference in their local region through engagement with "societal actors", met with the center's requirements of board oversight, broader recruitment policies, and a more thematically broad and funding-oriented strategic mission. Further, their relationships shifted from an interest-based group that had strong interpersonal bonds, to a group that was professionalised and more formal.

To reiterate briefly what we saw in some earlier chapters, in interviews in early 2018, in the months following the launch of the Climate Center, members of the Climate Laboratory related that there was tension in the air around these changes. Throughout a series of meetings, it became clear that the Climate Laboratory group did not like some of the changes that had been happening and still were being introduced as the center got up and running. They involved what had been an incremental but now faster formalisation of the group within their department and the university system. The new rules conflicted with parts of how the Climate Laboratory had previously been working. They

were moving from an informal group based in friendships and common interest to a formal organization. They needed to move from being a group of friends to a more professional group (interview, Johannes, 2019). This meant some procedures had already and would need in future to change and new rules and mechanisms would take over. This conflicted with a value the group had placed on equal participation and collective decisions. People felt they were losing their feeling of "being part of something" (interview, Johannes, 2019).

The center brought with it an administrative position, a research coordinator, who was hired externally (had not been part of Climate Lab) and had been given the job of building the place into a "proper center". That research coordinator role was instrumental in this consolidation of the Climate Laboratory research group's overall project, as the Climate Center grew. As we also saw captured in the earlier account of the center's launch event, the Climate Laboratory's focus on being a critical, alternative, autonomous group was now in tension with various other activities that pulled in other directions. Often, they were activities the research coordinator role was tasked with. For example, making collaborative partnerships with locally relevant/powerful actors (accommodating the "men in suits" (interview, Maria, 2018)), a focus on expansion in terms of budget, thematic direction, and seeking projects that would provide long-term stability in terms of funding and positions.

Solveig, a PhD candidate from the early Climate Laboratory days, related in interviews that she felt the differences created by these organizational changes in several ways. First that it was no longer possible to have an overview of what was going on now, as decisions were taken elsewhere, and there were many more projects that were not generated by the group and were not shared. Her feeling of understanding what was going on was reduced. Second, she no longer felt that she was as necessary a participant in the direction of the research group as before. Instead, her relationship to the group/center had become about her just completing her own PhD rather than deeply participating in the group's life and its strategic direction; what the group meant and could achieve. She, as with others, was not entirely negative about this, offering some sensemaking about how these changes also brought positives– growth meant better impact on climate issues, more visibility in the region, and the ability to do bigger projects. But here the tension between the taking on of institutional structures and ways of working, necessary for progress within the university system, made a palpable difference to the order of the group and what her role meant within it.

This tension also appeared for others. The things that made the group distinct were hard to maintain as they diverged from the institutionalised norms of their department and university, that was why it was different in the first place

[interview, Maria, 2018]. They were not like others, tried to be cutting edge, critical, rather than just finding their niche and doing the same thing over and over [interview, Maria, 2018]. The Climate Laboratory as a special group based on individuals, that would be hard to continue as it became less personal and more professional [interview, Maria, date]. It would be easy "going into bigger structures" to become like "every other boring center" and so they had to be careful not to lose their creativity and their critical edge [interview, Bjørn, 2018].

The tension was salient for members when the ZeroCarbon project was applied for. Some members felt excluded from the application process, and that it represented a new way of working that was not in line with the way they had previously been working [interview, Johannes, date]. Some interviewees saw that the ZeroCarbon project would be moving in a different direction to their current freedom to take on projects that were critical of the existing status quo [interview, Bjørn, 2019]. And if indeed the ZeroCarbon application had been successful, the changes that it would have brought were expected to have turned up the volume on this tension. They would have gone very far away from their initial mission of having a critical group of geography scholars working on climate issues [interview, Bjørn, date], and the Director would have had no time to attend to the 'health of the group' [interview, Johannes, 2019].

Tension is also visible in interviews from immediately after the application was rejected. The Director now felt he would be able to concentrate on the group more, giving attention to its activities and new people joining. Bjørn was relieved, believing that the project would have taken them off course from what their purpose was–to be critical researchers and not go with the status quo. Conversely, the research coordinator expressed being "no more than neutral" in his feelings on the application–the consequence was getting or not getting the project. This tension between new and old ways of working was not as salient to him. He became part of the center when the center was approved by the university, with a specific management job to do–to build out the center. However, this tension became salient for the Climate Laboratory group members during these changes, particularly at the moment of transition from Laboratory to Center and during the adjustment phase that followed, as it became apparent that certain activities of the center conflicted with the group's values.

To summarise, these competing demands to adopt rules and procedures but keep their values and feeling of closeness were salient as the Climate Laboratory group became more professional and formal, and were present as the Climate Laboratory was absorbed into the Climate Center. As they expanded, they took on more formal rules, norms and procedures of the university. In

pursuing their societal-change mission, which was closely linked to the personal beliefs and motivations which drove their early research group, they also needed to attend more and more to what their organizational context demanded of them, which was more formal procedures and rules around decision making and pursuing goals, and a more strategic vision. This more formal structure and procedures started to supersede the group's informal bonds, and bring their ideals-driven ethos into conflict with the more results-driven strategy. As the group and its leader contended with this shift, they were torn in both directions, with the ethos and ways of working that had been important in their success as the Climate Laboratory group in tension with the expanded set of goals at the center and its strategic direction.

Climate Laboratory:

> "…connects research on the geographies of energy, climate and society. The aim of the lab is to generate an engaging academic and intellectual environment to stimulate high quality research on these issues.

Climate Center:

> "...an initiative at the Norwegian U, led from the Faculty of Social Sciences. The goal of the centre is to produce actionable knowledge about how to achieve a rapid transformation of society to meet the climate challenges."

Proposed *ZeroCarbon* environmental technology multi-stakeholder center:

> "…Norway serves as the 'living lab' for a transition to sustainable transport in coastal areas. We will identify opportunities for advancing sustainable transport and for scaling solutions beyond Norway's borders–creating opportunities for industry."

Figure 7. Contrasting mission statements between the Climate Laboratory,

Their values of shared responsibility and participation, critical approach to research, aim to be divergent from the culture and norms of their department, feeling of closeness, and ambitions to be societally relevant, present since the start of the Climate Laboratory, were important. But so was contending with the demands of their university and the research system, now more pronounced as they formalised the center. In finding success within the university and being given management of a center, they took on "more responsibility"

which made it harder to maintain their critical edge and their creative and academic freedom.

There was some evidence for responses to this tension in the empirical material, and they are explored below.

Defensive Responses

Split spatially: A group within a center, moving together but diverging

As we have seen, after the Climate Laboratory took over management of the new center, tension arose between, on the one hand, the Climate Laboratory research group's values and, on the other, the new center's adoption of new goals and rules. The research group was absorbed into the new center. This meant members of the group were now also members of the center, but the group kept its identity to some extent. In interviews, members still identified as members of Climate Laboratory, it kept its website, and it still had several projects and activities carried out under its banner. Rather than the two organizations merging and blending, the Laboratory became a sub-part of the Center, working to some degree in its own ways, on its own projects and with its same group of members although not all of them were hired on to new positions in the Climate Center; they did not make it through the newly-formal recruitment process to hire new PhDs and Post-docs, which were advertised positions filled with the oversight of a board. Previously members of the lab had joined informally out of interest, or on projects with funding tied to an existing Climate Lab member. Climate Lab's values and goals were retained but worked on with a degree of separation from those of the center. This can be seen as spatial splitting, with different parts of the same organization being responsible for different tasks or working with different value (Poole and van de Ven, 1989). Given the divergent values and goals of the group and the new center, this response allowed both to co-exist without resolving the tension. The research group retained its values and members, while the center was able to adapt to rules, procedures and expectations of the university and the higher education system. However, this it appears this was a temporary solution as the group eventually slowed its activities within the following period, becoming somewhat dormant by 2019, when I left the field, with the climate Center's activities having become the focus. It was still in existence however. And in my final interview with Bjørn, who had just returned from his fieldwork, soon after the ZeroCarbon Application was unsuccessful, he was imagining plans for new Climate Laboratory activities that would be more critical and independent.

Avoid: work on other things

Other responses to this tension were less obvious in the field material. The group had ongoing discussions about the situation. As we have seen, the discussions were at times difficult, and people felt they were "losing something".

Solveig's withdrawal exemplified this–her job had become about just focusing on her own work, in contrast to the previous feeling of being a participating part of the activities of the group. And other members of the Climate Center felt this tension, expressed it in meetings but appeared to live with it. The Climate Laboratory group remained within the center, and its activities are still represented on its website at the time of writing in 2022. However, its activities stop in 2019. It ceased to be a focus and appeared to fall away somewhat from people's attention as the focus was on the Climate Center. The identity and relationships of the Climate Laboratory group had changed, and in some ways did not stay intact. The departure of two of its early members also contributed to the reduction in activity. Maria left for a position at another university, along with Bjørn, who had been a strong force in driving the Climate Laboratory's work, who left for one year to do fieldwork in the municipality's climate unit.

These organizational changes occurred and had to be lived with despite their creating tension with the values of the original group. However, it is worth making clear that not all views of these changes were negative. Many interviewees expressed that the new ways of working were the flipside of having more impact, a bigger budget, more responsibility–all good things that brought benefits. The Director was sensitive to the concerns of the Climate Laboratory group, and agreed with them that something was being lost, but saw this as a natural progression that would allow them to better achieve some of the things they valued.

Emphasise one pole to rebalance: Codify alternative values of research group in co-authored publication

This transition period from Climate Laboratory to Climate Center was also the time when the group set about writing the co-authored reflective paper on 'transformative social science' described in earlier chapters. I cannot say whether this was a direct response to the present tensions around becoming a more formalised and professionalised organization. Certainly, they had built up their identity on divergence from departmental norms and goals, and were now being pulled back towards them as they met with success within that environment, and the professional demands that came along with it. The tension that emerged between on the one hand adopting external rules and structures, and on the other pursuing their own ends and values certainly may have spurred action on making a statement about who they were and what they represented. As we saw in the launch of the Climate Center, the feeling of losing some control of the proceedings as they entered new relationships in which values and expectations diverged and contradicted their own, was certainly something they had started to experience and that was particularly salient at the launch. In any case, the co-authored article they wrote about 'transformative social science' branding themselves as 'transformative social scientists',

represented the Climate Laboratory's cumulative achievements, work and values, crystallising, at least in part, who they were and what their ultimate ends were. Whether this was a direct response to the changes they were experiencing in unclear. But asserting the value of their group and its distinctive work in that way, at that time, seems to have been at the very least a useful creative act. It gave them all a publication in a central journal for their specific field, of course. But it also gave them a reference point for their small community's values and achievements, just as it was being superseded in some ways by the more formalised organizing, they seemed required to enact given their progress in the university system.

7.6 Tensions around relating to society and its actors

Two tensions were salient for members in relating to society in transdisciplinary research, between contradictory ideas of *how university researchers relate to societal change in their roles* and between divergent *professional expectations from stakeholders in common projects*.

Tension between ideas of how to relate to societal change in university roles: distant *and* engaged

Tension appeared for members around their own roles as academics and the question of how they should relate to societal change in carrying out those roles. Tensions were present between different ideas of academia's relationship to society–on the one hand, within the university they were distant from societal change, working to the goals and rhythms of ivory-tower academia. On the other hand, they also needed to be engaged in societal change, particularly on urgent climate problems, and working 'out there' in society amongst non-academic actors, processes and problems. For the individual members, this was an ongoing tension that they appeared to feel acutely, based on accounts they gave of work situations in which it was relevant, and when asked to reflect about it. This presence of these mutually exclusive but interrelated views of their relationship to societal change was a tension all interviewees touched upon. Below I will zero in on a few moments and accounts that show salient examples.

For Johannes, it was crucial to feel integrated with the society around you to do meaningful work. In fact, this was one of his key motivations to do research in the first place. However, there was no way to influence societal transformation within academia; to engage with urgent issues like climate change from within the university. The work done in academia was slow, theoretical, incremental–it was not suited to the urgent action climate activists were

calling for. Yet, their organization and their research were meant to produce actionable knowledge, and to engage where possible in societal change and transformation. This simultaneous contradictory view of a role in academia was a long-standing tension for him, and it had been salient at different times throughout his career. He related how, in South America during his PhD, in doing his post-doc work and feeling quite isolated from the surrounding society. He was now home and had been living in Norway for many years. But even after having established the Climate Laboratory research group, and the Climate Center, still in his everyday work there was a persistent feeling of needing to do work on concrete problems integrated with society, while at the same time being distant from real change because of his academic role.

Johannes also offered a different example of another colleague, a professor who, in 2019 during the height of the School Strike climate movement, sent him an excited email about the activism happening in the streets. Johannes presented this as an example of the absurdity of how academics think they are engaged with society, but are in fact deluding themselves.

> Johannes: A colleague sent me a draft manuscript. And the colleague started the manuscript by talking about Greta Thunberg, and then continued the manuscript by saying 'oh we need an advanced theoretical frame work for blah blah blah...' And I was like (laughs) really, do we?! (laughs). So um, yeah and that kind of, that's really, I think, what brought home this sort of contrast to me in my head. Yeah, we are spending a lot of time on the finesses of our theoretical framework and I think that's a pretty big contrast to Greta Thunberg's "it's a crisis", it's really "act now, this is about the future of our lives". So yeah.
>
> LA: And that's not present in what the Climate Center does?
>
> Johannes: It is, but we are still in a university […] I think what we can do here with knowledge generation and education we work on some of the most gradual processes in society. And that's kind of the way it is. But I think the importance of our center and of our focus is we make sure that those processes are going in the right direction. And whenever we have an opportunity to contribute to a debate or maybe pushing something to go faster and to, yeah, accelerate then we should take these opportunities. But in its nature research and education are very gradual processes. Maybe I am contradicting myself. I am not sure Greta Thunberg would object. I was just being a bit pointed there. But it's something else than like, responding to this extreme urgency that she is pointing to and that others are pointing to and saying you know, the bees are dying. Insects, biodiversity is collapsing. That's, I

> think on a short-term scale it's impossible for us in the university to do something about. [Interview, 2019]

On the one hand as members of the Climate Center / Laboratory they needed to engage with actors and processes to help bring about change and transformation on urgent climate issues. On the other, they were part of an institution that was slow-moving, incremental, detached from social change and transformation. This feeling of distance and lack of capacity to engage with society's urgent problems persisted in his everyday work. This was in spite of the fact that the group had built up an action-oriented research group focused on making change in society towards sustainability. They also were working on many concrete projects with non-academics, some of which were quite solutions-oriented.

An interview with Jonathan, a post-doctoral researcher, further illustrates this tension. In a discussion of his own role, he expresses seeing academics as fundamentally detached from society, but at the same time, having a duty to engage with it. The pursuit of knowledge for its' own sake had value, but it allowed academics to detach from the society that supported and needed them. Having that week Organized and participated in long seminars on the history of science in a role he had at the department for humanities, Jonathan reflected on the dual nature of academic roles:

> That kind of critical reflection needs to inform our practice. But if that's all we do we could be very well informed without really being vehicles for change in society. […] maybe in 20 years if we manage to inform some decisions in a way that can keep society going in a way that it can invest in people who are paid to think, then we will have retained our relevance. And if we didn't manage to do that with our science, then I don't care how many people publish in high impact journals because there was no high impact. [Interview, Jonathan, 2019]

Inhabiting both roles of the distant academic pursuing knowledge for its own sake, and an engaged actor making a difference in society is possible. These are not necessarily incompatible, and at least for members of the Climate Center, are present and competing demands. However, the point here is that these are oppositional in that, on the face of it they cannot be realised simultaneously. One cannot be both engaged and distant, in proactive ways and in the abstract, at the same time. Yet they are also interrelated and necessary in this local setting. The mission of the group and center to be an excellent international research environment, and at the same time to contribute "actionable knowledge" to help transform society, presents these demands. Further, members' academic training in disciplinary departments also diverges from the

mission of the center. Those who move into transdisciplinary research have often first been trained in disciplinary settings, or at least familiar with them to some extent, and disciplines are required for transdisciplinarity to work. Yet transdisciplinary research prizes the relationship to societal actors and problems. At the Climate Center, this tension is salient.

This tension is also present in the founders' early discussions about starting up something new in their department. They felt the tension between these two ideas of their relation to society–to be engaged in the academic pursuit of knowledge detached from society and inside a university department, but at the same time feeling the need to find ways to engage in societal change (or "transformation", as they commonly put it). Members were torn between these opposing, yet present and interrelated, ideas of research and researchers' relationship to societal change on climate issues. The two initiators were researchers who had spent considerable time in developing countries and saw that academia could be rather isolated from society, yet there were societal problems that placed demands upon them and were important to relate to in order to do meaningful work. For them, there was a set of competing demands in their current department that were being addressed poorly, that the organizational arrangements in place were insufficient and lacking–they needed to be rethought. (As Smith and Lewis (2011) point out, people's "paradoxical cognition" can make tensions salient. Recognizing a tension can lead to saliency and corresponding efforts to respond thereafter.) They pointed to the importance of societal engagement as something they and others should address, which was divergent from the norm in their research environment, which was disciplinary-knowledge-focused. They set about organizing a response to it through forming a group with a distinct purpose and way of handling the tension differently. They would focus much more on doing things that were 'societally relevant', engaged with and trying to make a difference in real world problems. They would be critical scholars approaching the problems of climate with an alternative view. And they would do this while remaining embedded in their academic department.

At a later stage, within the Climate Laboratory, this tension was salient and thus work was approached differently to the way it was in their surrounding department–addressing societal engagement was important. For example, one of their first activities was to Organize the Fossil Free Futures conference that invited geographers and other scholars, but was focused on 'climate transformation' and the future 'beyond oil', and was also open to the public. The success of the Climate Laboratory led to attention from others including prominent scientists, government figures, and the faculty and university management. Tension between the disciplinary, societally-detached research approach (already present in their department), and the engagement by

academics in societal change that initiators saw as important, seems to have spawned the founders' action towards establishing transdisciplinary research.

In interviews, all interviewees at least touched on this tension between different ideas/views of their roles: that they were academics pursuing knowledge at a distance from society, but also that they should be actors making difference in society, engaged in societal change. Both active and defensive responses to this tension are explored below.

Defensive Responses

Splitting temporally–both detached in the ivory tower and engaged out in society. In interviews, most members reflected upon this duality in their academic roles, the practical questions it raised, and its contradictions. One of the clearest responses to this tension was offered by Jonathan, who quite literally carried out *splitting* of his activities across different percentages of his position, sometimes doing one, and sometimes another. He was able to address abstract academic discussions in one part of his job and do societally engaged interventions in society in another. His interview accounts exemplified the tension that arises in having a role that requires partaking in sets of activities that correspond to contradictory professional self-concepts. Part of his role was in a center for the humanities, in which academic thinking and writing was the job, for example multi-day seminars on the history of the philosophy of science. At the same time, he saw that that the kind of insular academic role was detached from the wider society, and in particular the climate emergency. In order to also address the need he perceived his role as demanding, for engagement in societal change, he took up other activities at different moments. He also took up many other activities outside the university, giving examples such as personally approaching ministers and investors on energy policy in a public consultation event, or doing collaborative art projects with artists to promote public awareness of climate and energy. In this "do a bit of this and then a bit of that" way, oscillating between these poles, he addressed both sides of the tension members of the Climate Center experience in the roles over how to relate to societal change. While these were compatible, they were also oppositional, as they were mutually exclusive. He was able to do this splitting, however he felt acutely the tension between these ideas of the university's relationship to society and their presence as part of his professional role. He was emotionally affected, upset, by colleagues' seeming inability or unwillingness to address these competing demands; he felt that both needed to be attended to through continual effort in order to properly inhabit the role of the university academic.

Active Responses

Members often used hybrid forms of activities and events integrating academic and non-academic domains and actors. They addressed the contradictory ideas of relating to society that their roles present them through integrative practices. To do so, members used *active*, creative, integrative *forms* and *techniques* employed in practice.

Integration: hosting academic events in public; placing academic content into public events. This involved placing academic forms and formats in public spaces. It is a practice that embraces on the one hand their embeddedness in the university with its institutionalised forms of meeting and distinct domain of the university campus, and on the other, the need to engage with non-academics out in society beyond the university.

In the first illustrative example, a conference/paper workshop was intentionally relocated out of the university in the public library so that it would embody both an academic event and a public event, and public audience members would feel more comfortable attending. The Climate Laboratory/Center's bi-annual Fossil Free Futures conference was held in a public venue for similar reasons. Public attendance was made free in order to encourage non-academics to sign up; non-academics were also encouraged to participate in discussions.

In another example, the first part of a conference schedule was a series of events held on a moving train heading to the conference, and conference attendees were encouraged to join it. It was designed to be a combination of an activism-oriented stunt, a positioning of academia out in society, a demonstration of "low carbon travel" for academics, and was on the official schedule of the academic conference. A further example is the collaboration between a Climate Center member with a local artist to make a large installation in the city museum on climate and energy use. The artist used scientific data to build visual/artistic representations of energy use, and the colours of the Sustainable Development Goals, and the research contributed to a video installation and poetic writing displayed on the walls. We can see such examples as creative attempts to integrate different forms and locations of academia (and its knowledge, institutional rituals) and wider societal contexts (e.g. public spaces, activist forms of organizing, artistic forms–painting and installation).

To reiterate, working on transdisciplinary research at the Climate Center meant encountering tension in how to relate to society in their university-researcher roles, between their distance from, and need for engagement in, societal change. Members used traditional academic forms in public spaces and I, appealing to and inviting participation from non-academic audiences.

They also used research-inspired non-academic forms to engage on issues of climate and energy.

Actor-integration within knowledge products: Involving non-academic practitioners as authors of academic outputs. This involved including non-academic practitioners in formal peer reviewed works and research applications. In one example, members of the center led a project in which they published a paper with academics from the natural and social sciences, which included as authors in the publication two practitioners from a local municipality with no local affiliation. This was seen as a great success and as representing the way in which the Climate Center was able to find ways to concretely (rather than only symbolically) integrate societal actors and non-academic domains in their work [interview, Johannes, 2019]. Non-academic practitioners were not only brought together to meet, but brought into the research process as participants, and they were co-authors in a published, peer-reviewed journal article. This unusual achievement was something of which the Director was quite proud. It concretely embodied their working across disciplinary specialties and non-academic domains, addressing both the detached analytical knowledge production of academia and working with practitioners on a concrete problem–in a transdisciplinary manner–by incorporating non-academics into the form of an artefact that is traditionally only the domain of academics. Taking on transdisciplinary research requires academics and scientists working with non-academics, but usually the form in which the final result is published in the academic system is strictly the domain of researchers. As Maasen and Lieven (2006) put it, while transdisciplinarity bridges the social distance between science and society through participation, the epistemic distance between the academy and those outside it remains–the end knowledge product is usually still only authored by the scientists. Yet transdisciplinarity makes claims to integrate actors and knowledge(s), despite the differing kinds of knowledge that is valued across different domains. In this example from the Climate Center, both gaps have been bridged.

When Jonathan collaborated with a local artist on the climate-focused visual art project–paintings and installations–this also led to him writing together with her a formal research application for academic funding. This is also an example of the integration of non-academic actors and their work into formal research processes. This was seen by the Organizer as an experimental and open-ended way of doing collaboration that was 'more likely to lead to something transformative' than working on a project with pre-set academic output. Working with a non-academic was a way to open up to unpredictable possibilities for change not available in highly conscribed academic proposals [interview, Jonathan, 2019].

Taking an either/or approach would have meant only choosing to do their research projects or work with other academics, or to do outreach and communication activities for the public as mutually exclusive activities. Here, in these examples, they take a both/and approach, experimenting with the integration of non-academics into the formal academic system and as co-authors on what would traditionally be only academic pieces of work.

Facilitating public meetings and processes with non-academic societal actors. Several members of the Climate Laboratory had worked as part of a 'Climathon'. A Climathon is a public meeting in which people who work in various sectors relevant to climate and energy met together and discussed ways forward to improve policy and practice on climate and energy. Members of the Climate Laboratory helped to facilitate the meeting, with over 100 people with different backgrounds and specialties reportedly in attendance including many from various government departments. The aim was to get people who were from "different parts of the system" and who "speak different languages" [Interview, Johannes, 2018] talking to each other and working on problems together, finding synergies. Such processes were unpredictable and open ended, and it was sometimes hard to know exactly what was achieved concretely. However, for Climate Center members the intermingling with non-academics was an end in itself. And was also valued due to the learning this facilitated: "you always come away from something like that better informed" and "you learn something different that just reading a paper" [Interview, Johannes, 2018].

Tension around relating to non-academic actors in research projects and activities*:* maintain autonomy and produce usefulness

The other area of tension is present around professional expectations when working with both academic and extra-academic actors and processes that have different values. Tension arises between maintaining *academic autonomy* and offering *useful knowledge* when doing research work in transdisciplinary research projects.

This was a core tension for the group in establishing their transdisciplinary research environment.

> We are trying to say OK, we should engage with society because of social challenges. We should contribute to solving those. I mean that's why the public is paying us. We should contribute to society in some way. But we should engage with society with what we know. With our core competences. An activist is much better at doing activism than I am. I have been trained in social science. We try to use social science to make that contribution. And that kinda sounds

> obvious but then it becomes a bit difficult. How do you actually do that? (Interview, Johannes, 2018)

Members' autonomy as academics is an important source of professional credibility. A main reason they are invited in the first place to work on or coordinate such projects is their status as trusted knowledge producers, as trained academic/scientific researchers. At the same time, the research group and the center's mission include a focus on engaging with concrete societal problems in climate and energy. This includes working directly in non-academic situations, like helping a neighbouring small city government design climate policy: "stepping beyond our comfort zone" (Climate Laboratory Group, Anonymised co-authored article). In these working relationships, they are often expected to act in ways, and produce outputs, that are different to what is traditionally expected of them in academia. Such as providing "solutions" to problems like carbon reduction, or reports that give answers to instrumental questions actors may have. In work projects that involved relationships with non-academic partners, members felt tension between competing demands to be both objective scientific knowledge producers, while also taking roles closer to consulting, in which instrumental knowledge was expected.

These situations brought tensions to the surface as members felt they needed to be both impartial academic experts *and* consultative partners with the required answers. Maria gave an example in which she was invited, while still a research assistant, as an expert who sat in one city's ongoing policy meetings and advised on climate policy on smart cities. She was treated as an equal, which felt good, but also it felt quite strange to be treated as someone who had the answers. She wanted to find ways to make a difference "on the ground" in that context, however, she felt she should not extend beyond her academic role either [Interview, 2018]. Johannes related how in meetings with architects and city planners on their sustainability and climate issues, he had to package his presentations in the right way, making them engaging and solutions oriented. He could not come across as a professor who was offering academic theorising as they would "tune out"; he had to speak their language and offer something useful. But he also had to make sure he didn't just give them what they wanted to hear, that he could pull the discussion "in the right direction" and persuade them that they should move towards making changes his specialist knowledge field was in favour of [interview, 2018].

These are everyday work examples of this tension that arises from working together with non-academics on work projects. The different professional expectations at play generate competing demands of, on the one hand, needing to maintain one's autonomous academic role, and on the other, needing to offer useful knowledge that fits others' values or apparent needs. In interviews,

members expressed that moving too far in either direction could be a problem, yet both were necessary given their organization's reason for being, their embeddedness in the university, members' ethos and scientific training, and the need to engage diverse actors on climate issues.

David offered an example of a well-known Norwegian climate research center that had been backing a 'green bonds' scheme for carbon reduction. They gave ratings on the bonds like a ratings agency. He elaborated that this offering a service to industry actors seemed risky. If the scheme didn't work, you risked undermining your professional credibility as an academic organization. Similarly, Johannes related an example of an urban transport policy the Climate Laboratory and Center had been publicly in favour of. It charged a toll to all cars coming into the city center. However, when the policy was implemented, huge protests had broken out in multiple cities against it. This left them in a bind. Should they have backed this scheme? They had both a professional obligation to hold to their specialist knowledge of climate and energy, but at the same time offer useful knowledge and engage in solutions that could transform society for the public good. Sticking only to being the autonomous, impartial academic would mean not backing any particular policies. But then, how to make change on concrete issues? Sticking only to creating useful knowledge and offering 'solutions' to problems would engage them with transformative change, but then their professional roles as academics would be compromised.

In the Climate Laboratory's co-authored article, previously described in the empirical chapters, this tension is also present in their accounts of previous work projects, and at times is explicitly referred to. How to balance the expectations of the non-academic actors, in commercial and administrative contexts, with their university-based academic roles is an ongoing consideration that appeared repeatedly in work projects. For example, in one collaboration with a regional authority, they carried out workshops and surveys and produced a report that was used extensively in climate planning across cities. In another, a city wanted the research group to tell them how to take advantage of a new rail upgrade to increase the attractiveness of their city, and to do it sustainably. The group involved themselves in many meetings and workshops on these concrete problems. While the group used their professional training and academic positions in carrying out these activities, all were initiated by non-academic actors with their own interests, and who initially set the frames for the projects. Again, the tension between different professional expectations here was salient in these interactions, and later when reflecting upon them.

The tension led to the feeling of a "balancing act" in that researchers had to juggle their roles as academics and their roles within the projects they had signed up to. Whereas usually the researcher would have the freedom to set

the epistemic aims of the research, albeit within the structures of the academy, in this case the only way to engage in these projects was to agree to provide what others saw as useful.

> There are certainly ways for us to produce knowledge that could be used in line with such demands and expectations. This would not, however, put our core competences, theoretical insights and critical sensibilities to good use. Hence, we have had to carefully negotiate such expectations, even as we strive to produce actionable knowledge. This is a balancing act, because our invitation into these collaborations was premised on us contributing to them–not just to our own research objectives or career trajectories (anonymised co-authored article from Climate Laboratory Group, 2017).

That was a central challenge for the organization in the way it worked in practice. As the Director put it, "we should focus on societal impacts, but not without losing any critical sensibility and asking difficult questions" [interview, Johannes, 2018]. When collaborating with others, they needed to be able to provide work in ways that were suited to the context and what others wanted, but without losing their independence. Through the various projects they did engage in with other actors, this tension was often salient. It was not possible to fully achieve either demand. They were contradictory, yet both were necessary, related as they were within the transdisciplinary research approach they had taken on. Attending to one pole/demand would lead to the other arising again, needing to be attended to. In interviews, and in the co-authored article we have been examining, how best to address these tensions this remained an ongoing open question.

This tension was also salient in the transition from the Climate Laboratory to the Climate Center, and arose around how the goals and values contrasted. The Climate Laboratory had been a small group driven by values including being critical in research and doing things differently to others, whereas the Climate Center aimed for collaborations with established people and organizations in the climate and energy field, integrating with them in projects, offering useful knowledge to them. As the Climate Laboratory became part of the Climate Center, tensions became salient between the critical, autonomous approach the laboratory had cultivated, and the new goals and relationships the center brought. While the Climate Laboratory group had seen itself as independent and critical, the new center meant new demands to partner with industry and government actors on larger scale projects and produce knowledge useful to them. This is different to the previously mentioned tension between the goals and rules of the formal, professional Climate Center, and the critical alternative values of the Climate Laboratory research group. While the former concerns how the group relates to the institutionalised rules of the university and wider system of higher education, the latter concerns

engagement with other actors outside the university and what they expect the center and its members to produce in projects.

This tension between researchers' ability to be autonomous and critical, and demands for usefulness from non-academic actors, was also salient at the Climate Center's launch event, shown at the start of this thesis. First, the scientist guests presented a stark overview of the lack of progress on climate action, and how urgent it was for the energy industry and policy makers to make fundamental changes, and then were followed by industry and advocacy actors who asked of the research scientists that they provide some help to develop technologies that would allow them to produce oil in a cleaner way. While on the one hand, it was important for the newly launched center to be open to working in collaboration with such actors and offering "actionable knowledge", it was also important they maintained their autonomy and distance. A research assistant who had worked with the Climate Laboratory group for many years put it as follows:

> I feel like Climate Laboratory should not kinda, give the answers that the society wants all the time. They should kind of keep their integrity. And I think that's a balance. Like, how do you do that? And still manage to stay involved in all processes, if you are not giving the answers that people want to hear? [interview, Maria, 2018].

Several responses to this tension were evident in the empirical material, and these are explored next.

Defensive Responses

Responses to this tension varied across different projects and situations. Sometimes it was avoided, other times defended against.

Avoid tension by withdrawing from project. We can examine examples of accounts of work projects offered in their co-authored article. One method is to completely shut down their participation in a collaborative project, thus avoiding the tension altogether. This happened in one instance when, as the Climate Laboratory Group expressed in a written account of the project, they realised that they were potentially being co-opted by a municipal government to increase tourism the area and ultimately lead to more carbon intensive travel. While the expectation from the municipality was that the Climate Center group could provide advice on low carbon transport, the Climate Laboratory group saw the project as being in strong contradiction with their professional credibility as academics. They closed the project altogether and exited from it, eliminating and thus *avoiding* the source of this tension.

Separating poles of a tension by downplaying or ignoring one. Some members addressed this tension by separating the interrelated demands for autonomy and usefulness. They separated their academic work from the demand that they engage beyond academia, despite the latter being so present in the organization's purpose and the aims of many projects.

One way they did this was being 'sure to stay on academic ground' by excluding or minimising work beyond an impartial academic role. The example of Sigrid, a PhD Fellow, illustrates this response. She was always scientifically impartial in doing her own academic work, but also in any other type of situation too. She would give occasional public talks on her climate research, for example at a local school, in which she stuck to her research only. She did the same even at professional social events and even at friends' parties. This allowed her to remain credible and not get too political, as she always felt her credibility, and the credibility of science, was on the line [interview, 2019]. A post-doc researcher, David, took the approach of sticking to his disciplinary territory, while still being onboard in spirit with the notion of societal engagement. A historian, his discipline didn't traditionally do any engagement with politics, and he thought it best to let others do that work. His research project with the Climate Center didn't require engaging with stakeholders [interview, 2019].

Others too separated the academic side of their work, while at the same time downplaying the demand to engage with society. For Jennifer, a PhD fellow, it was clear they needed to work on societal problems, but at the same time, the university rewarded the kinds of "nerdy theoretical work" that is written only for a small group of scholars, so one needed to focus on that. Working on narrow academic things individually was fine, as long as you "keep the big picture in mind" when doing it [interview, 2018]. For Karl, the research coordinator, to do their transdisciplinary sustainability work at the center, they would need to perhaps communicate a little more, and differently, about their research. But there was no serious tension in being autonomous researchers and partners to non-academics who wanted usefulness. All they had to do was "stick to the science", and while he saw potential issues doing that when forming partnerships with non-academics, it was easy to prioritise the science [interview, 2019].

It is worth reiterating that these examples are responses from of members of a research group/center with an explicitly stated aim to contribute to the transformation of society through producing actionable knowledge. Further, all of them were aware, and at times felt acutely, that there were demands on them to both do autonomous academic work *and* provide useful knowledge, but the response they had come to was one of downplaying or avoiding the societal engagement aspect of the work, avoiding the uncomfortable question of

professional credibility that arises in addressing both. This is not to say that they were wrong to do so, and members of an organization do not necessarily take on all its goals as their own, even if they identify strongly with it (Pratt, 2000). However, this may only ever be a temporary solution, and if they were to change projects or develop new working relationships, this response may be hard to persist with. The projects and working relationships the organization seeks out continue to integrate actors with demands for useful knowledge that are in tension with members' autonomy over their own research.

Active Responses

Integrate professional positions across time and across domains in "bold fieldwork". This refers to Bjørn's work, specifically his switching professional roles between researcher, public servant, and back again. He moved between a post-doctoral research position at the Climate Center, a political position as climate advisor to the heads of the Municipal Government, and then back to his post-doctoral position. Seen through the lens of a response to tension between demands: of autonomy to pursue one's research in academia and needing to offer useful solutions in public service; between doing university research as an analyst and working in government as a political actor, this kind of switching could be seen as a defensive response, the kind of *temporal splitting* that Van de Venn and Poole (1989) refer to that allows for responding to tension by addressing one element (or pole) of a paradox to be worked on for a while, and then the other, in sequence. This is a way of managing the contradiction and interrelation of paradoxical tensions and can generate an oscillation between poles over time and in this case, across different domains.

However, for Bjørn, within the context of his post-doctoral work, this was rather a sort of integration, an opportunity to take a both/and approach, rather than an either/or approach. He took on the political position at the Municipal Government knowing that he would be employed full-time as an advisor on whatever his superiors were working on, but he also saw that he would bring his connections to the research community to the position. Further, he treated his time there as fieldwork of a sort. On his return to his post-doc position 14 months later, he was eager to explain to me about how much insight he now had into the workings of climate policy in local government. It had been a particularly dramatic time, with street protests over the car toll travel policy in the inner city, vandalism of toll booths, and threats of violence being sent to government figures. And now this experience and the material he gathered would inform his post-doc work. Bjørn's strategy here looks somewhat like the image of a yin-yang over time, with his knowledge of and links to the academic community a key part of what he brought to his public position, and on the flip side of the coin, his having taken the position and carried it out then informed in a significant way his academic work. Both are interrelated, yet the

positions and their demands are divergent, even mutually exclusive, and needed to be taken on at different times.

Transcend with an integrative concept. Members also found a concept that transcended this tension. The group hit upon a new way to refer to the work they were doing–work that required addressing these contradictory competing demands. In the co-authored article they had written on "transformative social science", they built the self-referential concept of the '*transformative social scientist'*. This concept refers to these efforts and the "balancing act" they were faced with when entering transdisciplinary research projects. In the article they went to considerable effort to present these activities in such a way that the ongoing tension they face is not a problem to be resolved, or avoided, but rather one that makes sense for researchers like them to be doing. The risks of "stepping out of the comfort zone", backing a particular policy (like the traffic tolls) or working with a specific set of industry players (like the energy industry actors they convinced to sign on for the ZeroCarbon application) were necessary risks. They argued that researchers who want to engage in concrete problems and help bring about change, should not avoid this tension between maintaining autonomy and providing useful knowledge. Instead, they needed bring their professional skills to bear in non-academic contexts, while also retaining their autonomy. And farther, that social scientists were uniquely positioned to handle this work, familiar as they were with the complexities of social change and equipped as they were with critical and reflexive abilities. These skills and capacities should help them successfully navigate the tensions between different sets of values and expectations–embracing them rather than seeking to resolve them.

The article offers a picture of the kind of researcher who does what they do: the "transformative social scientist". This refers to a researcher who, as part of their everyday work, manages this tension. Here the tension is normalised as part of their work in projects. In this article, the transformative social scientist is offered by the Climate Laboratory group as a concept that integrates and transcends this tension that arises around working with non-academics, between autonomy and usefulness.

Reflexivity as active response. Members also exhibit a high level of reflexivity about how there are mismatches between what they can and should do as social scientists who are part of the academy, and what may be expected of them when working with societal partners and on projects which are transdisciplinary; involving non-academic partners and their goals and wishes. Some had a high level of reflexivity and acceptance of the tensions created here. This reflexivity is perhaps not surprising given that they are used to studying the social world and using reflexive thinking in doing so. However, this level of reflexivity and the ability to express it in writing publications and speaking

about their own work allows them not only to respond to this tension in practice, but present themselves as those who specialise in doing so. This tension is familiar to other researchers in their field. The fact that they can navigate this transdisciplinary terrain and its tensions is offered as a valuable contribution in and of itself, a specialty they are suited to executing. And this is valuable apart from what they do in practice in their projects. This is to say– this tension provides them with an opportunity to do identity work. Through retrospective sense-making in their co-authored article on transformative social science referred to above, they present their journeys in dealing with this tension as a part of their professional work, and position themselves as transformative social scientists, able to integrate demands for maintaining autonomy and producing usefulness despite their contradictions. A summary of this analysis follows on the next two pages.

7.7 Summary Table

The following tables across two pages summarise the findings of the analysis.

Table 7. Summary of analysis and findings (Part 1)

Tension Area	***Specific local tensions* / Description**	***Salient in* / Formulated as practical question & answer**	***Response type* / Description**
1. Relating to university & higher education system	*Consolidate - Interrelate* Need to consolidate around specific theme and set of relations with actors *and* have flexibility to work across heterogenous contexts, problems and networks	*Strategically selecting research projects* Q: What kinds of projects should we pursue? A: Those that consolidate around a theme and set of relations with actors over long term *and* those that allow us flexible interrelations across diverse landscape of local sustainability issues and actors	*Defensive* Split spatially: Pursue both, management does one while members continue with other
			Active -
	Maintain - Adapt Need to maintain group's critical, alternative values and feeling of closeness *and* adapt to rules, procedures, interests of university and others	*Changes to the group, from idea to group, to center, to Zero-Carbon application* Q: What/who are we? A: An informal critical, close-knit research group of friends *and* a formal, professional university research organization	*Defensive* Split: Group is now part of center but has its own goals and activities going on Avoid: Members move away from group and focus on other things, tension loses saliency.
			Active -

Table 8. Summary of analysis and findings (part 2)

Tension Area	***Specific local tensions* / Description**	***Salient in* / Formulated as practical question & answer**	***Response type* / Description**
2. Relating to society & non-academics	*Distance - Engagement* University researchers are both distant from society *and* engaged in societal change	*Accounts and observations of projects and organized events; members reflections on professional role* Q: What is the relation of the university researcher to society? A: Distant from societal transformation *and* needing to get out of the university and engage in societal transformation.	*Defensive* Avoid: Stick to one's own disciplinary research, despite being member of group that favours engagement Split temporally and oscillate: Do a bit of one and a bit of the other- engage in the purely academic sometimes and engage out in the world other times
			Active Integrate: Create research group that addresses climate issue, while embedded in disciplinary department Integrate: Create integrative/hybrid activities and events; spaces integrate university and society
	Autonomy - Usefulness Maintaining academic autonomy vs. providing what partners want in work projects	*Accounts of maintaining professional credibility in work projects* Q: What is expected of us professionally? A: Academic/scientific autonomy *and* providing what non-academic partners want from us	*Defensive* Avoid: Avoid tension by withdrawing altogether from project Split: Separating poles of a tension while downplaying or ignoring one
			Active Integrate in one project and split temporally: Professional positions across time and across domains Find transcendent concept: 'Transformative social scientist' gets 'beyond the binary'. Embrace: use reflexivity to work-with tensions

Chapter 8
Discussion

8.1 Chapter overview

In this chapter, I discuss the findings of this study and their significance. First, I discuss the findings in relation to transdisciplinary research in theory and practice. I also discuss empirical insights into the life of early, establishment phase research groups, pointing to findings showing tensions and responses that may not be visible in well-established groups. I make some suggestions for extending specific concepts in the tensions and paradox literature. I add to the discussion on tensions in research groups, arguing that 'societally engaged' groups may face different tensions relative to those more focused on disciplinary engagements. Finally, I suggest some theoretical reframings of transdisciplinary research that may be useful for scholars and practitioners.

8.2 Relating to the university and higher education

The risks and rewards of pursuing consolidation and interrelation

I found local tension in selecting which projects to pursue, between a path that favours consolidation and one that promotes interrelation. This resonates with Russel et al.'s (2008) macro-theorising about divergent shifts within the landscape of knowledge production. They argue a trend towards building up structures around particular areas of strength can start to interfere with transdisciplinarity's need to remain open and flexible to working with new actors and problems, a necessary condition to working with the complexities and uncertainties inherent in social and ecological sustainability problems. The authors make a conceptual argument here, that that tension is present in and relevant to the viability of transdisciplinary research across the research system.

I find some evidence in support of this tension my analysis of the empirical material about the development of the Climate Center, and a more fine-grained view of it. Here we can add empirical richness to their conceptual argument and see how it plays out at local level.

For Russel et al. (2008), knowledge economy drivers "pull" transdisciplinarity towards consolidated and structures are built to support it, particular themes that were meant to be transdisciplinary and cross the boundaries of 'disciplinary silos' can become silos in themselves–"islands of strength" as (2008, p.45) put it. Relationships with specific actors become ossified as projects are consolidated around one thematic direction and/or stakeholder configuration that is selected by market (government and commercial) interests. This can reduce the ability to respond to the need of transdisciplinarity for ongoing flexible interconnections with various actors and contexts and problems, an ability that is especially important for work within sustainability fields and solve its complex predicaments over time. Russel and co-authors (2008) are thus highly wary of the consolidation and silo-ing of transdisciplinarity incentivised by drivers within the research and higher education system, arguing that it is potentially problematic and unlikely to work out in the long run, given the problems described, without clever interventions (*ibid.,* p. 469).

Considering the findings in the case of the Climate Laboratory/Center, we can see the consolidation and structural building up of transdisciplinarity in sharper contrast. The flip side of consolidation is that a focus on interrelation, actors and contexts is difficult given the environment of the research and higher education system. It may put the financial stability and legitimacy (in the eyes of those with resources) of the group at risk. The expectations of the university/faculty management in this case were that the research group would take on management of a research center, and that they would make applications to calls like the FME (proposed ZeroCarbon project). While members did find funding for smaller projects, this was often more temporary, shorter term, and included fewer members and partners. Focusing on interrelating with diverse actors and problems in heterogeneous projects is a less stable path in this case, given that the Climate Center relies almost entirely on external funding and wants to potentially offer positions for their members in future, like post-docs or other research positions. Securing resources, collaborative partners, and long-term stability will require (at least to some degree) efforts to build up structurally around area(s) of strength.

Thus, while it is true that a focus on consolidation can interfere with the ability to maintain diverse interconnections, the converse is also true. An emphasis on interrelation can interfere with consolidating activities which offer benefits to the groups themselves, not only to e.g. external funders and the university. The aim to stay open, flexible and alternative can potentially cause problems

for the researchers and research groups–the 'basic units of the science system' (Hackett, 2005)–who must contend with their organizational environment in the science system. Eschewing consolidation in favour of interrelation will make it difficult to survive and thrive in the university system. Moving too far in either direction will cause problems, and eventually create the need for the other.

Spatial splitting of these poles of consolidation and interrelation across different parts of the organisation, delegating to different groups, appears to have a time-limited use given that, over time these two different, divergent aspects of transdisciplinary research may cause problems as they pull in opposite directions and may even undermine each other. The push-pull tension between these two elements of poles may be an important tension to note for managers and practitioners trying to navigate the norms and rules of a disciplinary university environment, while pursuing the transdisciplinary approach with its focus on flexibility and crossing disciplinary boundaries. Rather than conceptually seeing these two directions as an either/or prospect, as a dilemma that must be decided, for example, they could instead be seen from a both/and perspective that acknowledges their mutual presence, interrelation, oppositionality, and necessity, and tries to work with it.

Further, acknowledging this could make managers and practitioners consider the need for both in practice. This means that if we see a great emphasis on one only, we can expect that important elements of transdisciplinary research are being neglected. For example, if we can see transdisciplinary research is or is likely to be highly consolidated in one area and with built-up partnerships in a particular project area, how can this be balanced to ensure the possibility for flexible interrelation as well? Also, do research funding mechanisms take the need to attend to both into account? As we saw in the example of the ZeroCarbon project, being granted such a project potentially drastically changes the structure and identity of research groups. Does this interfere with the group's built-up (present and potential) flexible interconnections across diverse problems and contexts? This is especially important given transdisciplinary research's potential for transformative change relies to some extent on that very capacity (Nowotny, Scott and Gibbons, 2001; Russell, Wickson and Carew, 2008; Lawrence et al., 2022). The response to this tension indicates that one reason TR may be hard to realise in practice is not just this tension but responses to it. Defensive responses may work temporarily, but other more active responses may be needed in order to balance these divergent demands rather than addressing them separately.

Difficulties of maintaining group values during change

The findings identified a tension between the need to *maintain* the existing research group's (Climate Laboratory's) values and internal order, while at the same time seeking to *become* members of the new center, as they grew, formalised and took on the new center's goals and rules. Overall, this tension was felt acutely by the research group, but I found there was a feeling of inevitability about the changes occurring. The tension appeared salient in material towards the start of my fieldwork. Later the change had been more normalised once new staff were present and the center was an everyday reality. At that stage, the tension was less acute for the group overall. Had they been granted the ZeroCarbon Project, this would have put even more pressure on this tension between adapting to changes and maintaining their group's personal bonds and shared identity. It likely would have broken the research group up completely. This finding indicates that innovative, alternative groups that succeed in moving into transdisciplinary research may encounter tensions that (they perceive) put them at risk of losing their participatory, critical spirit and potentially losing their values. Further, this finding resonates with a finding of Hackett et al. (2004): through the funding of specific types of work organization and technical instruments over others, research funders (such as research councils) and their funding calls directly influence the form and direction of knowledge production at the 'ground level', so to speak, and thus have a hand in shaping the trajectories and identities of research groups themselves.

The presence of this tension and a seemingly short-term defensive response to it seem to have led to an initial 'solution'. The initial group was maintained as a separate but integrated part of the Climate Center. The critical, close group was able to operate as a group, while the center and its new management team and strategy operated towards its own ends. It is worth noting that here, the members of the research group and center overlapped, for example, with the Director of the center being also one of the initiating members of the group. Yet the group continued to exist in that it had multiple funded research projects, student activities, and outreach activities under its umbrella, and its own name and identity. Nevertheless, members also needed to engage with the new hierarchical structures, and various rules introduced as the center was built up, along with the new recruits, projects, goals and activities the center brought. Eventually, the research group stopped its activities, with some members moving on to other projects and the center taking precedence as attention was put into its new recruits and future projects while the Climate Laboratory gradually became dormant. The tension I have pointed to here that became salient in the transition from group to center may be one that emerges at the stage at which a research group becomes part of a larger entity. This specific tension appears to have been latent, and then became quite acute as the group become

more known and successful in securing grants in 2015 onwards to 2017 as the center was launched. After this period, it was not as relevant, and seemed to have become more latent once again.

Empirical insights for emerging, early-stage research groups

These findings indicate that tensions around organizing transdisciplinary research in a university department between consolidating and interrelating with actors, and between adopting rules and maintaining identity, are salient for nascent centers during their establishment phase. Seeing tensions from a more processual perspective (e.g. Gotsi et al., 2010; Smith and Lewis, 2011; Jay, 2013), it would follow that saliency is temporary–tensions salient now may be latent later. Studies of well-established centers may therefore not see these tensions, or may see different instantiations of the same tension but further down the line, in different conditions, after responses have already happened, decisions have been made and outcomes embedded in the organization (Jarzabkowski, Lê and Van de Ven, 2013).

One of the aims of this thesis was to illuminate the role of tensions in nascent research groups/centers. The few studies of tensions in transdisciplinary research groups/centers available in the literature have focused on well-established organizations (groups, centers or institutes) (Parker and Crona, 2012; Turner et al., 2015; Vincent, Danielson and Santos, 2015; Soini et al., 2018; Müller and Kaltenbrunner, 2019). This study has focused on a nascent, still-emerging center; the story of a small group making efforts to establish a transdisciplinary research environment. The aim was to offer insight into the development process of the early stages of establishing transdisciplinary research, getting a clearer empirical picture of *which* and *how* tensions may impact the life course of such groups/organizations in early stages. In early stages, tensions arise in relating to the university and to societal actors. Actors respond at times defensively, by separating poles of tensions, and at other times actively, by integrating and/or transcending them. Responses to tensions matter for their research group's trajectory through the research and higher education system (Hackett, 2005; Mueller and Kaltenbrunner, 2019), and not only affect but can become embedded in organizational conditions over time (Jarzabkowski et al, 2013). Specifically, it seems that the university relationship could be important in establishment processes of nascent groups/centers in ways that it may not be for more well-developed centers.

Responding to the tension between consolidation and interrelation defensively by splitting these interrelated but oppositional demands by assigning both to different groups/individuals and working on them separately, risks an outcome that would lead to rapid and disruptive consolidation and restructuring around one thematic direction and set of societal-actor-partnerships. A

researcher arriving at a later stage to study the resulting multi-stakeholder "environmental technology center" would see a very different picture. (Although may find this tension to have been persistent and manifested differently at that point). Likewise, the tension between, on the one hand, the need to maintain the initial group's values and closeness of internal relations, and on the other, the need to adopt the rules and procedures that came with the management of the center is also a particularly salient issue at this early stage and may not be visible later.

This is relevant for early-stage centers. Managing this transition in such a way that people can continue realising their feeling of participation in the group's direction is a key management challenge for group leaders. But also maintaining the critical, alternative creative ethos that early groups may have seems to prove challenging. Given the reflexive system-level critique of higher education that transdisciplinary research is to some degree based on, particularly in sustainability-oriented fields (Hadorn et al., 2007; Schneidewind et al., 2016), the challenge of maintaining alternative values and perspectives in this areas of research is key (Lövbrand et al., 2015). If incentives within universities to find funding and grow, and adopt university/departmental rules and norms, lead to groups with alternative visions and values being over time dissolved, disbanded, or faced with disruptive change, this is not an ideal outcome for transdisciplinary research. That is not to say that the group's values and outlook cannot be carried forward. However, responses to this tension could be more active, seeking ways to embrace or transcend this tension.

Further, I am not implying that the tensions and responses I have found here will not be present at later stages in the life of these organizations. However, they may manifest differently later, once conditions and viewpoints have changed. It is also not to generalise to all early stage transdisciplinary, sustainability-oriented research centers.

Nevertheless, there may be some analytical generalisations to be made here, as certainly, relating to the university and relating to society are generic relations that all such centers would need to address. As Hahn and Knight (2021) argue, there is a higher probability of particular paradoxical tensions arising in similar material settings. For example, a disciplinary department in a university in which a small group of motivated researchers set up an alternative research group seeking societal relevance. However, actor's cognition/mindset/framing matters here (Smith and Lewis, 2011), which in turn is linked to their history and cultural background and it is not assured at all that actors in a similar setting would construct interpretations of their substantive conditions in the same way as those we see here in this case (Keller, Loewenstein and Yan, 2017).

8.3 Relating to society and non-academics

The distance and engagement of academic roles generates active and defensive responses

The study also identified that researchers encountered tension between the distance and engagement required of them in their roles due to the structural distance of the university from society and the group/center's mission to engage in societal change. Members felt a fundamental "distance" they have from societal change and how they are part of a university system that is still broadly quite disengaged from society. This was felt acutely at times, despite their being part of what many of us in academia would likely view as a highly societally engaged group. They still felt distant from societal change, while simultaneously feeling that they should engage in it somehow. On the one hand, they were in academic roles that required using their scientific training which sought knowledge for its own sake, contributing incrementally and quite indirectly to societal change through, for example, education and theory development. On the other hand, they were working on a politically salient area in which their own research group/center was branding itself as engaged in working "for transformation" and "producing actionable knowledge" on a politically charged area, climate and energy.

Transdisciplinary research is, at least so it is claimed, a way of bridging the 'social distance' between the academy and society (Maasen and Lieven, 2006), through societal engagement that includes participation with non-academics in joint projects (Hadorn et al., 2007; Lawrence et al., 2022). Tension at one level can manifest at other levels and shape responses there (Andriopoulos and Lewis, 2009; Jarzabkowski, Lê and Van de Ven, 2013; Gaim et al., 2018). This tension at the level of the research group is a local manifestation of that macro tension that underlies transdisciplinary research itself. Interviewees expressed feeling simultaneously being at a distance from and engaged in societal change processes.

Defensive responses included 1) avoiding this tension by downplaying one pole–sticking to one's own disciplinary research, despite being member of group that favours societal engagement, and 2) splitting temporally by sometimes working within the academy at a distance from society, focused only on knowledge for its own sake, and other times going outside and working as an engaged actor intervening in societal processes, "hands-on".

Active responses were 1) to create Climate Laboratory in the first place as a way of addressing this simultaneous distance and engagement in academic roles–a group that would do societally relevant, societally engaged research related to climate change, rather than the disciplinary-focused geography

research their department was doing, and 2) to seek out integrative practices that brought together research and researchers on the one hand, and societal actors and problems on the other hand. This was done through the design, including location selection, of events and activities.

In the process of the development of the center, the recognition of these oppositional demands of their academic roles spurred action early in the development of the Climate Laboratory. The initiators pointed out this contradictory view of roles in the academy– both part of an organization that is detached from society, and at the same time needing to engage in societal problems that are urgent, fast moving and politically charged. Making a tension salient by perceiving it, talking about it and making it visible to others, and then responding to it by accepting or embracing it is a strategic way of working with and 'using' tension (Poole and van de Ven, 1989; Beech et al., 2004). The presence of this tension thus appears to have been a motivating, creative force driving change (Jay, 2013; Gaim, 2018) for the co-founders of the Climate Lab, and for the Climate Center. It is perhaps this tension that is most central motivator of the organizing they have done at the Climate Center. The other tensions described here spring from those initial efforts to organise in ways that would address their simultaneous distance and engagement, only becoming salient afterwards in the organizational changes that occurred.

The presence of this tension seems to have spurred additional, ongoing efforts to find creative integrative responses that use this tension productively. The concrete responses present in my empirical material do create outputs in forms in which researchers integrate with societal actors and contexts–realising a key part of the stated aims of transdisciplinarity.

If transdisciplinarity is ultimately about transcending disciplinary and university-society boundaries in the service of meeting societal challenges, we may prefer to see this tension as to be expected, embraced and a rather productive one. Rather than seeing this as a result of some flaw in our current university system, or see disciplines as structures that are in the way of potential innovation (Strathern, 2004). Perhaps the simultaneous distance from society and engagement in societal change built into formal roles in groups/centers like this one is an essential ingredient to transdisciplinarity in the first place, an 'essential tension' that will be encountered by researchers in transdisciplinarity.

A key question for members of this and other such research groups/centers, then, is how to respond to it–with avoidance or defence, or with acceptance and integration? The different responses on display even within this as-yet relatively nascent group (an interdisciplinary one, with multiple scientific trainings and backgrounds, yet with a somewhat common ethos and

organizational mission) suggest that one important variable to achieving the apparent promise of transdisciplinary research is how this tension is perceived. For example, as a threat or something to worked with. And whether there are common ways of perceiving it held within such groups. But further, that the way in which groups look upon and respond to this tension–for example, as something for which "actionable knowledge" is needed, may be different to how individuals see it, who still may have disciplinary backgrounds that lead them to see avoidance or defence as appropriate responses to this tension.

Working with demands to maintain autonomy while providing usefulness

The study also identifies a specific tension between the need to maintain autonomy and provide usefulness when working with other actors. Their transdisciplinary approach explicitly places researchers as professionals with responsibilities in both university *and* societal contexts. For example, on the one hand, as academics publishing in peer-reviewed journals, and on the other as "partners" working to solve concrete sustainability problems with industry, civil society, government, etc. While others have studied the intricacies of the roles of scientist academics crossing the policy and practice realms (e.g. Jasanoff, 2004; Pielke, 2007) my point here is not to theorise this fascinating, complex and shifting role, but rather to point out that this tension became salient for members of the Climate Center as they established transdisciplinary research.

The responses to this tension that emerged in the field material were multiple, both defensive and active. Defensive responses included 1) avoiding tensions by not working in projects in which the tension is too strong, and 2) downplaying one side of the tension to diffuse tension. Avoiding a project as untenable does eliminate tension in that instance. However, this is only ever a temporary fix, as given their transdisciplinary approach and the mission of the center to be involved in 'transformation' requires engagement with non-academic actors, they will need to continually enter such projects. The tension is likely only temporarily avoided through this approach, as the tension will persist given organizational conditions. Downplaying one side of the tension to diffuse tension will also likely be a temporary response, in that it too only deals with it short-term, given the ongoing need to provide usefulness and remain autonomous given the kinds of projects the group takes on, the members' ethos, and the organization's purpose.

However, it is also possible that a certain level of tension-salience was acceptable but past a certain threshold it became too much and the response was to withdraw from the project. For example, the group might work with the municipality, but back out when the state oil company becomes involved as

the risks to losing autonomy altogether become too great. The response to tension (paradoxical or otherwise) would thus be contingent on the *degree* of salience, which can increase or decrease as conditions change. This is an interesting consideration: that actors can strategically change response to tensions or paradox depending on degree of salience. This also means certain changes in conditions may trigger shifts in saliency and thus responses. And rather than an on-off binary, latency-saliency could be seen as a spectrum.

I also found two active responses, both of which raise interesting conceptual considerations.

Temporal Splitting as Active Response

The first active response was integrating both poles in one project, which happened in Bjørn's work. Specifically, his switching professional roles between researcher, public servant, and back again. Seen through the lens of a response to tension between demands: of autonomy to pursue one's research in academia and needing to offer useful solutions in public service; between doing university research as an analyst and working in government as a political actor. This kind of switching could be seen as a defensive response, the kind of temporal splitting that Poole and van de Ven (1989) refer to that allows for responding to tension by addressing one element (or pole) of a paradox to be worked on for a while, and then the other, in sequence. This is a way of managing the contradiction and interrelation of paradoxical tensions and can generate an oscillation between poles over time and in this case, across different domains. However, for Bjørn, within the context of his post-doctoral work, this was rather a sort of integration, an opportunity to take a both/and approach, rather than an either/or approach.

That suggests a refinement to existing distinctions between active and defensive approaches' respective integrating (working-with) and splitting of poles of tension. We could reconsider temporal splitting as active rather than defensive in some cases. Splitting poles of a tension across time could be quite active, depending on intention. If someone were to do 'a bit of this and then a bit of that' but as they were doing them, they kept in mind a greater unity of the two, and saw how one was interrelated with the other, then in fact temporal splitting is a way of taking a both/and approach. That would still acknowledge that actual work practices which are contradictory and mutually exclusive because of their nature must be taken one at a time, yet they can be part of an interrelated whole. If I walk up a mountain, I cannot walk down simultaneously. However, on the way up I can be gathering information for my descent down. And of course, I cannot go down if I have not come up. On the way down, my prior trip up will inform my path down. And indeed, by coming up the mountain I have already set in motion the going down (lest of course I died up there). Thus, these two opposites cannot be simultaneously achieved yet

they are interrelated parts that together form the mountain journey. Taking these two different directions at different times, however, is hardly *defending* against a paradoxical tension.

Looking closely at the example of Bjørn's "Bold Fieldwork" project, this suggests just such an active approach utilising temporal splitting of two poles of a paradoxical tension, while at the same time their interrelation is maintained. Looking at shorter time periods, splitting occurs, zooming out, we see two sides of one process, each defining the other within the frame of Bjørn's long-term intentions. The usual assumption in literature is that temporal splitting is a way of *not* addressing both sides of a paradoxical tension, and to thus be acting in a way that is sub-optimal in some sense (Smith and Lewis, 2011). It is a defensive response in that it is based on seeing the paradox as a problem to be defended against. However, this seems to exclude cases where temporal splitting is strategic, done with a mindset that keeps interrelation alive across time.

We could thus see temporal splitting of the poles of a tension as only sometimes a defensive action. Other times it is an active strategy that simply takes a processual view of a tension or paradox as a way of keeping the interrelation and opposition alive across time. It is not paradoxical to walk up a mountain and then walk down. But it is paradoxical to say or know that 'the way up is the way down'. The temporal aspect makes that which is paradoxical doable in practice, but the difference here is that while poles are split temporally, they retain their interrelated, oppositional qualities given their conscious integration within a whole; a project for example. We can here question to what extent addressing different demands at different times is "splitting" at all. As Strathern (2000) argues, "time turns a paradox into an oscillation", yet that oscillation can remain within the confines of an overall whole in which tension is never neutralised, only stretched.

Finding a Transcendent Concept

The second active response was to find a transcendent concept to get beyond this tension. In the co-authored article they had written they construct a self-concept for themselves as 'transformative social scientists'. This concept refers to these efforts and the "balancing act" they were faced with when entering into transdisciplinary research projects with other actors. This is a professional self-concept that (at least symbolically) gets beyond the oppositional demands of autonomy and usefulness, that of the transformative social scientist who can navigate across these tensions. This is helpful for the members themselves, orients them in their work, and provides distinctiveness to the group as was evidenced in their co-authored article published in a central journal for their field. However, it seemed that in the projects they worked on, the difficulties of managing this tension in practice remained. Instead of

necessarily having a way to deal with the tensions in the simultaneous need for maintaining scientific autonomy and providing usefulness, they have a self-concept which stabilises these two competing demands and makes their simultaneous existence in projects with others manageable, and their approach to research doable.

Indicated here in this local response to tension is an everyday-practice level picture of what Kaldewey (2018) and Kaldewey and Flink (2021) have articulated conceptually and called for empirical research on. Namely, that the research policy discourse on grand challenges is repurposing knowledge production, and this translates to the local level. For researchers aligning their research with societal needs through participation with other actors in 'grand challenges', crafting identity through symbolic and practical work becomes a central task. Without going too far into identity as a concept here in this discussion, as it is not the focus of this thesis, I suggest that in responding to tensions the group has done identity work to develop a new self-concept that makes sense of their situation. That is, a response I see in my material to tensions of relating to society from within the academy, is to find a professional self-concept that transcends the tension (see also Lam, 2010 who found a similar response in science-commercial settings). The concept of 'transformative social scientists' positions them well as experts who can manage engaging with societal change from within the academy.

Research groups and the tensions of societal engagement

Tensions and paradox literature theorises that tensions are *nested* across levels. They can be present at macro/landscape level and then become embedded into organisations, for example as divergent goals are pursued at the same time by different departments (Jarzabkowski, Lê and Van de Ven, 2013). These can cascade down to workgroup, project and individual levels, and can drive responses there. (Andriopoulos and Lewis, 2009; Gaim, 2018). The active response we observe here in the case of the Climate Center/laboratory resonates with Masen and Lieven's (2006) conceptual arguments about the micro-negotiations of societal accountability of research that are now the work of individual academic scientist/researchers and their teams. Whereas previously the responsibility for the university-society relationship was placed at the institutional level, today transdisciplinary research places the responsibility for making research useful and meaningful to society upon individuals, who are to achieve this through their own enterprising efforts.

The findings in this study offer some insight into how the need for societal engagement placed upon researchers and their groups today is addressed in practice. Some research groups are particularly affected by the consistently increasing trend towards alignment of the direction of research with societal

needs (Hackett et al., 2016). We thus need to take into account that they not only need to invest in epistemic pathways and create identity in their field. They also engage with non-academics and enact sets of practices that are not those of traditional science and academic practice. Further, some research groups believe they should no longer rely on the university as the institutional context in which to achieve their ends, and thus must find ways to exist in direct and meaningful relation to urgent societal issues as well. They do not accept–and it is no longer fashionable to accept (Flink and Kaldewey, 2021)–that science-as-institution or the university itself will deliver the needed 'societal engagement' for sustainability. Research on tensions present in the work of research groups must give attention to their efforts to be (seen to be) actors in society doing good–as well as academics building reputation, managing laboratories, and so on.

In works such as Hackett (2005), this area is neglected. This study of such a group attempts to highlight that in today's research policy environment, researchers are coming to see themselves as in a more direct relationship with societal issues and societal actors. Research groups are not *only* a "basic unit" within the science system. They are *also* a locus at which research and researchers participate in societal problems and with non-academic actors in solving the grand challenges of the day. They are seen, and see themselves reflexively, as not only scientific or academic researchers but also actors who are to be more or less directly involved in a larger mission of societal change (Flink and Kaldewey, 2021). This means they need to not only build a reputation and identity in relation to their peers and competitors. They also perceive a need to relate to the outside world, and to form that relation themselves on the basis of their own efforts, and in a contemporary context in which a traditional science-society relationship is no longer seen as sufficiently up to the task of knowledge production, let alone achieving the progress required on sustainability problems (Maasen and Lieven, 2006; Schneidewind et al., 2016; Fazey et al., 2020). Achieving their ends is thus arguably a more complex task for such a research group that wants to also pursue a societal change mission in addition to their seeking reputation within their field and university, than for one that doesn't. It is, at least, potentially open to new areas of tension. Taking note of this new empirical situation, brought about by decades of policy that has increasingly placed research and researchers in an ever-closer relation to society and its apparent needs (Kaldewey and Flink, 2021; Nowotny et al, 1994), means that our understanding of the areas of tension that a research group copes with needs to be expanded to include cases of transdisciplinary research and its demand of societal engagement.

8.4 Theoretical reframings for reconsidering transdisciplinary research

As mentioned earlier, in a recent article, De Keyser, Guiette and Vandenbempt (2019) review tensions and paradox literature and outline various ways paradox is utilised for generating theoretical contributions. One key approach in making a contribution is the use of paradox to "understand and advance" existing knowledge/theories, such as strategy or leadership, moving that theory forward. This approach includes a specific mode of using paradox to reframe phenomena. This allows getting a "conceptual angle from which to gain a new perspective on a particular phenomenon", and "reframe the indicate complexities of their respective theoretical discussions" (*ibid.*, p. 149). This is a relevant approach in my study. The authors (*ibid.*) offer an example of an article by Dameron and Torset (2014) in which those authors *reframe the theoretical conversation* they are in. Aiming to understand how organizational strategy is constituted, the authors inherently operate from the conceptual background of paradox, analysing the debate from a tension-based angle. Important to note is that, for Dameron and Torset (2014), the paradox paradigm doesn't merely represent one of the many theoretical bases they could have grounded their research in: it is noted as actively aiding them in the reconfiguration of the conversation to which they mean to contribute.

A process view of transdisciplinarity in research contexts?

In this study I am suggesting that a reframing of transdisciplinary research is possible using a "tension-based angle". My findings reveal that transdisciplinary research is infused with ambiguities and contradictions. And that local, contextual, organizational factors are important to understanding transdisciplinary research. After all, transdisciplinary research is always established and carried out in local organizational context. It is not only a research technique or a way of framing individual research projects; it is a research approach around which people organize within research and higher education.

In this study I am introducing a more paradox-literature-inflected version of the tension concept. I argue that this shows that transdisciplinary research does not only have tensions *present* within it, as other authors have (Turner et al., 2015). Rather, transdisciplinary research being introduced in a local context then brings tensions to the surface–tensions already latent in existing ambiguities and contradictions found within the research and higher education system. This more active view of transdisciplinary research harnesses an existing concept of transdisciplinary research as a kind of "overlay" on top of existing knowledge architecture (Etzkowitz and Leydesdorff, 2000; Fazey et al., 2020). It is one that (in theory) reconfigures the relation between science

and society (Nowotny et al., 2001), that not only is a model for 'good research' but that makes a difference in a specific socio-material context. One way it does so is to make tensions salient in organizations which implement it and for actors which take it on.

This is an organizational view of transdisciplinary research, which frames it as (requiring) an organisational change process, not as simply a research model or technique. Again, while I do not get into process theorising in this thesis, I want to suggest it as a fruitful pathway for building theory about transdisciplinary research and the reconfiguration of the science-society relationship. Perhaps we can develop a more processual view of transdisciplinary research, as an approach that makes salient specific areas of tension in the university/academic context, and they are dealt with over time within the groups/organizations that take it on.

One of the insights of management and organization paradox literature is that tensions are push-pull forces generated by competing demands (contradictory elements) that "tear" actors in divergent directions (Gaim, 2018). Such tensions can lie dormant, latent in organizational conditions until change triggers them to become salient, rising to the surface to be felt acutely by actors. Thus, to take tensions as a fundamental conceptual view to look upon and grasp the challenges of transdisciplinary research in practice, means to see transdisciplinary research not as an approach that simply 'has' contradictory tensions, paradoxes in it, but rather as an approach that, as it is introduced (overlayed) onto a university context, makes tensions between competing demands (contradictory, interrelated elements) *salient*. This flip side of this is that they were already present, just dormant, *latent*, in hibernation, existing as possibilities.

This gets to an important issue with potentially all studies that address tensions in this or that phenomenon–that elements are always already potentially in tension if they have or can be seen to have a contradictory interrelationship of some kind. Logically this means all potential tensions or paradoxical tensions in a given socio-material context are always latent unless they are salient, because they either exist in organizational conditions already, or could do when things change. (See Hahn and Knight's (2021) ‘quantum approach’ to paradoxical tension for a substantial elaboration of this line of thinking). This means that tension and change are inextricably tied together, so the only way any tension becomes salient is through change. Therefore, if one looks upon paradoxical tensions as static binaries that help explain say, identity formation (e.g. Carollo and Guerci, 2018), without addressing the inextricably processual nature of tensions and paradox, one misses something fundamental: that tensions (like everything ultimately) have always come into being through change and can pass away again through more of it, which is always coming. The latent/salient aspect of tensions has quite deep implications in this sense–

tensions, whether inherent, constructed, or both, are always a result of some change which made them salient or returned them to latency. Again, this has consequences for thinking about tensions in research organizations. They are not static binaries that allow us to place dualities in rational frameworks in order to analyse, they are rather ontologically always in flux–arising and fading away subject to a changing world.

On considering tensions in transdisciplinary research with a both/and approach

Is the presence of tensions a problem for transdisciplinarity? As Russel, Wickson and Carew (2008) point out, transdisciplinarity is often presented as a solution to the need for the research and higher education system to deal with sustainability issues. It is a "one size fits all solution which will boost the economy, save the environment *and* empower the community" (*ibid.*, p. 470). Further, it is often seen as a normative ideal to strive for, and is a lovely buzzword, and so it is tempting to overlook real challenges or problems within it. Therefore, the authors argue, looking at tensions that characterise transdisciplinarity is an important part of making it more robust as a research approach. However here they, like some other authors, imply that for transdisciplinarity research, tensions equate to problems yet to be solved, contradictions yet to be faced, mistakes needing to be corrected. For them, tensions in transdisciplinarity reveal issues that "weaken the concept and the case for its adoption if left unanswered".

It is true that tensions that arise in transdisciplinary research may be local instances of macro-contradictions of the knowledge production landscape playing out over the long term, say between economic, environmental and public "drivers", that chart a course for transdisciplinary research along divergent paths. And concurrently that, as Russel et al. (*ibid.*) argue, "changes in the *practice* of transdisciplinary research will feed back on these drivers, and bring about change in the knowledge production landscape" (p. 470, emphasis mine). In other words, a structure-agency argument along the lines of Giddens' (1984) (the notion that structure and agency depend on each other; structures constrain individuals, who construct and reconstruct those structures). However, one might take a different position to tensions than this macro-contradiction perspective when *actually working in practice*.

Tensions that arise in establishing and carrying out transdisciplinary research may be best and embraced. They may not be best seen as problems, in the sense of something that needs correcting in order to make progress; wrinkles that need ironing out. Whether or not tensions are definitively contradictions (dialectics) or paradoxes is a discussion that can be had (see also Hargraves and Van de Venn (2017) for an interesting discussion of the distinction and

relationship between dialectical contradiction and paradox). Rather, from a managerial and practice standpoint it may be more productive to see such tensions as best met with a both/and approach. Active, creative responses to such tensions may then be possible. Defending against or avoiding the tensions that many authors call "inherent" and "essential" in the work of knowledge production (Hackett, 2005; Turner et al., 2015; Schikowitz, 2020) may be a frustrating and ultimately untenable position, given that they are ubiquitous, persistent, can be generated between elements of one's organizational environment and present in the "mindsets" and "frames" of individual actors as they do sense making and act (Smith and Lewis, 2011; Keller, Loewenstein and Yan, 2017). While ultimately, over the long *durée*, dialectical processes may be at work, for actors at the micro, on-the-ground level of practice it is the salient sense of being torn in divergent directions by competing demands that they encounter day-to-day (Hargrave and Van de Ven, 2017). Embracing and then integrating, or finding a way of transcending, such oppositional tensions may be a preferrable way of seeing tensions at the level of practice, with the potential to generate the kinds of practices that can "bring about changes in the knowledge production landscape" itself (Russell, Wickson and Carew, 2008, p.470).

Literature on transdisciplinarity assumes that it can be achieved through the implementation of the right principles/models, that tend to look rather unambiguous and linear (e.g. Jahn et al, 2012). There is a tendency in this literature to perhaps adopt what in organization literature is an assumption that underlies the field, originating in *contingency theory.* Here we usefully mirror a debate that Smith and Lewis (2011) articulated in their highly influential article on managing paradoxical tensions. Contingency theory posits that organizations, like species, are (best) shaped to fit their environment, and (would be wise to) adapt to environmental conditions (Morgan, 2006). Responding to these divergent options is a matter of understanding what is the best fit given current conditions. (Here 'environment' is meant in the organizational studies sense: that which is external to the organization). In other words, the prospect of relating to society through a transdisciplinary research approach would present people with a series of management choices: 'is it better to do A or B; this or that?'. Which option is best (or would be best) is answered with reference to the environment around the organization. Actors make choices based on their attempts to make a good 'fit' with conditions, a choice that is intended to produce favourable outcomes. To take the example of the findings in this study: Do disciplinary *or* transdisciplinary research? Consolidate *or* interrelate? Conform *or* diverge? Create useful knowledge *or* do autonomous academic work in stakeholder-collaborative work projects? Take a role in the university as an integrated societal actor *or* as a detached academic analyst? And so on.

However, the tensions and paradox literature posits a different set of assumptions. That tensions arise when a plurality of interrelated, divergent demands (or contradictory elements) is present and tension between two (or more) of them become salient. And that organizations respond to these, enacting active or defensive responses, but with both demands or elements–poles of a tension–remaining in play rather than being resolved when actors respond to them. Responses are only ever temporary. Returning to the field, observing that the Climate Laboratory group/ Climate Center were pursuing projects that led both to increased *consolidation* on the one hand *and* those that lead to increased *interrelation* on the other is, in this view, not a confused inability to choose what is best given environmental conditions. Rather, the persistent and contradictory nature of these demands means that it makes sense to pursue both despite the tension generated in their interrelated and oppositional nature, tension which can be felt acutely and at times rather uncomfortably by actors.

Given the findings in this study, what does this suggested shift in perspective entail for our knowledge/theory of transdisciplinary research? And more specifically how that theory has been elaborated in the context of societal engagement for social and ecological sustainability?

One simple observation in answer to these questions is that transdisciplinarity as a phenomenon that exhibits tensions that are (at least in part) inherent given the structure and norms of the university, and the values of transdisciplinarity as an idea. Many studies have observed the tensions between the new transdisciplinary approach and entrenched norms of academia (Maasen and Lieven, 2006; Polk, 2014; Felt et al., 2016; Thompson et al., 2017; Fam et al., 2020; Fazey et al., 2020; Lawrence et al., 2022). These tensions are often presented as a complication, problem, conflict to be solved. This is attributed to a lack of conceptual clarity about what is meant with transdisciplinarity, or a lack of agreement about how it should look in practice, and/or to the fact that 'old structures' of the research and higher education system and its universities have not yet adopted to this new approach. This viewpoint 1) sees these tensions as originating in a lack of conceptual clarity and agreement that causes problematic ambiguity, and 2) assumes that if this deficiency was resolved we would then be able to choose transdisciplinary research as the best respond to a changing social and ecological situation. In other words, clearing up the conceptual and practical mess that characterises transdisciplinarity, and updating universities to accommodate this new approach would rid us of contradictory tensions in transdisciplinary research.

Those arguments are worth questioning. Here we can consider an alternative view. While it would be valuable indeed to clean up the concepts, improve our practice in transdisciplinary research for sustainability, and do more to make our universities (and perhaps other research organizations) amenable to

transdisciplinary research, it is perhaps a wrong move to assume that this will clear up tensions. This is so for the quite obvious reason that, as has been pointed out by transdisciplinary research theorists, transdisciplinary research requires disciplinary research in order for it to be viable in the first place and is in fact built on top of a disciplinary knowledge structure (Jantsch, 1972; Max-Neef, 2005).

Further, transdisciplinary research is most often embedded in universities. While they may be made more amenable to transdisciplinary research, they are organizations that have proved highly resistant to any change in their fundamental disciplinary structure (Gumport and Snydman, 2002). Other sources of tension will likely remain in place also. Research projects will continue to integrate actors in ways that bring power and competing interests to bear on the participatory processes of knowledge production. Researchers will largely continue to be trained in various disciplines, and then thrown together in inter- and transdisciplinary research projects. Finally, and not least, the work of research is fundamentally characterised by tensions (Kuhn, 1996; Hackett, 2005; Turner et al., 2015; Andersen, 2013; Schikowitz, 2020), even before we add the plurality that transdisciplinary approaches bring to the table.

Why then should we see the presence of tensions as signalling problems to be resolved, be they conceptual, structural or practical? We could instead take the view that tensions are present as part of organizing and become salient during change and innovation (Quinn and Cameron, 1988; Smith and Lewis, 2011). The project of transdisciplinarity has overtly, successfully aimed to complexify the research system's relations to society in the service of (in theory) innovations in knowledge and for the public good. It has led researchers to cross boundaries between disciplines and beyond the university itself. It may be that there is no tension-free version of transdisciplinary research; smoothly implemented in a fully updated university that is no longer "lacking the capacity" to house it. Rather, as Heraclitus would have it, a state of tension or "strife" may be the natural way of things (Wheelwright, 1959; Graham, 2021).

8.5 Tensions and responses in establishing transdisciplinary research

The above discussion has covered several main areas. First, in this thesis I made use of the concept of tensions in examining the actions and experiences of researchers establishing sustainability-oriented, transdisciplinary research within their university departmental context. A departure point in doing this was that transdisciplinary research has been put forward as a way of

addressing urgent societal challenges, but at the same time has proven hard to realise and thus we need to look at practice (Felt et al., 2016; Fam et al., 2020; Schikowitz, 2020; Lawrence et al., 2022). Another departure point was that tensions are infused in the work and organizational contexts of scientific/academic research, and that tensions thus have effects the efforts of groups and individual researchers (Hackett, 2005; Andersen, 2013; Turner et al., 2015).

Considering these premises, the aim of this study was to identify tensions encountered by researchers in the work of establishing and carrying out transdisciplinary research. Like Thompson and co-authors (Thompson et al., 2017), and Schikowitz (2020), I find that tensions are not only conceptual issues in transdisciplinary research. There are quite concrete manifestations of tensions at the ground level in the everyday work of researchers. With the findings I add empirical insight to the overarching theoretical and conceptual issues in transdisciplinary research, identified by authors like Jahn et al. (2012), and Russell, Wickson and Carew (2008). The findings identified multiple simultaneous tensions that are present and become salient as university-based researchers establish and manage transdisciplinary research that focuses on addressing sustainability challenges. I also explored responses through which researchers address/manage these tensions that play out in practice. Thus, widening our view of transdisciplinary research in practice by describing and exploring both defensive and active responses to these tensions. This shows how tensions can be responded to in various ways and that responses matter for realising transdisciplinary research.

The various tensions present locally for our Norwegian research group, and responses to those, offer us insight into the on-the-ground practice of transdisciplinary research. Tensions in *relating to the university* at the Climate Center were addressed through defensive responses as members tried to address divergent demands separately over time, and within different groups/spaces. The enacting of defensive responses here suggests that such groups face challenges to their long-term viability. Both in terms of their ability to do transdisciplinary research that contributes to sustainability challenges, and their ability to maintain critical and alternative values and approaches to research.

These findings also offered some empirical insight into tensions the influence the life course of early-stage research centers. Few other studies have done this (Thompson et al., 2017; Soini et al., 2018), instead looking at well-established organizational contexts. Identifying challenges and tensions at the early stage in the life course of a research group can offer empirical insight into changes they go through and challenges they face as they seek to engage on sustainability issues and enact transdisciplinary approaches. Given that the move to start up societally engaged research in collaboration with societal

actors is now a common pathway for researchers, understanding the challenges they face early in this process and how they respond to them can offer useful empirical insights for those interested in seeing such environments flourish.

Tensions in *relating to society* at the Climate Center were addressed through both active and defensive responses. In interviews some members gave accounts of splitting and addressing oppositional demands at different times, and/or downplaying one demand in favour of the other. I also observed the addressing of tensions through active responses, in which members integrated and worked with, or transcended and moved beyond the divergent demands that created tensions. The enacting of these different responses suggests that, even within one group/center there are potentially multiple different responses to the same tension being enacted. This offers a richer picture of how researchers relate to and make their work relevant to society–and non-academic actors more specifically. My material indicates that these activities are not only part of a transdisciplinary approach to research, but are ways of responding to tensions generated by the competing oppositional demands transdisciplinary research is premised in, and which are present in the (changing) conditions at the Climate Center/Laboratory and perceived by members.

Further with the help of the findings presented, I have also put forward some modest reconsiderations of concepts in the literature on organizational tensions and paradox. Considering this local case, the findings suggest the distinction between active and defensive kinds of responses could be nuanced productively. Finally, these findings also suggest that our understanding of the tensions research groups encounter can be extended by looking at transdisciplinary contexts. Taking tensions salient in the contemporary emphasis on societal engagement at the level of researchers and their groups, into account.

Literature that identifies barriers to transdisciplinary research may need to consider, as Schikowitz (2020) has argued, that tensions in everyday practices of researchers and the ways in which they respond to them may produce outcomes that have consequences for achieving the ambitions of transdisciplinarity–for example, its aims to engage research with society and work towards sustainability, to integrate actors from across specialties, and to work on common problems. The presence of tensions and particular, local ways of addressing those tensions may make transdisciplinarity harder to realise, and they may on the other hand offer generative ways forward. The responses available can depend on the frames individuals have available to them in interpreting their world (Smith and Lewis, 2011; Keller, Loewenstein and Yan, 2017), or the standardized tools and techniques actors commonly use to respond within a given field or context (Schikowitz, 2020).

The identification of different responses to tensions, active and defensive, points to the need for more discussion around tension management as a key part of conceptualising transdisciplinarity in university environments as it plays out today. The outcomes of transdisciplinary research projects may depend on the saliency of tensions at different moments, and the responses and organizational arrangements available to actors to address them. This indicates that practitioners and policy makers may want to direct attention towards searching for such responses and arrangements. The findings are consequential given that in many countries such as Norway transdisciplinary research is central to government policy on innovation, research higher education, and on climate and sustainability (Fagerberg, Mowery and Verspagen, 2009; Research Council of Norway, 2011; Kuhlmann and Rip, 2016). Given the high stakes and ambitions at local, national and international levels for climate and energy research and other fields engaging in sustainability challenges, it is crucial that we understand the dynamics that influence the work of researchers trying to realise it.

In addition, the theory and findings presented allowed for some reframing of the problem of tensions and paradox transdisciplinary research. I offer support for the idea that moving from seeing tensions that arise in transdisciplinary research with an either-or perspective, to a both/and framing may be beneficial for scholars and practitioners alike.

Finally, in considering future research I proposed that examining research organizations with tensions lens may fruitfully be done from a more processual angle, and that literature on challenges of transdisciplinarity may also benefit from such processual view. Seeing transdisciplinarity as a local change process that happens with university contexts, and theorising it as a process, may be a fruitful path forward.

Chapter 9
Conclusion

With this study, I have aimed to take up the call for management and organisation studies to turn towards studying problems relevant to social and ecological sustainability. I have done so in perhaps a roundabout way–by inquiring into the challenges and tensions present in transdisciplinary research and the contexts in which it is carried out. Transdisciplinary research has been put forward as an approach through which researchers can engage with societal transformation for a better world; one path towards addressing the need for social and ecological sustainability and the 'grand challenges' that presents us with. In its primary tasks of integrating of knowledge across boundaries and engaging directly with society and its problems, transdisciplinary research is said to be able to address wicked sustainability problems and do so in a way that has transformative potential in its interface with broader society. Yet, as I and others have argued, transdisciplinarity has been hard to realise in practice and does not necessarily conform to our models and ideals of it.

By looking at the efforts of other researchers in order to better understand challenges they face in the higher education system, I have aimed to shed light on challenges and tensions that emerge for researchers carrying out transdisciplinary research in practice. Specifically, I have examined tensions that arise in the on-the-ground efforts of researchers to establish and manage a transdisciplinary research organization within a Norwegian university. Drawing on interviews and ethnographic fieldwork, I have looked at a local case in which climate and energy researchers took a transdisciplinary approach in establishing a "societally engaged" research group and research center in a social sciences department. Key questions were: *which tensions do they encounter? How do they respond to them?*

In answering these questions, the thesis made use of concepts from the organization and management literature on tensions and paradox to extend the discussion on tensions in inter- and trans-disciplinary research. What I have found is the tensions salient for researchers, and their responses to them, can

be a source of difficulty and creative progress when it comes to realising transdisciplinary research. The thesis identified, illustrated and analysed several tensions: between the need for both consolidation and interrelation; between the need to grow and formalise the group while also maintaining its closeness and values; between ideas of researchers' relationship to societal change as both distant and engaged; and between the need to maintain academic autonomy and provide usefulness to non-academic actors. Various responses to these tensions were identified and explored, including defending against and actively working with them.

The findings indicate that that specific tensions in transdisciplinary research groups' *relating to the university and higher education system* are important to understand and manage. The tension between demands for stable consolidation around a theme, and flexible interrelation across different projects tore the research group in divergent directions. Their responses to this tension can lead to dramatically different outcomes for the research group. A second, related tension became salient while undergoing organisational change as the research group grew and formalised; the need to adapt to the demands of others came into tension with the need to maintain strong group values and bonds.

The analysis of these two tensions offers empirical insight into the life course of early-stage research centers. These tensions and the responses enacted to them may not be visible later, or appear differently once conditions change. And thus, studies that look at well-developed, later stage center centers may miss these important influences tensions have on outcomes at this early stage.

In *relating to society and non-academic actors*, tensions become salient around the simultaneous distance and engagement members feel in their roles, and the practical-professional need within projects to both maintain their autonomy as researchers while providing useful knowledge to others. Researchers respond to these tensions with a range of defensive and active responses. Active responses find creative ways of integrating and working with or transcending tensions. Here the responses to tensions were generative. Exploring them reveals insight into how tensions are responded to in ways that make the central 'societal engagement' task of transdisciplinary research possible, even while its oppositional elements and divergent demands remain in place. These findings also suggest that our view of the tensions encountered by research groups can be extended to include the societal engagement tasks many of them now take on.

I argue that the above areas of tension constitute some of the "ambiguities inherent in aligning research with society" (Hackett et al., 2016) and the ways in which people respond to them can be seen as ways that researchers deal with these ambiguities at ground-level.

In light of the above findings, I have also suggested that some concepts in the literature on tension and paradox can be nuanced, based on the empirical findings. Further, I argued for 'reframings' of the problem of transdisciplinary research, considering oppositional conceptual and practical tensions that are present as not necessarily to be approached as either/or choices or problems to be solved, but rather both/and management tasks that can be expected and even embraced as an inherent part of transdisciplinary research itself. Ultimately, the thesis has offered insight into the challenges of transdisciplinary research in practice, and the ways in which tensions encountered and how responses are enacted matter to how it is realised.

9.1 Bringing a tensions lens to the study of sustainability-oriented research organizations

One aim of this thesis was to utilise management and organization studies theory and concepts to gain insight into how research organizations work in the context of sustainability. The study of competing demands, the tensions they generate, their sometimes-paradoxical nature, responses to them, and organizational outcomes, are concepts that have been the subject of lively conceptual development in management and organization literature. An as-yet small number of other works have used the concept of tensions to analyse organizations in this field/empirical setting (e.g. Hackett, 2005; Parker and Crona, 2012; Turner et al., 2015). And when they have done so, they have tended not to use them in the way management scholars do, giving them a more basic treatment. This is notable, especially when contrasted to those in corporate sustainability, where the paradox lens has become a well-developed and used framework (Hahn et al., 2015; Hahn and Knight, 2021). This study aims to strengthen the case for the utility of this conceptual lens in understanding research organizations, particularly (but not only) in sustainability-oriented research contexts. This is important in understanding the conditions in and efforts behind how knowledge for sustainability is made. It also offers a piece of the picture of how universities and the research and higher education system in general undergo organizational change in the direction of sustainability.

9.2 Implications for research managers and practitioners

Transdisciplinary research is a work in progress. I am a member of a generation of student cohorts in sustainability-science focused Master's programs

who, over the last couple decades, have been taught about inter- and transdisciplinary approaches to knowledge and research. We were taught the macro-picture of *why* such approaches are needed: to address 'wicked problems' that are complex, have no stopping point and involve plural, competing values (Funtowicz and Ravetz, 1993); to study complex, cross-cutting problems that will not conform to the boundaries of disciplines or specialties (Popper, 1965); and to be able to 'think in systems' when encountering the often messy, interlinked, social-ecological realities of sustainability problems and their non-intuitive feedbacks and leverage points (Meadows, 2008). Transdisciplinarity was a way to achieve these things. We were also taught the 'how' of transdisciplinarity, being given theory with conceptual frameworks for research (Hadorn et al., 2007; Jahn, Bergmann and Keil, 2012) to read and try out. Recruiting various disciplines, societal problems, and diverse actors and settings into the research process would continue the long-term project of bringing us out of the ivory tower help change society, now an even more pressing mission for the academy in times of ecological crisis (Klein et al., 2001; Max-Neef, 2005; Hadorn et al., 2007).

So we were taught. What I have come to realise, however, is that transdisciplinary sustainability research is a work in progress–both conceptually and in practice. There is a good deal of aspiration and idealism in its models, and a good deal of experimentation and the unexpected to be found in practice. In this thesis, I have aimed to contribute knowledge that informs this gap between transdisciplinarity in conceptual terms and how it looks on the ground.

For those interested or already engaged in establishing, managing and/or working within transdisciplinary, sustainability-oriented research settings, it is worth considering that *tensions* will arise between divergent, contradictory and or paradoxical elements. Thus, when moving into transdisciplinary research it may be beneficial to consider that when tensions arise between competing demands, *how* they are perceived and categorised by members, and how they are responded to, are linked together and are matters of importance for (research) organizations (see Gaim et al., 2018). Are tensions seen as problems to be solved? As dilemmas in which one must choose between A or B? Or as persistent and interrelated, and therefore needing to be embraced? Developing a more sophisticated understanding *that* tensions will be there and *how* they can be seen and managed may offer benefit to those in transdisciplinary research fields.

Researchers already working in sustainability areas may pride themselves on having a refined ability to hold multiple competing and contradictory frameworks and goals in mind. Such abstract, plural thinking is a valued skill and comes with the territory of research as a vocation. Perhaps particularly so in the social sciences. However, when it comes to our everyday work in

organizational life, it is often not obvious that we may be encountering persistent or paradoxical tensions brought about within changing conditions. Developing a more refined ability to perceive and respond to tensions–what Smith and Lewis (2011) refer to as a "paradox mindset", could be highly valuable for researchers and managers trying to make their way within the organizational and epistemological complexity of transdisciplinary research geared towards addressing social and ecological sustainability.

Given the ongoing "work in progress" of our attempts at bringing the direction of science in line with the needs of society, and the organizational challenges faced by the increasing numbers of researchers adopting transdisciplinary research as their approach, enhanced attunement to tension management may be of benefit. As Smith and Lewis (2011) argue, there is benefit to taking a both/and approach when dealing with contradictory, interrelated tensions. This is the understanding that there is value in embracing contradictory, divergent elements, rather than seeing their coexistence as problems. Pursuing synergies or ways of transcending (seemingly) paradoxical tensions may even be essential to operating in this space at all (Thompson et al., 2017; Ashby, Riad and Davenport, 2019; Schikowitz, 2020; Arnold, 2022).

It is worth considering which organizational arrangements could hold tensions and responses and productive responses in place over time. Salient tensions are felt acutely by people, and they (feel they should) respond to them. This study has looked at some tensions in a transdisciplinary research organization and responses enacted to those tensions by its members. However, other research (e.g. Gotsi et al., 2010; Gaim, 2018) has observed how organizations can put into place various organizational arrangements that assist managers in responding to tensions by holding tensions and responses to them in place over time. This allows for consistent responses, relieving some of the burden of repeatedly needing to address a tension or paradox again and again. Such arrangements get out in front of tension-filled situations by having responses ready at hand.

9.3 Future research

Future research could examine the processual nature of tensions in the work of research. Specifically, studying transdisciplinary research as it unfolds in organizational context. Given the reframing I have suggested that sees transdisciplinarity from the perspective of an organizational change process, further study may look more deeply at the unfolding process of, for example, moving from a disciplinary research approach to a transdisciplinary one within a given department and discipline, and at the tensions and paradoxes that arise

in doing so, and at the temporal process by which they move in and out of saliency. Adding this temporal dimension by way of process (Langley, 1999) would give us a more precise picture of how tensions influence organizational and epistemic outcomes in transdisciplinary research. Such a conceptual picture would give us insight into how the "essential ambiguity in the ever tighter coupling of the direction of research with the needs of society" (Hackett et al., 2016) unfolds in the everyday work of research groups. The study of the interrelationship between the organization of research and its knowledge outputs has yielded great insight in studies of research and higher education (Hackett et al., 2016). As transdisciplinarity is now commonly put forward as the way towards responsible research that can meet societies' sustainability challenges in areas like climate and energy, studying the process through which it emerges in university environments can shed light on the *how* of this vital activity.

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**Note on anonymisation: references to literature that directly concerned the empirical setting have been removed from both the body of the text and this list.*

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Appendix

The below two tables provide information on interviewees and interviews.

Table 9. Interviewee details

Participant (pseudonym)	Position	Years in group/center	Total no. interviews
Johannes	Founding member, Professor, Director the Climate Center / Climate Laboratory	2014 -	10
Karl	Research Coordinator, Climate Center	2017-	4
Solveig	Founding Member, PhD Fellow, Climate Laboratory	2014 -	3
Sigrid	PhD fellow, Climate Center	2018 -	3
Jonathan	Post-Doctoral Researcher, Climate Center	2016 -	3
Bjørn	Founding member, Post-doc, Climate Laboratory / the Climate Center	2014 - 2018	2
Jessica	PhD Fellow, Climate Laboratory / Climate Center	2015 -	2
David	Post-Doctoral Researcher, Climate Center	2018 -	2
Maria	Research Assistant, Climate Laboratory	2014 - 2018	1
Karen	PhD Fellow, Climate Laboratory / Climate Center	2015 -	1
Former dean of faculty	Dean, Norwegian U Social Sciences Faculty	N/A	1
Tim	PhD Student, Climate Center	2018 -	1
Astrid	PhD Student, Former policy analyst for environment ministry	2018 -	1
Ingrid	Research Assistant, Communications	2018 -	1
'Students'	Students involved in Organizing Climate Center activities	2018-2019	1

Table 10. Interviews over the course of the study listed chronologically

Interview no.	Year	Month	Participant (pseudonym)
1	2018	April	Bjørn
2	2018	April	Maria
3	2018	April	Johannes
4	2018	April	Karl
5	2018	April	Solveig
6	2018	April	Jessica
7	2018	April	Karen
8	2018	April	Johannes
9	2018	April	Johannes
10	2018	October	Solveig
11	2018	October	Sigrid
12	2018	October	Johannes
13	2018	October	Karl
14	2018	October	Jonathan
15	2018	October	David
16	2018	November	Johannes
17	2019	May	Dean
18	2019	May	Jonathan
19	2019	May	Sigrid
20	2019	May	Johannes
21	2019	May	Johannes
22	2019	May	Johannes
23	2019	May	Karl
24	2019	October	Tim
25	2019	October	Jonathan
26	2019	October	Sigrid
27	2019	October	Jessica
28	2019	October	David
29	2019	October	Johannes
30	2019	October	Karl
31	2019	October	Solveig
32	2019	October	Astrid
33	2019	October	Ingrid
34	2019	October	'Students'
35	2019	December	Bjørn
36	2019	December	Johannes

DOCTORAL THESES

Department of Business Studies, Uppsala University

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