Transforming Transportation

How the City of Malmö Can Support Transitions Towards Decarbonized Mobility

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Abstract

Cities play a crucial role in mitigating climate change, yet reducing transportation emissions remains a challenge. Achieving decarbonization in the transportation sector requires systemic transformations across society. However, there is still a limited understanding of how transitions within transportation can be achieved, and further insight is needed to guide cities in driving transformative change. Transition management offers one approach for understanding and accelerating transitions. Using the City of Malmö as a case study, this thesis thus employs a transition management approach to assess how the municipality works with transformative change to drive decarbonization within transportation. A theoretical framework was developed based on three key concepts within transition management: visions, experimentation, and collaboration. Through interviews, document analysis, and workshop participation, data was gathered to evaluate Malmö's transformative capacity. The findings indicate alignment with transition management in several regards, although not across all aspects. While Malmö has ambitious targets, there is a need for more inspiring visions that go beyond numerical goals. The municipality is actively engaged in experimentation, but more radical actions and scaling up of successful initiatives are required. Collaborative practices are strong, both within the municipality and with regional actors. Nevertheless, there are tendencies to work in silos and competing interests are common, even if goals are shared. Based on the findings, seven recommendations were developed for the City of Malmö. These recommendations target establishing a transition arena, fostering collaborative skills, adopting captivating visions, encouraging radical experimentation, scaling up successful experiments, and expanding collaboration with regional entities. While the City of Malmö demonstrates ambition, these recommendations aim to assist the municipality in driving transformative change further regarding decarbonization of transportation.

Keywords: transition management, transportation, mobility, decarbonization, urban governance

Executive Summary

Problem definition and research questions

Cities play a critical role in mitigating climate change, and many cities have set ambitious targets for reducing greenhouse gas (GHG) emissions. However, progress in decarbonizing transportation, a major contributor to urban emissions, has been limited. Despite technological improvements within the transportation sector, emissions are still high, and in scenarios limiting global warming to 2°C or less, most remaining emissions are predicted to derive from transport and industry (IPCC, 2022). Due to the complex nature of mobility, a holistic shift across society is required to transform the sector. A transition towards a decarbonized transportation system involves reducing travel and shifting to low-carbon modes of travel, such as walking, biking, and public transport.

Transition management (TM) offers an approach to governing these types of systemic shifts and can contribute to the acceleration of transitions. However, there is still a limited understanding of how sustainability transitions within transportation can be achieved, and further insight is needed to help cities tackle decarbonization within the sector.

This thesis focuses on the city of Malmö, Sweden, which is one of the EU Commission's Mission Cities, with goals to achieve climate neutrality by 2030. While emissions from transport in Malmö are decreasing, the current rate of reduction falls short of the necessary pace required to meet national and local environmental targets. Therefore, the aim of this thesis is to explore transformations toward a decarbonized transportation system in the City of Malmö, using the TM approach. The focus is on understanding how the city works with visions, experimentation, and collaboration, as these three aspects are understood as critical within TM for enabling transformative change (D. Loorbach, 2010). As transportation cannot be isolated to the boundaries of a city, the municipality's collaboration with regional actors is also considered to explore greater solutions. To guide the study, the following research questions (RQs) have been formulated:

RQ1: How does the City of Malmö work with visions and goals for reduced emissions from transportation?

RQ2: How does the City of Malmö work with experimentation, innovation, and scaling up for reducing emissions from transportation?

RQ3: How does the City of Malmö work with internal collaboration for reducing emissions from transportation?

RQ4: How does the City of Malmö collaborate with regional actors for reducing emissions from transportation?

Based on the findings of the above RQs, this thesis will assess how the City of Malmö works with transformative change, in relation to decarbonizing transportation. The discussion will highlight strengths and weaknesses in the municipality's work, and the thesis concludes with providing recommendations to guide their work further.

Research design and methodology

This study has a qualitative approach, and an evaluative, single-case study research design was employed. The City of Malmö served as the case, and data collection was conducted through interviews, document analysis, and workshop participation. Semi-structured interviews

constituted the primary method for data collection. In total, ten interviews were conducted. Eight interviews were held with respondents within the City of Malmö, representing the Streets and Property Department (FGK), the City Planning Office (SBK), the Environmental Department (EF), and the City Office (SK). Two interviews were also conducted with regional actors, representing Region Skåne (RS) and the regional public transport company Skånetrafiken (ST). Additional data was collected through document analysis and workshop participation.

To analyze the data, a qualitative content analysis was performed. Based on the TM approach and the key concepts of visions, experimentation, and collaboration, a theoretical framework of critical elements was developed. This framework was used to deductively code the data and assess the transformative capacity in the City of Malmö.

Main findings

Concerning RQ1 and visions of a decarbonized transportation system, the City of Malmö has ambitious climate targets and visions of becoming a green, dense city with walking, biking, and public transport as the dominant modes of transportation. However, there is a strong emphasis on quantitative goals within the municipality, and numerical targets may not be sufficiently inspiring to mobilize actors and facilitate transformative change. While a shared understanding of the problem at hand and a clear direction of movement exists within the City of Malmö, departments tend to focus on different objectives. Thus, while goals are shared, there may be competing priorities in practice. Furthermore, while it is clear where the city wants to be in the future, long-term goals are rarely broken down into interim objectives, and it is not necessarily evident what a transition means in the short-term.

Regarding experimentation and RQ2, the City of Malmö is active and is involved in many projects. The municipality is eager to act as a testbed and foster innovative solutions, which can further a transition towards reduced emissions from transportation. Throughout the city, many actors are engaged and cooperate with the municipality through various initiatives and trials. While a wide range of experiments exists across a variety of domains, most experimentation conducted within the city may not be as radical as it could be, and respondents highlighted how bolder action may be needed. Additionally, scaling up is often difficult, even if positive examples exist.

For RQ3 concerning internal collaboration in Malmö, many actors are involved in processes related to decarbonizing transportation, and further work is currently under development. However, the topic of transportation is predominantly handled by FGK, and there are still tendencies for people to work in silos. Additionally, there is a need for capacity building in terms of having people with the ability to approach complex, interdisciplinary problems who, likewise, are skilled at working collaboratively and bridging dialogues between different types of actors.

Finally, in relation to RQ4 and collaboration with regional actors, Skånetrafiken and Region Skåne's visions largely align with the City of Malmö, even if they may have different priorities and scopes. Region Skåne is involved in a lot of strategic work in the region, whereas Skånetrafiken and the City of Malmö collaborate more on concrete actions related to public transportation. Region Skåne, specifically, dedicates a lot of effort to developing networks and platforms for knowledge-building and sharing. Collaboration within other domains, however, appears to be less developed.

Recommendations and concluding remarks

Based on the findings of this thesis, a set of seven recommendations were developed to guide the City of Malmö further in its efforts to decarbonize the transportation system. The recommendations can be summarized as follows: (1) The City of Malmö should establish a

formal transition arena with frontrunners from different domains; (2) Individuals with strong collaborative skills and the ability to approach complex, interdisciplinary problems are needed; (3) The municipality should adopt a captivating and inspiring vision which can be communicated externally to mobilize actors, such as the "15-minute city"; (4) The City of Malmö should use a broader variety of tools when envisioning the future, such as images, narratives, and storytelling, and focus more on the process of change, not just final results; (5) More radical experimentation should be encouraged; (6) Methods and strategies to scale up successful experiments and accelerate innovation should be developed; and (7) Expand collaboration with regional entities and leverage their resources and capacities to complement the work within the City of Malmö.

This thesis took an evaluative approach and aimed to contribute knowledge and insight on how the City of Malmö can accelerate its work with decarbonizing transportation. While the results are primarily relevant to the City of Malmö, the conclusions and recommendations may also provide useful insights on findings, or questions to explore, within other cities in similar contexts as well.

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Abbreviations

CP – Comprehensive plan

FGK – Property and Streets Department

GHG – Greenhouse gas

MF – Environmental Department

MLP – Multi-Level Perspective

RS – Region Skåne

SBK – City Planning Office

SK – City Office

SNM – Strategic Niche Management

ST – Skånetrafiken

SUMP – Sustainable Urban Mobility Plan

TM – Transition Management

1 Introduction

Cities play a critical role in combating climate change. Urban areas constitute a significant source of greenhouse gas (GHG) emissions, but they also offer opportunities for mitigating climate change (IPCC, 2022). Estimations indicate that more than 70% of global emissions derive from urban areas (Lwasa et al., 2022). However, cities are highlighted as prevalent actors in leading emission reductions as well, and cities may be at the center of net-zero pathways moving forward (C40 Cities & Arup, 2016; IPCC, 2022; Neij & Heiskanen, 2021).

Many cities have set ambitious targets to tackle climate change. These typically occur on a voluntary basis, and local and regional efforts may even be stronger than that of national and international governments (Smeds & Acuto, 2018). Through various climate networks, such as the C40 Climate Leadership Group, the Global Covenant of Mayors for Climate and Energy (GCoM), and the Swedish initiative Viable Cities, cities demonstrate that they are at the forefront of climate action, pledging to reduce their emissions, and collectively collaborating to tackle the global challenge facing them. The C40 network, for instance, consists of 96 member cities that make up 20% of the global economy and have the mission to halve emissions by 2030. The GCoM is the largest climate network of cities with over 11,500 members. Meanwhile, members of Viable Cities pledge climate neutrality by 2030, currently including 23 Swedish cities and representing 40% of the national population (C40 Cities, n.d.; Global Covenant of Mayors, n.d.; Viable Cities, n.d.).

Within cities, transportation stands for a significant portion of GHG emissions. Indeed, in terms of total quantity by sector, transportation is often only surpassed by emissions from stationary energy. Within transportation, road-based transport is the main culprit. For many cities, road-based transport alone can be responsible for one-third of the total emissions. The significance of road-based transport is especially prevalent within developed countries where it is often responsible for a higher proportion, compared to less developed regions (Wei et al., 2021). When looking at Sweden, these emission trends stand true as well. Transportation is responsible for approximately one-third of Swedish emissions, and of these, road transport is, again, of primary concern (Naturvårdsverket, n.d.).

Despite transportation being a major source of emissions, progress has been limited in terms of achieving reductions. Indeed, emissions may even be increasing in some cases (Banister, 2011; Lamb et al., 2022). Unlike many other sectors, where the growth of emissions—to some extent—has slowed down in recent years, the transportation sector has globally experienced a steady increase over the recent decade (2010–2019) (IPCC, 2022). Furthermore, when scenarios that limit global warming to 2°C or less are modeled, most remaining emissions are expected to derive from transport and industry (IPCC, 2022). Because of this, it is critical to address the impacts transportation has on climate change.

In Sweden, domestic transport—where road traffic dominates the emissions—was responsible for approximately 13.6 million tons CO_2 equivalents in the year 2022. While transport emissions successfully have been reduced by 34% since 2010, the national target is to reach a 70% reduction by 2030. Thus, emissions need to be reduced by roughly 1 million CO_2 equivalents each year to meet the goal (Naturvårdsverket, n.d.).

When considering emission reductions in relation to transportation, the urban environment offers many opportunities. Considering the high share of emissions associated with private car use, reducing travel by car can be impactful. In cities, distances may be short enough that active modes, such as walking and biking, are possible, and dense populations facilitate the expansion of public transport (Banister, 2011). The *avoid-shift-improve* framework is often applied to

understand how sustainable mobility can be achieved. In this hierarchical model, the first goal is to *avoid* trips altogether. *Shift* relates to choosing more sustainable modes of transport, such as biking, walking, and public transport, instead of cars. Lastly, *improve* largely pertains to increasing efficiency. This could be related to fuel, but also, for instance, increased capacity per vehicle (Bongardt et al., 2019). Overall, the key messages of transitions towards sustainable transportation systems highlight the need to reduce travel and ensure that the travel which does take place is done through low-carbon modes, along with maximum efficiency (Banister, 2011).

Cities can be central actors in facilitating the necessary transitions towards carbon neutrality in the transport sector. Through urban form, infrastructure, policy, and local culture and norms, cities shape transport behaviors, and patterns of mobility can vary greatly between different localities (Barr, 2018; Cass & Faulconbridge, 2016). Tackling mobility, however, is understood to be a highly complex challenge that is difficult to solve, often referred to as a "wicked" problem. Largely, this can be attributed to the social, cultural, and economic demands of high mobility, along with the correspondingly detrimental effects that high mobility has on the climate (Barr, 2018; Holden et al., 2020).

1.1 Transformations towards sustainable transportation

Problems characterized by complexity, persistence, and uncertainty, as in the case of transforming transport, often require the shift of an entire system from one stable state to another and demand a societal transition across multiple levels and dimensions of society (D. Loorbach, 2010). In this case, a transition towards a sustainable transportation system entails reducing travel overall, and, predominantly, shifting trips conducted by car to walking, biking, and public transport. Research on *sustainability transitions* forwards the need for radical change to socio-technical systems, and gradual improvements or technical solutions are most likely insufficient for bringing about the necessary levels of change (Köhler et al., 2019). In the case of transportation, this becomes clear as cars have become increasingly environmentally efficient through technological developments over the last years, but nevertheless, neither car traffic nor its corresponding problems have diminished. Consequently, the case for institutional and transformative change is made, warranting the need for a transition approach (D. A. Loorbach, 2022).

To understand how sustainability transitions can be achieved, the sub-field of *transition management* (TM) can be applied which offers an approach for governing systemic shifts and accelerating transitions (D. Loorbach, 2010). In the context of urban governance, TM argues for establishing a direction of movement, inspiring change, and encouraging action within a city (J. Wittmayer & Loorbach, 2016). The TM framework advances four different types of activities: strategic, tactical, operational, and reflexive. These four different types of activities can take place in any given order but should involve: (1) establishing a transition arena to collaboratively determine a problem definition and develop future visions; (2) turning visions into more concrete agendas and making the sustainability transition relevant within different organizations; (3) conducting experiments; and (4) continual evaluation and applying reflexivity (D. Loorbach, 2010). Collaboration permeates the entire process of TM and involves having a diverse set of actors who collectively work in the same direction, providing different resources to propel the transition forward.

1.2 Transition management and transportation

Sustainability transitions has been applied extensively to the topic of transportation. Indeed, when discussing the transition of sociotechnical systems, transportation and mobility are among the most common examples (see e.g. Grin et al., 2010; Köhler et al., 2019; Loorbach, 2010). The nature of the transportation system in many ways makes up the prime example of a socio-

technical system. While technological components make out the core of the system, it is also highly defined by social, cultural, and institutional aspects (Cass & Faulconbridge, 2016; Cohen, 2012).

TM has been considered in relation to transportation in various ways. Some central trends as to how transportation has been approached in the literature include (1) from a historical perspective, for example, demonstrating how cars became mainstreamed in society or transitions from sail to steam ships (see e.g. Grin et al., 2010; Loorbach et al., 2017; Meadowcroft, 2009); (2) from a technological perspective, predominantly how to replace cars with internal combustion engines with alternate fuels (see e.g. Farla et al., 2010; Huétink et al., 2010; Köhler et al., 2009); and (3) from various governance perspectives (Hopkins & Schwanen, 2018; Jhagroe & Loorbach, 2018; Upham et al., 2015; Vagnoni & Moradi, 2018). If search terms are expanded to not exclusively TM, but transitions overall, the literature on transitions and transportation becomes incredibly vast.

The justification of applying TM in relation to urban mobility is well established. From a decarbonization perspective, the current transportation system, dominated by cars, constitutes a systemic, persistent problem. Cars are subject to a technological lock-in, upheld by multiple domains of society, and while many efforts to reduce car traffic exist—and have experienced success—the hegemonic role the car has in society has not diminished. The conclusion for this can largely be attributed to the need for several changes to occur simultaneously—which also warrants the application of TM (Kemp et al., 2011). The case has also been made that a transition perspective is needed because policies aimed at solving the sustainability challenges of transportation have been largely limited to technological fixes or modal shifts, and that, instead, a greater societal and institutional perspective is needed. For instance, the fundamental demand to travel needs to be tackled as well (Köhler et al., 2009).

From a governance perspective, the application of TM to the topic of transportation has been primarily experienced in Dutch contexts. Kemp et al. (2011) outline three examples from the early 2000s of how TM has been utilized within mobility. In the first example, the Ministry of Transport in the Netherlands integrated TM language in policy documents. In the second case, a "Sustainable Mobility Platform" was established where actors were brought together to identify transition paths concerning sustainable mobility. Third, an innovation program for driving transitions towards sustainable mobility was established, and TM elements were utilized during workshops within the program.

A more prominent example of integrating TM into governance practices for mobility can be found in the case of Rotterdam (Jhagroe & Loorbach, 2018). Starting in 2015, Rotterdam followed a highly methodical TM approach to pursue sustainable mobility. A transition team interviewed visionaries and entrepreneurs within mobility in Rotterdam to establish a transition arena where, eventually, 15 people from different domains and with different capacities were brought together. Within the arena, the group examined the problems of the current mobility system and continued to define new visions of mobility in Rotterdam. These visions were then further translated into pathways and strategies for the city, and experiments were conducted. In the ensuing years, cars remained prominent in the transportation system, but it was nevertheless determined that a paradigm shift had taken place in Rotterdam and that a new, more inclusive, and sustainable narrative on mobility was emerging (Jhagroe & Loorbach, 2018). Later, after Covid-19, the city could take advantage of a window of opportunity to enact further changes. Enabled by the new mobility framing and policy changes that had been introduced preceding the pandemic, more radical experimentation followed (D. Loorbach et al., 2021).

1.3 Problem definition

It is increasingly understood that decarbonizing mobility constitutes a complex and persistent sustainability challenge, and, consequently, it must be addressed through changes across the entire transportation system. Thus, a radical sustainability transition is required that tackles not only the technological aspects of transportation, but also targets institutional, social, and cultural dimensions (D. A. Loorbach, 2022). The TM approach can be employed to help guide this shift.

The field of TM is growing steadily, and TM is studied in relation to transportation in various ways (see e.g. Kuss & Nicholas, 2022; D. Loorbach et al., 2021; Upham et al., 2015; Vagnoni & Moradi, 2018). Many case studies also exist on cities adopting TM approaches (see e.g. Roorda & Wittmayer, 2014), as well as literature on how cities can apply TM to their governance practices (Frantzeskaki et al., 2018). However, there is limited research within the intersection of these three areas—decarbonizing transportation, empirical urban case studies, and the application of TM in cities. Moreover, most TM case studies focus on the design and implementation of TM, with few evaluating the extent to which municipal practices align with the forwarded governance principles. Consequently, there is a scarcity of case studies that consider local governance in the context of decarbonizing transportation, and a substantial knowledge gap remains regarding achieving transitions within mobility.

1.4 Aim and research questions

The aim of this thesis is to explore transformations toward a decarbonized transportation system in the City of Malmö. With the transportation sector constituting 37% of end-use CO_2 emissions globally (IEA, n.d.), there is a critical urgency to increase understanding of how these emissions can be reduced. Many of these emissions derive from cities, but concurrently, cities have also demonstrated a strong willingness and ability to tackle climate change mitigation (Lwasa et al., 2022; Smeds & Acuto, 2018). Local efforts should also take regional perspectives into account, especially in relation to mobility, as infrastructure and transportation networks often extend across multiple jurisdictions (Hughes et al., n.d.). Regional action may also result in greater access to resources and could propel efforts to mitigate climate change even further (Salvia et al., 2021). However, despite the potential of harnessing cities and regions when tackling decarbonization, research is still limited on how urban areas can drive urban transitions and generate transformative change (Köhler et al., 2019).

This thesis focuses on the City of Malmö as a governing body in the region of Skåne, Sweden. As a city, Malmö is a leader in climate mitigation and is one of the EU Commission's Mission Cities with goals to achieve climate neutrality by 2030 (Malmö stad, 2023b). With ambitious targets, the city is already working with programs throughout the city to drive a climate transition (Malmö stad, n.d.-d). Transportation constitutes one of the largest portions of the city's territorial emissions, however, accounting for nearly 40% (Malmö stad, n.d.-b).

The transition management (TM) approach has been employed in this thesis to assess how the City of Malmö works with transformative change to accelerate decarbonization in the transportation sector. The TM approach emphasizes radical and systemic change and provides insight into how a complex socio-technical system—such as transportation—can transition to a new, more sustainable state. Three central concepts within the TM literature are visions, experimentation, and collaboration. These three concepts have guided the analysis of this thesis. Visions relate to establishing a shared understanding of which direction a transition is headed in. Experimentation pertains to the idea of testing innovative solutions. Collaboration, finally, should characterize all work processes and be continually prevalent throughout TM.

Interviews were conducted with respondents from the City of Malmö who work with transportation. This includes the Property and Streets Department (FGK), the City Planning Office (SBK), the Environmental Department (MF), and the overarching City Office (SK). To capture how the City of Malmö collaborates with regional actors and widen the scope of solutions, a respondent from Region Skåne (RS) and the public transport company Skånetrafiken (ST) were also interviewed. The interviews were further complemented with a document review of municipal and regional documents and workshop participation.

This thesis intends to contribute to both the broader body of knowledge on sustainability transitions within urban governance, focusing on transportation, as well as provide applicable knowledge and guidance to the city of Malmö.

RQ1: How does the City of Malmö work with visions and goals for reduced emissions from transportation?

RQ2: How does the City of Malmö work with experimentation, innovation, and scaling up for reducing emissions from transportation?

RQ3: How does the City of Malmö work with internal collaboration for reducing emissions from transportation?

RQ4: How does the City of Malmö collaborate with regional actors for reducing emissions from transportation?

Based on the findings of the above RQs, this thesis will evaluate how the City of Malmö works with transformative change, concerning decarbonizing transportation. The discussion will highlight strengths and weaknesses within the municipality's work and conclude with recommendations to guide the work further.

1.5 Scope and delimitations

This thesis examines the decarbonization of transportation in Malmö, using the TM approach. There is a focus on urban governance and studying the City of Malmö as a facilitator of transformative change. As transportation extends beyond municipal limits, a regional perspective is incorporated as well. Regional actors are, however, only included within this study to the extent to which they interact and collaborate with the municipality.

Within the City of Malmö, the scope has been restricted to the departments which primarily work with the topic of transportation. This includes the Property and Streets Departments (FGK), the City Planning Office (SBK), the Environmental Department (MF), and the City Office (SK). From a regional perspective, Region Skåne (RS) and the public transport company Skånetrafiken (ST) have been included. Notably, political actors in Malmö—including the political committee which exists in connection to each municipal and regional department— were excluded from this study. In total, ten interviews were conducted: eight interviews with respondents from the municipality, and one interview each from the two regional actors.

The research questions further delimit the scope of the study to certain aspects of the TM approach: visions, experimentation, and collaboration. As only a limited number of respondents were included in the study, this also narrows the results accordingly. However, due to time restrictions, these were intentional limitations to deliver an in-depth analysis of the studied concepts and actors.

1.6 Ethical Considerations

This research has been conducted as an independent thesis at the International Institute for Industrial Environmental Economics in Lund as part of the master's program in Environmental Management and Policy. The research has not received any funding and no external organization has influenced the nature of the research or the conclusions.

The research design has been reviewed against the criteria for research requiring an ethics board review at Lund University and has been found to not require a statement from the ethics committee. To elaborate, no personal data is employed in the research and there are no harmful implications expected upon participants. The thesis does entail the participation of respondents, and this may be the main ethical consideration at hand during this research project. Before interviews, respondents were informed of the purpose of the study, how the research would be conducted, and their role within the research project. Consent was obtained from each participant before each interview took place, along with information on how the data would be recorded and stored. While the participants' departments were disclosed, their names were kept anonymous, and information that could clearly disclose a person's identity was excluded from the findings.

All data that has been collected or generated through this research is stored on a password-protected computer, as well as on password-protected cloud storage.

1.7 Audience

This study aims to provide knowledge on how municipalities can contribute to sustainable transitions within the transportation sector. Considering this, the thesis specifically targets local authorities and may provide insights into how a decarbonized transportation system can be facilitated locally. Furthermore, the ambition is that the research conducted during this thesis can contribute to the greater scientific community and knowledge base on sustainability transitions and TM.

1.8 Disposition

This thesis has the following disposition:

Chapter 1 introduced the research problem and provided the necessary background and context for this thesis. It identified the problem definition, aim and research questions, and discussed the scope and limitations, ethical considerations, and audience.

Chapter 2 presents the theoretical framework and introduces the current literature on sustainability transitions and transition management, elaborating on visions, experimentation, and collaboration. The chapter concludes with a developed framework highlighting critical elements of TM.

Chapter 3 outlines the research design for this thesis and presents the methodology for data collection and data analysis.

Chapter 4 presents the findings of this study. First it introduces the context of Malmö. Next, it discusses the findings in relation to each research question, utilizing the theoretical framework.

Chapter 5 discusses the findings in connection to existing literature, highlighting strengths and weaknesses in relation to each TM aspect. It concludes with a synthesized reflection on the alignment between different TM aspects, as well as discusses the results and implications of methodological choices.

Chapter 6 presents the conclusions of this thesis, following with practical recommendations and suggestions for future research.

2 Theoretical Framework

2.1 Sustainability transitions

Persistent and systemic problems characterized by uncertainty and complexity—such as those related to climate change and sustainability—lack clear solutions. These types of "wicked" problems are often holistic and embedded within multiple levels of society, and it is increasingly understood that they need to be addressed through long-term and large-scale solutions across society. This type of systemic change that is needed can be referred to as a sustainability transition, and it is described as a nonlinear and disruptive shift from one stable state to a new, more sustainable, equilibrium (D. Loorbach, 2010; D. Loorbach et al., 2017).

The foundations of transition research are largely based on understanding socio-technical transitions. Socio-technical systems have a technological feature at the core, but there is recognition of the interplay that exists between technology and society. Thus, the importance of power dynamics, historical events, and cultural and societal factors cannot be overlooked in any attempt to shift a technological system (D. Loorbach, 2010; D. Loorbach et al., 2017). The cultural and social underpinnings of technology can, for example, help illustrate how path dependencies and technological lock-ins occur, as well as why innovations seldom prompt systemic transitions across society (D. Loorbach, 2010; Meadowcroft, 2009).

A common approach to conceptualizing transitions is by application of the Multi-Level Perspective (MLP) (Geels, 2011, 2012; Whitmarsh, 2012). In this model, three levels of society are identified: niches, the socio-technical regime, and the exogenous socio-technical landscape. Niches are peripheral spaces where innovation occurs. The socio-technical regime is the current, dominant, and stable configuration of society. This can be understood as the status quo, and it is this presiding order which a transition attempts to overturn. Finally, the socio-technical landscape is the external environment surrounding the regime—the greater societal context and macro-trends (Köhler et al., 2019; D. Loorbach, 2010; D. Loorbach et al., 2017).

The MLP captures the dynamics and interactions between these three levels, demonstrating how social processes influence innovation and their dissemination. For example, landscape pressures may cause disruptions within the existing regime, creating windows of opportunity for new innovations to arise and stabilize (D. Loorbach et al., 2017). An example could be how climate change, as a landscape pressure, destabilizes the current regime of the fossil fuel energy sector, which allows emerging technologies such as solar power to take off (Avelino, 2017). When studying sustainability transitions, all levels are necessary to consider, but the research tends to concentrate on "meso"-level processes. This means that the focus is not on individual action, nor on understanding large-scale processes, such as tackling the roots of capitalism (Köhler et al., 2019).

Sustainability transitions can be characterized by several aspects; Köhler et al. (2019) outlines seven of these. Firstly, they are multi-dimensional, and transitions consist of many different processes and elements developing interdependently. Secondly, they involve a wide variety of actors. Thirdly, there is a focus on stability and change, and the interplay between radical shifts and path dependence is central. Fourth, time scales are long, and transitions cover the emergence of innovations from small-scale niches up to societal stability. Fifth, transitions are marked by uncertainty and multiple futures are possible. Sixth, there is a value-laden and contested nature to sustainability transitions as there is no consensus on what the ideal future pathway is, or what sustainability entails. Seventh, and finally, there is a need for public policy to guide the normative direction of transitions, due to the limited incentives for private actors to pursue sustainability goals.

2.2 Transition Management

While the literature on sustainability and socio-technical transitions helps explain what a technological transition in society may look like, it provides limited knowledge on how transitions can be achieved. That is, how can niche innovations take off and establish a new socio-technical regime. The field of transition management (TM), however, offers a theoretical approach for guiding this shift. TM has its roots in governance and systems theory and can be utilized to bridge the gap between short-term actions and the pursuit of long-term sustainability transitions (D. Loorbach, 2010).

The need for TM is based on the understanding that traditional governance practices are not sufficient when it comes to sustainability challenges. This is due to the complex nature of these problems. Simply, if the issue at hand stems from a system of complex interactions without clear causality, this consequently implies that a straightforward solution does not exist either. Hence, this necessitates a different approach to governance (Kemp et al., 2007; D. Loorbach, 2010).

Transition management can be characterized by a few different aspects. There is a distinctive interaction between long-term and short-term thinking, where long-term outlooks (of at least 25 years) are used to form policies on shorter timescales. TM covers complex dynamics and entails multiple realms of society, multiple actors, and across multiple levels. There is an emphasis on practical application and learning-by-doing, as well as doing-by-learning. The future remains uncertain, and TM is distinguished by flexibility and adaptability in relation to future objectives. Ultimately, there is also the underlying aim to prompt development and innovation of the system (Rotmans et al., 2001).

The various governing processes of TM have been conceptualized in what is known as the TM Cycle, and it consists of four different types of activities: strategic, tactical, operational, and reflexive (see Figure 1). The first sphere, strategic, relates to organizing a network of frontrunners who collectively develop an understanding of the problem at hand and a future vision. This process is known as establishing a transition arena—creating a space for frontrunners that is conducive to innovation where actors jointly can address a problem. The aim is to establish the direction a transition is headed in and develop the overarching vision and culture of the transition. These strategic activities must be approached on long timeframes—30 years—and a basic understanding of what type of sustainable development is pursued needs to be defined, along with the corresponding norms and values (Grin et al., 2010; D. Loorbach, 2010).

The strategic sphere of TM can be compared against the otherwise short timeframes of political cycles and the associated tendencies to focus on short-term concerns influenced by public pressure, immediate interests, and personal agendas. Developing a transition arena can thus be important for establishing longstanding visions of the future with common goals (D. Loorbach, 2010).

The second type of activities found in the TM cycle are tactical, and these relate to what is called building a transition agenda. That is, concretizing visions into tangible images and objectives. Visions are turned into viable, short-term actions within subsystems. The overarching ideas are anchored within existing networks, organizations, and institutions. Attention is paid to structural conditions and identifying regime barriers that hinder the transition. This could, for example, include economic or regulatory factors, as well as behaviors, and infrastructure, among others (D. Loorbach, 2010).

To exemplify the strategic and tactical spheres, a case on Dutch waste management can be utilized. In this example, the strategic activities of the transition were largely related to establishing awareness and the need for proper waste management. Spurred by environmental concerns, for instance about toxic waste, frameworks such as the "waste hierarchy" contributed to a shift in the perception of how waste should be handled. Once the understanding and urgency of waste management were established, tactical activities followed, which involved changing the market structure, developing a new council for organizing waste management, new regulations, and so forth (Kemp et al., 2007).

The third sphere of the TM cycle relates to operational activities—mobilizing actors and turning visions into actions and experiments. Experiments, in this sense, are understood broadly and can be of a societal, technological, institutional, or behavioral nature (D. Loorbach, 2010). This sphere is central to the TM features of learning-by-doing and doing-by-learning (Grin et al., 2010). Transition experiments can help deepen understanding of the sustainability transition and generate knowledge, and successful experiments can—and should—be repeated and scaled up (Grin et al., 2010; D. Loorbach, 2010).

Finally, the fourth sphere concerns reflexive activities, such as evaluation and assessment. Reflexive activities should be integrated within the three other spheres of governance and these processes are highlighted as crucial for gaining insights and knowledge for further transferability (D. Loorbach, 2010).

TM can be understood as an ongoing cycle, consisting of the four spheres outlined above. Importantly though, these should not be viewed as a sequential set of activities. Rather, the TM cycle captures processes that are essential for a transition to occur and pinpoints links between the different activities. Regardless of order, the TM cycle can be summarized in the following steps: (1) A small network of actors makes up a transition arena that defines the problem and envisions a long-term sustainability transition across an entire system; (2) these visions are broken down into more concrete agendas and short-term images of the future within subsystems; (3) visions are adapted into projects and experiments that promote and trial the sustainability transition; (4) reflexivity is continually applied, ensuring evaluation, monitoring, and learning (D. Loorbach, 2010).

Due to the intricate nature of the TM framework, which aims to govern complex societal transitions, it is difficult to outline singular activities which are critical for its success. As the TM framework outlines a multiphase and multilevel process, particular actions alone are unlikely to have significant outcomes. Nevertheless, certain activities can still be recognized as important success factors. These include developing visions, experimenting, and collaborating among actors from different domains. These aspects should not be viewed as an exhaustive list of vital parameters but should, nevertheless, be advanced and carefully considered when attempting to govern a societal transition. These different aspects will be expanded on further in the subsequent sections.
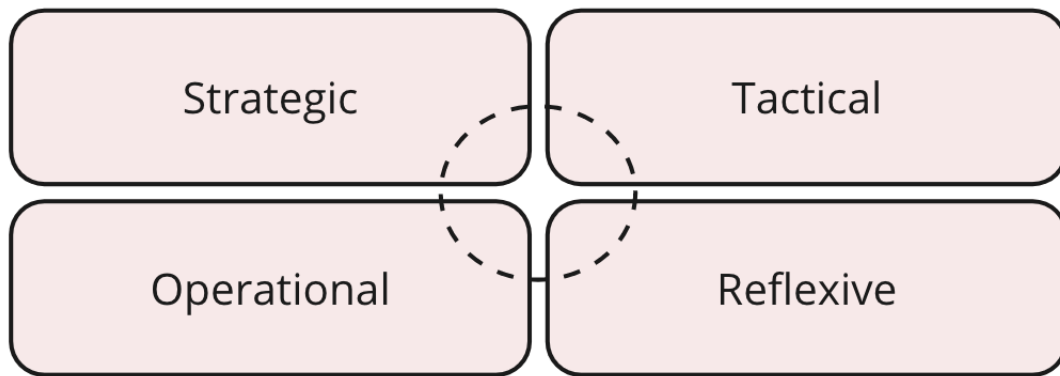
Figure 1. The Transition Management Cycle

Source: Own presentation, based on Loorbach (2010)

2.2.1 Visions

Establishing visions is an integral part of TM. While the process of visioning can be laborious, it is necessary for aligning actors against the same vision and reaching a critical mass working towards the same aim (D. Loorbach, 2010). Thus, it is crucial to have a shared view of the system, and the roots of the problem, and establish characteristics of the desired change for actors to work jointly in a common direction (D. Loorbach et al., 2015). Furthermore, having a clear, attractive vision can also be key for mobilizing actors and getting people on board and inspired in the first place. While visions should be enticing it is, however, also important that they are within the realm of feasibility (Grin et al., 2010; Rotmans et al., 2001). Rotmans et al. (2001) highlight, for example, "putting a man on the moon" and "underground transportation" as successful examples of desirable visions (p. 23).

The concept "transition arena" is commonly used in the context of envisioning to describe how frontrunners are brought together to build partnerships with each other and develop imaginations of the future. This network of actors can then collectively build a joint problem formulation and settle on a shared vision together. Organizing the transition arena is one of the key strategic steps of TM, as it joins actors behind a shared understanding of the need for a transition (D. Loorbach, 2010; D. Loorbach et al., 2015). Indeed, the process of developing visions and aligning actors and interests is equally important as the products of the process itself. The output of a transition arena should not merely be a goal, but rather, a goal coupled with an understanding of how transformations towards that future can be accomplished (D. Loorbach, 2010; Nevens et al., 2013). The transition arena should be able to provide the fundamental discourse surrounding the transition and what problem it aims to solve, some kind of definition for what a sustainable future would entail, and a base understanding from which further transition images can be developed (D. Loorbach et al., 2015).

Visions act as a starting point, and more concrete images and transition pathways can be derived from these (D. Loorbach, 2010; D. Loorbach et al., 2015). These concepts can be understood as a hierarchy with increased detail. A vision consists of many different transition images, and from these, a more concretized pathway can be identified (Grin et al., 2010). Literature on transition visions often highlights the role of developing narratives and using them to evoke powerful imagery. A goal is not sufficient on its own but must be coupled with the understanding of the corresponding transition which enables the goal (Nevens et al., 2013). Storytelling, likewise, can also be a helpful tool for approaching complex problems, being imaginative, and aligning perspectives (Mourik et al., 2021).

Short-term policy objectives can be established from visions, and existing policies can be assessed against this imagined future as well (Rotmans et al., 2001). The relationship between the long-term vision and intermediate objectives set up on shorter timescales is key, and TM literature often stresses the importance of both fore- and backcasting between these. Interim goals can become more and more specified—perhaps quantified—the nearer they become, but transition visions and objectives should not be purely quantifiable as this cannot grasp the full complexities of the multilevel and multiphase processes TM aims to govern (D. Loorbach, 2010; Rotmans et al., 2001).

As alluded to above, the process of visioning is highly iterative, and visions both can and should be adjusted in line with new learnings (Rotmans et al., 2001). Considering the TM cycle, visions can take on different roles in the different spheres of governance, indicating how visions are not fixed but continually evolving. Visions play a strategic role during initial problem structuring and while developing the transition arena. In the tactical sphere, they are translated into more concrete images and objectives as they are incorporated into a transition agenda and applied to existing structures and networks. But, importantly, reflexivity is also present and visions are modified as experiments are carried out and lessons are learned (D. Loorbach, 2010; Rotmans et al., 2001).

The nature which a vision must take is somewhat contested. The argument has both been put forward that visions must contradict the existing regime and its actors, clearly aiming to overturn existing power structures (D. Loorbach, 2010). This could, conceivably, even function as the definition of what a transition is. However, a slightly contrary stance has also been submitted, contending that it can be enough for a transition to aim for improvement of the existing system, and it may be that divergence from current policy aims only is realized eventually—even if the ultimate output is a shift in status quo (Rotmans et al., 2001). Meadowcroft (2009) balances this pursuit between "system innovation" and "system improvement" by arguing that both are needed. The case for "system improvement" is largely dependent on the reasoning that if improvement is enough, this is easier and faster to achieve, it reduces the risk of resistance from the presiding regime, and innovations can develop simultaneously in the background until they are ready for takeoff.

In terms of the nature of the vision, it is important that they are not purely technological, but also contain a social aspect. As transitions relate to systems change, they must go beyond the technological domain and consider social, cultural, institutional, and environmental factors as well (D. Loorbach, 2010; Rotmans et al., 2001).

2.2.2 Experimentation

One of the leading ideas of TM relates to "learning by doing" and conducting experiments (Köhler et al., 2019; D. Loorbach, 2010; Rotmans et al., 2001). Within TM, experimentation is a broad concept and can refer to a wide range of innovative practices, be it technological, social, institutional, or behavioral. Transition experiments are bold, high-risk ventures and should, thus, be able to produce novel insights (D. Loorbach, 2010). Not only can experiments complement theoretical knowledge with practical insights, but it is also forwarded that the implemented actions can be central for gradually restructuring society (Bulkeley, 2021; D. Loorbach, 2010).

A central reason why experimentation is advanced within TM relates to the complex and nonlinear nature of sustainability transitions. Due to the intricate and indirect relationships within sociotechnical systems, experiments may simply be necessary to reveal insights on how a transition may, or may not, occur and the intel provided can not necessarily be predicted beforehand (D. Loorbach et al., 2017). Hence, a crucial aspect of experimentation—and TM overall—are processes of reflexivity and learning (Grin et al., 2010; D. Loorbach, 2010). It is

known, however, that learning from experiments is often rare or, at least, inadequate in terms of catalyzing further change throughout the system (Bulkeley, 2021).

While experiments are concrete projects with short timeframes, approximately 0 to 5 years, they should derive from a long-term, overarching vision (Grin et al., 2010; D. Loorbach, 2010). Without a broader, social dimension, experiments tend to become technology-focused and may only target incremental improvements. The greater sociotechnical context and social vision are important for enabling deep, institutional learning that can question current assumptions and existing frameworks (Grin et al., 2010). It is also valuable that experiments go beyond the sociotechnical sphere as well and that innovation occurs within different domains as, again, a systemic shift is being pursued (D. Loorbach et al., 2017; Smeds & Acuto, 2018). Having a greater vision can thus be helpful to tie experiments to a greater narrative. Similarly, it can be equally unhelpful to have visions without complementary experiments. Too often, future imaginations exist without any subsequent action (Grin et al., 2010).

Ideally, a diverse set of measurable and significant experiments that complement and strengthen each other is established, constituting a bricolage of experiments that all fit within the same vision and transition pathway (Grin et al., 2010). Rotmans et al. (2001) even suggest a possible set of criteria for assessing if an experiment is conducive to generating a sustainability transition or not—highlighting how experimentation and goal setting are iterative processes that should be evaluated regularly. The authors suggested the following criteria:

- Do the actions and experiments taken provide insight into the coherence between nature and the environment, and between the socio-cultural, economic and institutional dimensions of a transition?
- Are the possibilities for innovation and transition paths explored through the action and experiments taken?
- Do the actions and experiments taken contain the potential for learning?
- Do the other actors adopt the transition objective as their own action perspective? (p. 30).

The proposed criteria by Rotmans et al. (2001) capture many of the elements already discussed above, as well as incorporate how other actors should take on action perspectives too. The transition arena should be a stimulating environment where frontrunners are empowered to contribute with the resources they have to propel the transition forward. The transition arena, as such, should generate action perspectives among the involved actors (Grin et al., 2010; D. Loorbach, 2010).

Once an experiment has proven to be successful, efforts to scale it ensue. A distinction can be made between scaling out—broadening—that is, testing and repeating experiments in new environments, as well as scaling up innovations to higher levels of governance (D. Loorbach, 2010; Smeds & Acuto, 2018). Scaling can, however, be costly in terms of both time and money, and much literature speaks to the difficulty of accelerating and scaling up experiments (Bulkeley, 2021; Köhler et al., 2019; Smeds & Acuto, 2018). On the one hand, trials with favorable outcomes are often scaled out and repeated in different environments. City networks have, for instance, been helpful in this dissemination and in encouraging shared learning between cities (Smeds & Acuto, 2018). Nevertheless, progress is often limited in terms of scaling up. Smeds & Acuto (2018) highlight, for example, how Sweden has experienced success in terms of sustainable urban developments, such as Hammarby Sjöstad in Stockholm. While good practices from these experiences have been repeated in other contexts and neighborhoods, it remains the case that many unsustainable urban practices continue to exist as well. The overarching regime has not been influenced, and national urban development has not been

significantly altered due to the successful local examples. Thus, scaling up local experiments to meaningful levels proves to be challenging and deserves attention.

Nonetheless, urban areas have been recognized as suitable sites for conducting experiments (Bulkeley, 2021; Köhler et al., 2019; Smeds & Acuto, 2018). While TM originally was primarily applied to functional systems (energy, for example) it is increasingly being considered within geographic systems as well, such as cities, and the urban perspective is becoming progressively relevant (Smeds & Acuto, 2018; J. M. Wittmayer et al., 2016). As urbanization increases, cities' significance as actors follows accordingly (Köhler et al., 2019). Practically, it may also be easier to gain political acceptance for more extreme interventions on smaller scales. Rotmans et al. (2001) exemplify, for instance, how local governments can experiment with car-free areas in city centers, something which might not be feasible on greater scales. Thus, much potential exists in urban experimentation, the key just lies in ensuring that taken actions have the potential to contribute to sustainability transitions.

2.2.3 Collaboration

Within TM, it is understood that transitions are multi-actor and multi-level processes. A crucial part of the framework thus concerns bringing in actors from different domains and developing networks of joint action (Köhler et al., 2019; D. Loorbach, 2010). Consequently, collaboration is at the heart of TM, and it is understood that stakeholders need to work together toward shared visions to overcome persistent problems. These networks do not necessarily have to be explicit, and informal networks are encouraged as well as formal. What is established, however, is that singular actors cannot alone build a transition, but through processes of co-evolution, clusters of actors and activities can collectively generate a societal transition (D. Loorbach, 2010; D. Loorbach et al., 2015).

Concepts such as "coalitions", "networks", "partnerships", and so forth, are applied extensively throughout the literature, and one of the main purposes of the TM framework is to bring actors together to work towards a common goal. The aim is, essentially, to create a safe space for frontrunners to interact in—this is done through the formation of a transition arena (Grin et al., 2010). Often, a small group of people can initially develop a transition team, and these people can identify relevant actors to involve in a transition arena (Jhagroe & Loorbach, 2018; D. Loorbach et al., 2015). The arena should then consist of a diverse cluster of approximately 15 visionary frontrunners from various domains and types of organizations, and together, these actors build a "societal network of innovation" (Loorbach, 2010, p. 174). The output from the transition arena should include shared visions, common goals, and strategies (Grin et al., 2010; D. Loorbach, 2010). In other words, a collaborative partnership driven by a common understanding of sustainability is formed.

It is important that the people in the transition arena also obtain the abilities and competencies to drive a transition. This pertains to being able to think about complex problems, having an interdisciplinary approach, being skilled at communicating visions and disseminating ideas throughout networks, being open to new ideas, and welcoming collective thinking (D. Loorbach, 2010).

A tension that can be considered in choosing people for a transition arena, however, is the relationship between niche and regime players. On the one hand, it is understood that both actors are critical, and both should be represented in the transition arena. On the other hand, resistance is often experienced within the regime, which may inhibit the progression of a transition (Bulkeley, 2021; Grin et al., 2010; D. Loorbach et al., 2015). Furthermore, niche actors should have a safe operating space—separate from the incumbent regime—to develop and foster novel and innovative structures. However, the transition arena cannot be fully isolated

from the regime that it is trying to influence. The recommendation, therefore, is to take advantage of regime actors who are favorably inclined towards change in general, as well as the specific transition vision (Grin et al., 2010). The general observation is that in the early stages of a transition, regime actors tend to take on a more restraining role. Whereas with time, the regime increasingly functions as an enabler, for instance by leveraging capital and organizational capacities (Rotmans et al., 2001). Frontrunners must be empowered, and this could entail the provision of financial resources, knowledge, skills, legislation, etc. It is thus important that actors collaborate and self-organize, and social networks are needed specifically to leverage resources and enable the takeoff of a technological niche (Grin et al., 2010; D. Loorbach et al., 2015).

2.3 Theoretical framework based on transition management

Based on the TM approach and the concepts of visions, experimentation, and collaboration, a theoretical framework has been formed for the assessment of transformative capacity in the City of Malmö, focusing on transportation. By reviewing the literature on these three central concepts within TM, a set of key elements is identified for each category. The full list is shared in Table 1. This list should not be understood as an exhaustive list of criteria which is necessary to achieve sustainability transitions, but as a set of elements that are conducive to sustainability transitions in relation to these three concepts.

In this thesis, the concepts of visions, experimentation, and collaboration are used to capture a broader set of ideas and processes for transformative change. This section aims to describe how the use of these words should be understood in this thesis.

The word "vision" is used in this thesis to describe a future direction. Therefore, when discussing visions, this may also refer to terms and processes related to goals, strategies, narratives, storytelling, and similar practices of imagining a future or working towards a certain aim or objective.

The word "experimentation" is used in a broad sense in this thesis to describe actions of experimentation, testing, and trialing. Specifically, it implies innovative practices and attempts to foster new ideas and generate novel insights. Furthermore, scaling up is often considered tangentially to experimentation, which relates to accelerating actions and propelling experiments further through escalation to higher levels of governance.

Finally, "collaboration" is used in this thesis and refers to collective, cooperative, or aligned action. Collaboration is used loosely to describe any kind of cooperative relations between actors. This includes actions that bring actors together, processes related to networks, shared understandings, common goals, and so forth. Collaboration can be both implicit and explicit and merely describes actors working jointly in some manner.

The theoretical framework used in this thesis is found in the table below, which highlight elements within TM that are conducive to sustainability transitions.

Table 1. Theoretical framework on critical elements of TM — Visions, experimentation, and collaboration

Visions
There is a clear and inspiring vision
An organized network of actors supports a shared vision
Connections exist between long-term visions and short-term objectives, and visions are continually modified
The vision aims to improve or overturn the current regime
The vision contains a social dimension
Experimentation
Actions and experiments are radical and closely tied to a vision
Actions and experiments are multidimensional
Actions and experiments enable further innovation and transition paths
Actors are empowered to take on action perspectives
There is a portfolio of experiments which reinforce each other
Actions and experiments contain potential for learning
Successful experiments are scaled out and scaled up
Collaboration
A transition arena is established with a network of visionaries from different domains
Common understandings of sustainability are established among actors
Actors collaborate to provide resources which can accelerate the transition

Source: Own presentation

3 Methodology

3.1 Research design

This thesis aims to understand how emissions from transportation can be reduced in the City of Malmö, and this result-oriented objective has a strong basis within the pragmatic worldview. Understanding the philosophical worldview underlying research helps explain the paradigm within which the research has been conducted in—essentially, the fundamental beliefs which have directed the research. In the pragmatic worldview, there is a focus on real life application and how to contribute to the solution of a problem. The pragmatic worldview is further characterized by the recognition that research occurs within social, historical, and political contexts, and researchers within this worldview typically utilize theoretical frameworks which capture these (Creswell & Creswell, 2018). There is an inherent political nature to this thesis as it assumes a need for a societal transition within transportation, and the application of the transition management framework further reflects these attributes of the pragmatic worldview.

This thesis explores how the City of Malmö can support transformative change to mitigate climate change, focusing on transportation. For this study, an evaluative, single-case study approach has been selected. A case study researches a phenomenon within a real context, and an evaluative case study, specifically, aims to assess this phenomenon (Yin, 2014). The choice of a case-study allows for in-depth knowledge and a comprehensive and thorough analysis (Bryman, 2012). While criticisms against case studies highlight the lack of general and theoretical knowledge, the study of specific cases allows for a high level of detail, nuance, and practical applicability which otherwise would not be possible. While the findings inevitably are situated and context-dependent, this is also typically the case for studies within social science (Flyvbjerg, 2006).

Case studies are a particularly useful method for evaluation when considering highly complex and contextually dependent matters. An example of a suitable application of such a complex case includes evaluating an initiative or process and tackling "how" or "why" questions. As expressed by Yin (2014):

> Such a case study evaluation may be the entirety of an evaluation when the tracking of outcomes is premature. In such a circumstance, the case study evaluation can play a *formative* role, with the findings from the evaluation helping to redefine or redirect the initiative. (p. 223)

In this thesis, the process of aiming to decarbonize transportation within the City of Malmö can be understood as the initiative under evaluation, and this thesis aims to contribute with knowledge and insight on how this process can be improved. While the findings primarily will be relevant to Malmö, this case study may also provide insights which can be relevant to other cities as well.

Evaluative case studies can incorporate both qualitative and quantitative data. In this thesis, a qualitative approach has been selected. As the goal is to gain a deeper understanding of the intricate governance processes related to transportation, the qualitative research design offers greater nuance than its quantitative counterpart. Secondly, qualitative research offers considerable flexibility and adaptability within the process (Bryman, 2012; Creswell & Creswell, 2018). Additionally, case study evaluations can be both descriptive and explanatory. In this case, the study is descriptive, as the intention is to describe the case of decarbonizing transportation in the context of Malmö.

Yin (2014) forwards how it can be advantageous to initiate case study research with a theory in mind. In this thesis, a theoretical framework has been adapted from literature on TM, see section 2.3. How this theoretical framework is applied to analyze the data is expanded on in section 3.3.

3.2 Methods for data collection

3.2.1 Interviews

Interviews are commonly used in case study research (Yin, 2014) and semi-structured interviews make up the primary method of data collection for this study. An interview guide was established in preparation of the interviews (see Appendix I – Interview guide). Having an established structure can ensure that similar questions are asked to different interviewees and facilitate interpretation of data after the interview. As the interview is *semi*-structured, however, there is still flexibility to depart from the guide, ask follow-up questions, and shift the conversation depending on the interview. The guide serves as a tool to help obtain detailed and nuanced perspectives from the different respondents (Bryman, 2012). As explained in the following section, the data was analyzed using a deductive coding approach. Themes were determined in advance based on pre-existing theory, and this helped guide the interview questions (Terry et al., 2017).

In the City of Malmö, there are four primary departments which engage with transportation: the Property and Streets Department (FGK), the City Planning Office (SBK), the Environmental Department (EF), and the City Office (SK). These divisions within the municipality interact with transportation from different perspectives, and interview were conducted with respondents from the different departments. As many transport issues occur on a regional level, a respondent from Region Skåne—the regional governing body—and one from the regional public transit company, Skånetrafiken, were interviewed as well.

The participants were identified through purposive sampling and snowballing by requesting further relevant recommendations from the initial interviewees. To encourage open and transparent answers, respondents were kept anonymous and only their department was included. A list of final interviews is found in Table 2.

Table 2. List of respondents

Respondent number	Organization	Interview length	In person/online
1	Environmental Department (MF)	34 minutes	Online
2	Property and Streets Department (FGK)	1 hour, 18 minutes	In person
3	Property and Streets Department (FGK)	43 minutes	In person
4	Property and Streets Department (FGK)	1 hour, 16 minutes	In person
5	Property and Streets Department (FGK)	38 minutes	Online

6	City Planning Office (SBK)	35 minutes	Online
7	City Office (SK)	39 minutes	Online
8	City Office (SK)	46 minutes	Online
9	Region Skåne (RS)	1 hour, 2 minutes	In person
10	Skånetrafiken (ST)	46 minutes	In person

Source: Own presentation

3.2.2 Document analysis

In addition to semi-structured interviews, a content analysis was also conducted on related public documents. Material was acquired through purposeful sampling and the documents were accessed both through the municipal and regional websites, as well as by asking respondents to forward relevant material after the interview.

In qualitative research, it is common to collect data from multiple sources. In this case, the documents can complement the interview material. This triangulation can further increase the study's validity as information can be cross-referenced across sources (Creswell & Creswell, 2018). Moreover, triangulation and use of multiple sources is particularly forwarded within case study research to capture the complexity of a case (Yin, 2014). Utilizing documents as a source can also be advantageous for multiple reasons; written data can be understood to represent content which has received greater focus and deliberation, it was not produced for the purpose of research, and it contains the direct wording used by the participants (Bryman, 2012; Creswell & Creswell, 2018).

Documents reviewed in this thesis are included in Table 3.

Table 3. List of reviewed documents

Document title (English title)	Year	Author
Översiktsplan för Malmö (Comprehensive Plan for Malmö)	2018	City of Malmö
Comprehensive Plan for Malmö: Summary in English	2018	City of Malmö
Sustainable Urban Mobility Plan	2016	City of Malmö
Miljöprogram för Malmö stad 2021-2030 (Environmental Program for the City of Malmö 2021-2030)	2021	City of Malmö
Det öppna Skåne 2030: Skånes utvecklingsstrategi	2020	Region Skåne

(The Open Skåne 2030: Skåne's Development Strategy)		
Hållbarhetsprogram för Skånetrafiken (Sustainability Program for Skånetrafiken)	2021	Skånetrafiken

Source: Own presentation

3.2.3 Workshop participation

Participation in a workshop was the final form of data collection and was used as a supplementary method to add perspectives and nuance to the data gathered from the interviews and document analysis. The workshop was conducted by the knowledge platform *Klimatneutrala städer 2030 – Öppen akademi*, a knowledge platform encompassing universities, municipalities, businesses, and other organizations, which has the purpose to support the three Mission Cities of Malmö, Lund, and Helsingborg in their pursuit of climate neutrality by 2030 and to encourage transformative change and interdisciplinary research. The theme for the workshop was mobility and transportation and approximately 30 participants were present, representing academia, municipalities, public agencies, and other organizations, to discuss how transformative change and climate neutrality can be achieved within the transportation in the three Mission Cities (Lunds universitet, n.d.).

Workshops can provide a different kind of data compared to other methods, such as interviews, and generate unexpected insights, and they are understood as particularly advantageous when combined with other methods of data collection as well (Ørngreen & Levinsen, 2017). In this instance, the workshop was not created for the purpose of this thesis, even if the subject matters aligned. I engaged in the workshop as a participant and notetaker, and as such also contributed to producing the findings and recommendations from the event. Following the workshop, the material and recommendations were consulted and used as data in this thesis (Neij et al., 2023).

3.3 Methods for data analysis

The data, from both interviews, documents, and the workshop, was analyzed through a qualitative content analysis. The main process of this involved coding, that is, systematically organizing the content into categories. With the codes as a basis, broader themes can be identified and utilized for analysis. Overall, the coding process helps interpret and decipher open-ended data into something that can be understood (Bryman, 2012; Creswell & Creswell, 2018).

Coding is usually done either deductively, where theory is used to determine codes in advance, inductively, where codes are developed from looking at the data, or through a combination of the two (Terry et al., 2017). In this thesis, a deductive coding approach was selected. From the theoretical overview, a framework was established based on the TM approach, see Section 2.3. This framework was used as a deductive set of codes to analyze the data collected in this thesis. This coding framework helped guide the interview questions asked, as mentioned in Section 3.2.1. After each interview, the data was manually coded utilizing the framework (see Appendix II – Coding framework for categories). Data from the document review and workshop was also analyzed using the same framework.

4 Findings and analysis

This chapter presents and analyzes the findings of this thesis. First, the context of Malmö will be described briefly. Next, the first three research questions—which each relate to a key concept within TM—will be discussed in relation to the theoretical framework. Finally, the fourth research question will be presented, focusing on collaboration with regional actors. These findings are further discussed in Chapter 5.

4.1 The context of Malmö

The city of Malmö is a municipality in southern Sweden in the region of Skåne. It is one of Sweden's fastest growing cities with a current population of approximately 350,000 inhabitants (2022) (Malmö stad, n.d.-c). As a municipality, Malmö has a strong sustainability profile and has set ambitious targets, including reaching climate neutrality by the year 2030. Furthermore, the city has been chosen as one of the EU Commission's Mission Cities to become climate neutral by 2030. As one of the Mission Cities, this also means that the city receives extra funding and support from the EU to be leading in demonstrating pathways towards climate neutrality (Malmö stad, 2022b).

In the year 2020, transportation was responsible for approximately 40% of Malmö's territorial emissions, constituting the largest portion (Roslund et al., 2022). Currently, car travel accounts for approximately one third of all trips in Malmö (Morin et al., 2019), and roughly half of the emissions from transportation derive from personal car use (Roslund et al., 2022). At the same time, the city has ambitions of a more sustainable transportation system, with reduced emissions, where walking, biking and public transportation are the dominant modes of travel (Malmö stad, 2022a).

Nationally, the ambition is to reduce emissions from transport by 70% by 2030, compared to the year 2010 (Naturvårdsverket, n.d.). From the year 2010 to 2021, emissions from road traffic in Malmö were reduced by approximately 28% (Malmö stad, n.d.-b). If this rate of reduction remains consistent, emissions would be halved by 2030. The rate of emission reductions from transport must, therefore, accelerate in Malmö to align with the goal of 70% emission reductions.

In terms of fostering a sustainable mobility system—where reducing emissions is one area of interest—Malmö has had a sustainable mobility plan since 2016 (Malmö stad, 2016). Currently, one of the primary ways Malmö is working with their transition towards climate neutrality is through their program Climate Transition Malmö. Through the program, the municipality aims to work holistically throughout the city to mobilize actors who can contribute towards decarbonization. At present, the initiative has seven prioritized areas, with mobility being one of them (Malmö stad, n.d.d).

Finally, a note can be said on how the municipality of Malmö is organized, in relation to transportation. The City of Malmö is governed by the City Council, which is the highest decision-making body. The city is further split into 15 different departments, each responsible for a different subject area in the city. In connection to each department, a political committee exists which makes decisions in relation to the corresponding department. The departments within the City of Malmö which work with transportation are, primarily, the Property and Streets Department (FGK), which owns and develops the municipal land, the City Planning Office (SBK), which is responsible for the overarching planning of the city, the Environmental Department (MF), which is in charge of the city's environmental work, and the City Office (SK), which works along the City Council and is responsible for the entire municipal organization (Malmö stad, n.d.-a, 2021b).

4.2 Visions

TM emphasizes the need of a shared understanding of the problem at hand, and having an inspiring vision to move towards (Grin et al., 2010). The theoretical overview highlighted the following elements (see Table 4) as conducive for driving sustainability transitions, in relation to visions. The findings, in relation to each aspect will be presented in the following subsections.

Table 4. Theoretical framework on critical elements of TM – Visions

Visions
There is a clear and inspiring vision
An organized network of actors supports a shared vision
Connections exist between long-term visions and short-term objectives, and visions are continually modified
The vision aims to improve or overturn the current regime
The vision contains a social dimension

Source: Own presentation

4.2.1 There is a clear and inspiring vision

The City of Malmö has ambitious climate targets and has been selected as one of the EU Commission's Mission Cities to achieve climate neutrality by 2030 (Malmö stad, 2023b). As stated in their environmental program, the City of Malmö has targets to reduce territorial emissions by 70% and become climate neutral within the organization by 2030 (Malmö stad, 2021a). In relation to transportation, the city has goals of having a sustainable mobility system dominated by walking, biking, and public transportation. The city has targets on modal splits where cars constitute 30% of trips, and notably, Malmö is aiming to manage growing as a city without increasing the total number of car tips (Malmö stad, 2016). When respondents were asked about the city's visions and goals of a sustainable transportation system with reduced emissions, the tendency was to focus on these types of yearly targets and numeric objectives, along with referencing the corresponding governing document such as the comprehensive plan (CP), environmental program (EP), or sustainable urban mobility plan (SUMP) (Malmö stad, 2016, 2018b, 2021a).

However, TM highlights the need of having a desirable and inspiring vision, highlighting how goals are not sufficient on their own, but should be paired with other instruments such as images and narratives which help conceptualize the transition. In this regard, the emphasis on numeric objectives can be questioned as quantitative goals, arguably, do not constitute the clear, inspiring, multidimensional visions which may be needed. The city's CP, on the other hand, potentially offers something close to a vibrant, tangible, multifaceted vision of the future—in contrast to the yearly targets. For example, one of the prioritized objectives of the CP is that Malmö should become a "close, dense, green mixed-function city", and this is described in the following way:

> Malmö will develop as a mixed-function city in order to generate a rich and vibrant urban life which still retains strong elements of greenery. Walking, cycling and public transport will form the basis of the transport system. (Malmö stad, 2018, p. 3)

This vision provides a clear direction for the city, covering more aspects, and incorporating qualitative elements. On a similar note, various keywords are repeated in both planning documents as well as interviews which help conceptualize the future vision. Examples includes words such as: "space efficient", "green", "dense city", "social spaces", "close", "green corridors", "bicycle town", "human-centered traffic solutions", "short-distance city", "healthy", "slower pace", "beautiful", "well-function city logistics", "accessible", and so forth (Malmö stad, 2016, 2018a). The most prominent message throughout both interviews and governing documents is, ultimately, the emphasis on walking, biking, and public transport dominating the mobility system (Malmö stad, 2016, 2018a, 2021a).

It is evident that there is a common understanding within the municipality of the roots of the problems of fossil fueled transport—particularly private car use, and there is an established, clear direction for the transition ahead. That is, moving towards a green, dense city with walking, biking, and public transport at the forefront. However, the city mainly utilizes quantitative goals and words to understand this transition, and other instruments such as using narratives and images to imagine the future are lacking. It was also underscored how perhaps more compelling visions of the future might be needed. One vision which was mentioned as a possible contender was the idea of the 15-minute city (see Box 1. The 15-Minute City), which was understood as a promising solution for decarbonizing the transportation system (Neij et al., 2023; Respondent 2, FGK).

Box 1. The 15-Minute City

> **The 15-Minute City**
>
> The 15-minute city is an urban planning model which promotes proximity and reducing the need for travel. The model forwards that cities should be made up of nodes where residents can reach activities and services within a 15-minute walk or bike ride. Ideally, each neighborhood is designed to provide the six basic functions of housing, work, education, commerce, health care, and entertainment.

Source: Own presentation, based on Allam et al. (2022) & Moreno et al. (2021)

4.2.2 An organized network of actors supports a shared vision

Overall, respondents expressed similar goals and directions for the future—as referred to above. Furthermore, most respondents also stated the explicit impression that, internally within the City of Malmö, actors did have shared visions and were working towards the same goals. The CP also functions as a coordinating document which everyone tries to abide by and guides the direction of the city (Respondent 4, FGK; 6, SBK).

The CP, however, needs to be relevant to the entire city and all departments, and consequently, it must be quite general. Furthermore, the stance of the CP is highly idealistic. The assumptions of the CP are, thus, somewhat detached from reality. In practice, priorities must be made between different aims, and the CP does not capture this (Respondent 4, FGK). Similarly, another respondent commented on how visions from one department often become watered-down in the CP. As the CP needs to be applicable and agreed upon between all departments, something which may have started off as a strong, detailed vision from one department, eventually becomes highly simplified in the CP as it must adhere to perspectives from the entire organization. While the respondent highlighted how this democratic process is important, they also noted how it becomes a limitation when aiming for more substantial changes (Respondent

2, FGK). Likewise, a new SUMP is currently being developed, and the aim is to get it adopted by the City Council, thus making it applicable to all departments. Again, however, this means the SUMP must be general enough so that it does not control too much (Respondent 4, FGK).

While respondents agreed upon goals and the general direction for Malmö, it was nevertheless underscored how departments, in practice, tend to focus on different goals (Respondent 8, SK). Even within departments, conflicts of interest are prevalent. One respondent said:

> There are conflicting goals between climate and other things that are important in a city. For example, an attractive city, […] a just city, an accessible city for everyone... I can see that all these images do not align. They can be aligned, but you need to think about it all together, and that is the challenge. You must think about the climate neutral city […], but you also need to consider that even if we electrify cars, they still occupy the same space. So, it is still important to think about space efficient transport. (Respondent 2, FGK).

As conveyed above, it is difficult to plan a city that is climate neutral, just, space efficient, accessible, safe, green, healthy, and so forth. Most likely, all parameters cannot always be achieved, and in practice, each department has different priorities (Respondent 2, FGK; 4, FGK). A respondent from the Urban Planning Department (SBK) pointed out how in comparison to space efficiency, emissions is typically a secondary concern for their department. Instead, the topic of emissions is primarily owned by the Environmental Department (MF). In the case of private car use, SBK thus aims to reduce car use due to space concerns. However, if a property developer wants to initiate a carpool, it matters less to SBK whether it is an electric carpool or fossil fueled, as the same amount of space is still occupied (Respondent 6, SBK). A respondent also highlighted how the goal of climate neutrality specifically is quite new in many ways. While an awareness of the goal exists, the target has not been fully anchored within all departments (Respondent 2, FGK).

In other words, the City of Malmö appears to have a shared, general understanding of the future throughout the different department of the organization, and people are striving towards the same goals. However, in practice, it appears as though the goals are utilized to various extents during daily operations. Consequently, the reality may be that the municipality works in a slightly sprawling manner with mixed interests, even if the general goals are common.

4.2.3 Connections exist between long-term goals and short-term objectives, and visions are continually modified

The City of Malmö primarily uses 2030 as a target, in relation to transportation. This includes the environmental program and the SUMP. From today, these targets constitute goals on a seven-year timescale, even if the plans originally were established with timelines of 10-15 years (Malmö stad, 2016, 2021a). There are visions on other timescales as well, the primary example being the CP, which has an approximate 20-year timeline (Malmö stad, 2018b).

The municipality rarely breaks down long-term goals into interim objectives, even if it happens in limited circumstances. The modal split target for 2030, for instance, also had an interim objective for 2020 (Malmö stad, 2016). A respondent pointed out though that the municipality's climatic work in relation to transportation is currently being developed, forwarding how further objectives would be developed shortly (Respondent 1, MF). Another interviewee commented, however, that the municipality rarely works with breaking down what long-term goals mean in the short-term, and this could be an area of improvement (Respondent 2, FGK).

While the city's work with interim objectives is limited, the municipality does regularly modify visions and goals. Both the current CP and the SUMP are currently under revision. In many regards, the municipality also demonstrates an openness towards the future. For example, in relation to fuel, respondents would speak about the possibilities of electrification, hydrogen, or "whatever it may be" (Respondet 4, FGK), indicating an adaptable approach and readiness to modify visions regularly. A respondent also commented on how the constantly changing conditions make long-term roadmaps meaningless, favoring agile approaches instead (Respondent 1, MF).

In some cases, the municipality is forced to adopt long-term thinking, however, which may reduce flexibility in modification. For example, national and regional plans—produced by the region and the Swedish Transport Agency—are done on an 11-year basis, and funding may be tied to certain projects in relation to these and locked in for years at a time (Respondent 4, FGK). Within individual projects, and not the overarching municipal documents, the level of modification which takes place is often highly dependent on the individuals involved within a certain case. A common example related to procurement processes. Whenever new agreements are established or updated, this creates an opportunity to revise goals. Whether this in fact takes place or not, however, is usually largely based on individual action (Respondent 3, FGK).

4.2.4 The visions aim to improve or overturn the current regime

The current regime is largely defined by car-dominated travel patterns and its accompanying infrastructure. Future visions of a decarbonized Malmö, however, capture a scenario which is disparate from the current regime. For instance, Malmö and its future transportation system is described as a "close, dense, green mixed-function city" dominated by walking, biking, and public transport (Malmö stad, 2018. p. 3). Nowhere in the future visions are cars and road-traffic promoted, indicating visions of an overturned regime.

There are, however, challenging tensions in relation to reconstructing already built environments and, subsequently, challenges in planning for an overturned regime. First, certain infrastructure patterns are so ingrained that they are difficult to change or envision differently. One respondent highlighted how cars have been built into cities since the 60s, creating a building pattern which is extremely costly and time consuming to reverse. The course of action must nevertheless be to consciously redistribute space, removing space from cars in favor of sustainable modes of transport and blue and green spaces. However, achieving this requires time, courage, and knowledge (Respondent 2, FGK). It is hard to rebuild what already exists, and it is much easier to be innovative when building something new (Respondent 3, FGK).

Second, if something has already been built, there is a hesitancy to rebuild the same place again, as this—to some extent—reduces the value of the previous investment. This does not automatically mean that further investments do not take place, and it is very possible to rebuild an area again. The general aim, however, should be to not waste money, and this tension can be difficult to balance. Practically, the reluctance against wasting former investments nevertheless shapes future planning (Respondent 4, FGK). Thus, while visions can be understood as aiming to overturn the current regime, planning can nonetheless be inhibited by the current reality.

In relation to imagining a different future, however, it was pointed out how the different departments' roles affect their ability to be visionary. FGK, for instance, works very much in the real world and is also responsible for ensuring a functioning transportation system. SBK, on the other hand, does not have to carry this responsibility. If something does not work, such as congestion or insufficient accessibility for emergency vehicles, SBK is not held accountable. This lack of authority makes it easier for SBK to take on a more visionary role. In contrast,

FGK must be more cautious against negative repercussions, which, consequently, may inhibit their imagination and subdue a more radical progression forward (Respondent 3, FGK; 6, SBK).

4.2.5 The vision contains a social dimension

The City of Malmö has multidimensional visions. The CP offers, perhaps, one of the best examples of a multifaceted vision of the future (Malmö stad, 2018a). In interviews, respondents also highlighted the importance of social dimensions when discussing decarbonization of transportation, touching on aspects of equality, behavior, public acceptance, among others (Respondent 1, MF; 2, 4, FGK; 6, SBK).

A respondent pointed out, however, that while goals may be multidimensional, the tools they use to work with them are not necessarily equally comprehensive. As mentioned previously, the FGK's work is highly anchored in reality. They are extremely well-versed in handling traffic-related issues, and they have advanced models to simulate various traffic scenarios. The downside of this expertise, however, is that they are not equally adept at measuring social aspects. Consequently, an intervention which may have great social benefits might not ever be considered if the impacts on traffic are negative. For example, the idea of superblocks instantly appears as red in the FGK's traffic models (red representing negative impacts, green representing positive), and negative impacts on traffic may be enough of a reason to disregard an idea. However, it would be beneficial if there also existed a model which showed social impacts, which in the case of superblocks might make the model green (Respondent 4, FGK).

Similarly, another respondent pointed out how they are working with a climate tool to measure emission reductions. But the tool only looks at emissions, and does not consider, say, aspects related to health or space (Respondent 2, FGK). Consequently, while there are multidimensional goals which do take social aspects into consideration, different types of goals may not be utilized to the same extent, in part due to the limitations of tools.

4.3 Experimentation

TM forwards learning by doing and emphasizes the need for action and experimentation, as well as scaling up successful experiments (D. Loorbach, 2010). The theoretical overview highlighted the following elements as conducive for driving sustainability transitions, in relation to experimentation (see Table 5). Findings, in relation to each aspect, will be presented in the following subsections.

Table 5. Theoretical framework on critical elements of TM – Experimentation

Experimentation
Actions and experiments are radical and closely tied to a vision
Actions and experiments are multidimensional
Actions and experiments enable further innovation and transition paths
Actors are empowered to take on action perspectives
There is a portfolio of experiments which reinforce each other
Actions and experiments contain potential for learning

Successful experiments are scaled out and scaled up

Source: Own presentation

4.3.1 Actions and experiments are radical and closely tied to a vision

The City of Malmö works with many different types of actions (see Figure 2). Among many measures and initiatives, examples include work with mobility hubs, bicycle lanes and parking, bicycle highways, bicycles deliveries, last mile deliveries by electric car, hydrogen and electric charging infrastructure, bus lanes, bus rapid transit, "summer streets", demands on transportation during procurement processes, and so forth.

In relation to Malmö's measures, however, a few things can be remarked upon in relation to whether actions and experiments are 1) radical, and 2) closely tied to a vision. Defining what is radical can be difficult, but the theory forwards that transition experiments should be high-risk endeavors. Arguably, certain measures—such as expanding bicycle and bus lanes—are actions which have been done for many years and, perhaps, do not fall into the category of "radical". However, while examples such as biking is not a new, daring phenomenon, the degree to which the municipality is working with it can, in some instance, be understood as pushing boundaries. For example, the city is currently, in collaboration with a food wholesaler, experimenting with school lunch deliveries by bike, and nighttime, off-peak deliveries by electric trucks (Respondent 3, FGK; Respondent 7, SK). While these delivery methods alone are, perhaps, not radical, the scale at which it is being trialed is novel in many ways.

Multiple respondents shared their personal belief, however, that they think the city could be even bolder in their actions and that local politicians need to be more daring. Most commonly, the interviewees would highlight regulation and question if it still is enough to predominantly work with "carrots", or if more "sticks" need to be used as well (Neij et al., 2023; Respondent 2, FGK; 6, SBK; 7, 8 SK) One respondent said:

> I think we need to be more daring—politicians need to be more daring. […] Dare to prioritize sustainable modes of transport further, dare to remove car lanes and replace them with trees or bicycle paths, and so forth. That's probably what I feel is needed. (Respondent 6, SBK)

In relation to visions, many of the actions Malmö is working with are closely tied to their visions and goals of a dense, green city dominated by walking, biking, and public transport. These includes efforts such as the summer streets, expanded bike and public transport infrastructure, mobility hubs, and so forth. However, something to note is that while the City of Malmö puts a lot of effort into electrification—and this was a highly prevalent topic during all interviews—an electrified transportation system is not prominent in Malmö's documented visions of a future transportation system. While "clean motor transport" is forwarded and electric vehicles are mentioned in the city's SUMP and CP, its scope is marginal compared to, for instance, biking. To exemplify, cycling is mentioned over 150 times in the city's SUMP, whereas electric or clean vehicles are mentioned fewer than 10 times each (Malmö stad, 2016). It is possible to argue, therefore, that certain actions are more closely tied to the City of Malmö's vision than others. However, efforts in electrification—or hydrogen, for that matter—can nevertheless be tied to goals of climate neutrality and are certainly not unaligned with the municipality's vision.
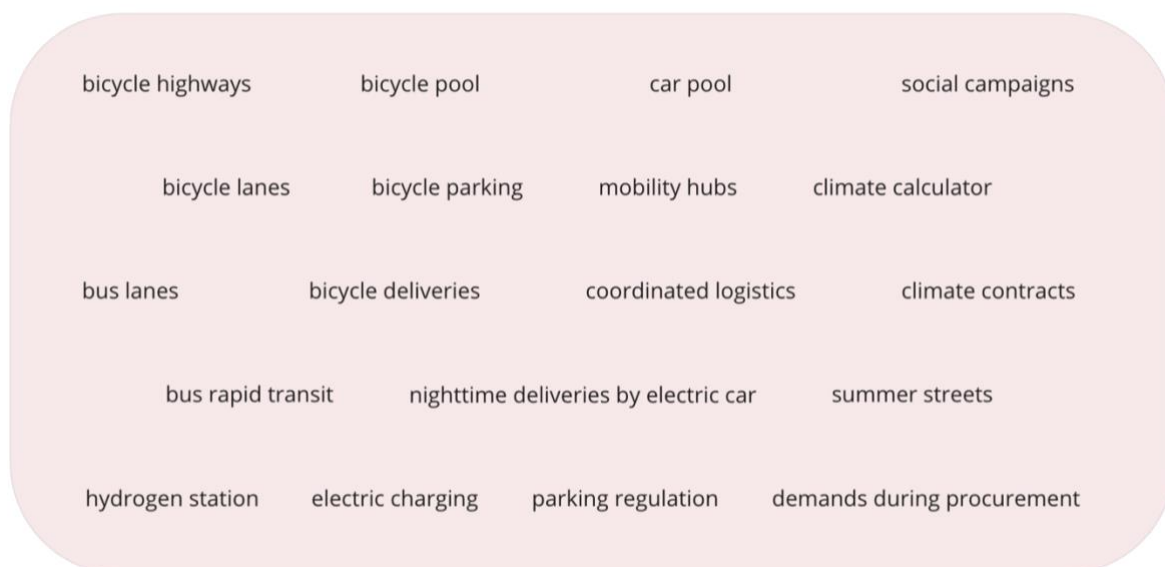
Figure 2. Examples of actions within decarbonization of transportation in Malmö

Source: Own presentation

4.3.2 Actions and experiments are multidimensional

There is a range of actions and experiments taking place in Malmö in relation to transportation (see Figure 2). While many are technology-focused—for example, efforts related to charging infrastructure—several experiments target other dimensions as well. For instance, many experiments tackle social behavior in relation to norms, culture, and how people travel. This relates to measures such as developing mobility hubs and sharing services, which aim to alter travel patterns, influencing perceptions of street space through summer street-initiatives, changing delivery norms by trialing alternate forms, initiating "climate contracts" to engage companies and citizens to take on actions, social campaigns, among others (Respondent 1, MF; 2, 3, 4, FGK; 7, 8, SK). For instance, one of the most prominent campaigns the city of Malmö promoted was the "no ridiculous car trips"-campaign which became very visible and quite famous both in Malmö, as well as other cities, which targeted reducing short car trips (Respondent 2, FGK).

While experiments targeting different dimensions can be identified, respondents did point out how the type of measures the city works with is not evenly distributed. One person mentioned, for instance, how the city used to work much more with soft measures previously, such as community dialogues, involving citizens, information, social campaigns, etc. Now, these types av soft measures have become less widespread, partly due to reduced finances as they used to receive a lot of EU-funding for these types of initiatives (Respondent 2, FGK). The same message was echoed in another interview as well, however, pointing out how innovation projects often are technology-oriented and about *what* is done, and rarely *how* things are done. Ideally, the respondent would like to see more attention given to norm-innovation in relation to how people behave (Respondent 5, FGK).

As discussed previously, many of the tools used by FGK are also much better at measuring traffic-related aspects than, say, social. In practice, this also means that experiments which result in positive effects in relation to traffic are more easily adopted than socially beneficial endeavors, simply because it is more difficult to measure these effects and see if a project is worthwhile or not (Respondent 4, FGK).

4.3.3 Actions and experiments enable further innovation and transition paths

Actions and experiments should aid a transition forward and be conducive to further innovation in the same direction. Some examples exist in Malmö of how this successfully has been achieved, the prime one being the example of summer streets. Summer streets consists of temporarily restricting car traffic on a street—usually during summer—and giving space to pedestrians, greenery, seating, cafés, and so forth. The initiative makes it possible to understand what a city without cars might look like. In Malmö, the result of a first summer street-project was that more areas began requesting summer streets as well. One of the summer streets has even turned into a permanent summer street, closed to car traffic year-round. In this case, the experiment led to positive reactions which propelled the summer street-project further, and streets were subsequently added at a faster pace than FGK had originally planned, due to the positive response (Respondent 2, 4, FGK). The spread of the summer streets can be understood as a furthering of a transition pathway.

Another example which can be mentioned is the City of Malmö's work with "climate contracts", a system where the city makes agreements with companies and organizations who pledge to reduce their emissions, and in return, the municipality supports them in their efforts. For instance, it was one of the climate contract-agreements that generated the pilot with the food wholesaler and nighttime deliveries by electric truck—a project which was initiated by the wholesaler (Respondent 1, MF; Respondent 7, SK). The climate contracts, as such, can be understood as an action which enables further innovation.

4.3.4 Actors are empowered to take on action perspectives

Within TM, a transition arena has ideally been established which provides a stimulating environment where actors are keen to take on actions themselves (D. Loorbach et al., 2015). While a formal transition arena does not exist (further discussed in Section 4.4.1) networks have been established which empower companies, organizations, and citizens to take action to reduce their emissions. This includes the climate contracts, as mentioned above. As demonstrated with the food wholesaler, this environment as also been conducive for companies trialing pilot projects in relation to reducing transportation emissions. Malmö as a city is also very open to offering itself as a testbed for experimentation (Respondent 1, MF). Indeed, it was frequently mentioned how Malmö is very keen to enable experimentation, provide resources, and the municipality is very open to trying new ideas (Respondent 3, 4, FGK; 8, SK). Additionally, it was forwarded how citizens in Malmö are generally also very open to testing new things and allowing towards experiments (Respondent 4, FGK).

While the municipality, arguably, offers a supportive environment for actors who do wish to take on action perspectives, there may be frontrunners who could be further encouraged to act, however. One respondent explained how they hoped the City of Malmö could have such a strong facilitating role that actors throughout the entire city would be brave enough to strive for climate neutrality (Respondent 3, FGK). The respondent mentioned how the municipality can encourage and influence actors through agreements or dialogue, but the implication was that there is further potential to unlock within the city and that frontrunners could be empowered to greater extents.

It can also be noted that while enthusiastic frontrunners exist within the City of Malmö, civil servants are limited in their ability to act as everything must be tied to the organizational goals and grounded in political decisions. It can thus be easier for either politicians or private actors to be proactive as the municipality easily becomes bureaucratic and must ensure that tax money

is spent well. Ultimately, municipal workers are locked by political decisions (Respondent 2, 3, 4, FGK; 6, SBK).

4.3.5 There is a portfolio of experiments which reinforce each other

In the City of Malmö, many different experiments are being conducted across different domains. When asked about current experiments taking place to reduce emissions from transport in the city, respondents mentioned a plethora of examples, ranging from improved physical infrastructure, parking and mobility solutions in relation to property development, logistics and delivery solutions, bicycle initiatives, work commuting, sharing services, hydrogen and electric charging, and so forth.

In relation to biking, for example, actions include expanding bike lanes, improving bike infrastructure—such as handrails in intersections, developing bicycle highways, working with companies to encourage bicycle commuting, increasing and improving bicycle parking, mobility houses, deliveries by bike, and so forth. Similar lists can also be made in connection to public transport, logistics, or decarbonizing motor vehicles. For an example, but non-exhaustive list, of actions taking place in Malmö in relation to decarbonizing transportation, see Figure 2.

A point of contention which potentially exists relates to the coinciding efforts to reduce car dependence, increase modal shifts, and remove parking spaces while simultaneously working with transitioning fuels and increasing charging infrastructure for electric vehicles. As such, the transition *away* from cars is occurring alongside the transitioning *of* cars. However, it is largely understood that both pathways are needed concurrently (Respondent 8, SK).

4.3.6 Actions and experiments contain potential for learning

The advantages of working with experimentation was promoted during interviews specifically for the benefit of learning. One respondent highlighted how it is important to work with many different types of experiments to understand what works (Respondent 2, FGK). Similarly, a respondent pointed out how it is not sufficient to conduct long investigations on various measures, but that things need to be tested practically for relevant insights to be obtained (Respondent 3, FGK). However, for learning to take place, it is important that follow-up processes are both prevalent and thorough. The interviewees shared mixed perceptions, however, on how well follow-up processes work within the municipality. One respondent pointed out that the city has a strong history of monitoring progress and that each year an account is reported on what has been done. Likewise, travel surveys are conducted regularly (Respondent 2, FGK). On the other hand, the opposite view was taken as well, arguing that the city needs to be better at gaining lessons from experiments. Travel surveys, for instance, are only conducted every five years, and it is difficult to discern which measures produced certain results (Respondent 4, FGK).

One respondent also expressed how they specifically were working with increasing the knowledge on learning, focusing not only on *what* has been done well but *how,* to ensure that this knowledge becomes transferable. Largely, the work is focused on identifying good initiatives—from different domains—and understand what, in terms of operations and work processes, has worked well. As explained by the respondent, however, this work is very new and is currently under development (Respondent 5, FGK).

4.3.7 Successful experiments are scaled out and scaled up

Experiments are often understood as relatively easy to conduct as they in many cases are externally financed, and it is "risk-free" in a sense as people know it is just a test (Respondent 2, FGK). Instead, the challenge lies in scaling successful experiments. A common example

shared during interviews of successfully scaling out an experiment was the summer streets-initiative. What began as a trial with one summer street has now resulted in five. One of the streets even became permanently pedestrianized, which can be understood as scaling up. One reason for the successful scaling was due to a positive response from the public and people, consequently, requesting similar action on their streets (Respondent 2, 4, FGK). Communication and effective dialogue, as such, can therefore be highly beneficial in scaling trials. This is also being experienced in relation to the trial of nighttime deliveries of school lunches by electric truck. Through internal communication between schools, participating school kitchens could share their positive experience of the project, which aided the spread of the trial, even if it is still in a pilot stage (Respondent 7, SK). Communicating favorable results is not always simple, however, and one respondent expressed how when following-up experiments, part of the task is the pedagogical challenge in communicating the results to politicians who, ultimately, are the decision-makers (Respondent 2, FGK).

Another example of successful scaling in the city relates to parking in connection to property development. In the Western Harbor, property developers began experimenting with car and bicycle pools connected to people's residences. Now, new property developments are rarely built without a car or bicycle pool in connection to the residence. One of the main factors as to why this escalation was possible was due to governing documents being updated in parallel (Respondent 6, SBK). There are municipal guidelines on how many parking spots developers need to establish in connection to residences. However, if the property developer incorporates other mobility solutions—such as a car or bicycle pool, bicycle repair workshop, public transport passes, screens with public transportation information in real time, among others—the developer is allowed to reduce the level of required car parking (Malmö stad, 2020). The property developer can save money, as they do not have to provide as much parking, while simultaneously promoting more sustainable modes of travel. A prerequisite for this development, however, is the fact that the municipal parking guidelines were updated (Respondent 6, SBK). Arguably, this example of the altered parking guidelines not only acts as an example of scaling out—as innovative mobility solutions are repeated throughout the city—but also, as an example of scaling up as it led to new regulation.

Scaling is not always easily done, however, and one common scenario of when it can be difficult, in relation to transportation, is if a decision must be applied to the entire city all at once. The example provided during the interview related to bicycle lanes and how a decision such as making one-way lanes the norm, rather than double, would then have to apply to entire city at the same time (Respondent 4, FGK). Although, conversely, if such a decision is made, it effectively results in widespread scaling out. One respondent emphasized how city-wide decisions is one of the most effective ways to spread a measure. Raising the minimum standard in a procurement agreement, for instance, instantly produces results (Respondent 7, SK). While regulation can be effective for accelerating action, it can also be an inhibiting factor if it is not up to date. Insufficient legislation on shared vehicles and charging infrastructure on a national level, for instance, has diminished progress in the areas as the municipality does not want to act without proper legislation in place (Respondent 8, SK).

Another common obstacle for scaling relates to financial constraints. As mentioned, many experiments are conducted with external funding. For an experiment to successfully become scaled up therefore, it requires a financial model which makes economic sense, otherwise it is difficult for the project to last (Respondent 3, FGK). Finally, there are also practical challenges to scaling up certain initiatives. In relation to electrification, for example, charging opportunities need to increase in alignment with electric vehicle uptake. Expanding charging infrastructure, however, is highly dependent on greater issues of electric power supply (Respondent 8, SK).

4.4 Collaboration

The theoretical overview highlighted the following elements as conducive for driving sustainability transitions, in relation to collaboration. Findings, in relation to each aspect, will be presented in the following subsections.

Table 6. Theoretical framework on critical elements of TM – Collaboration

Collaboration
A transition arena is established with a network of visionaries from different domains
Common understandings of sustainability are established among actors
Actors collaborate to provide resources which can accelerate the transition

Source: Own presentation

4.4.1 A transition arena is established with a network of visionaries from different domains

As expressed in the literature, a transition arena is a safe space for frontrunners to work in and develop shared visions and strategies. Frontrunners should be empowered in this space and it should act as a stimulating environment for innovation (Grin et al., 2010; D. Loorbach et al., 2015). The City of Malmö is currently working with the initiative Climate Transition Malmö, where mobility is one of the focus areas, and the ambition for this project is largely that it can act as a collaborative platform for transitions in mobility (Respondent 1, MF). However, while the intention is that Climate Transitions Malmö will lead to greater cooperation between departments within the City of Malmö—as well as externally—the project is in its initial start-up phase and, currently, the working group for mobility consists of three people within FGK (Respondent 1, MF; 3, FGK; 8, SK). Furthermore, in line with their assigned role and responsibility within the municipality, FGK is, by far,the primary actor working with transportation issues (Respondent 1, MF; 2, FGK; 8, SK).

As part of the city's climate work, the city has established climate contracts with companies and organizations in the city who pledge towards a climate neutral Malmö 2030. The initiative is even being expanded to include individual action as well, essentially as a form of community dialogue. This enables opportunities for sharing experiences between actors as well as developing relations towards the municipality so the city can provide support and resources (Respondent 1, MF; 3, FGK; 8, SK).

Indeed, when asked about collaborative action, respondents highlighted a large variety of networks and forums which they interact in. Examples include both city-wide networks, such as Viable Cities, as well as many different platforms related to specific topics, such as freight, electrification, work commuting, and so forth (Respondent 1, MF; 3, 4, FGK; 7, 8, SK). There are also close collaborations between the municipality and actors such as property owners and suppliers, as the municipality works closely with these actors on many issues (Respondent 3, FGK; 6, SBK; 7, SK). Overall, it appears as though the municipality has many partnerships and networks which they can—and do—interact with.

Internally, the City Office can take on a coordinating role within the municipality and lead projects which many actors must be involved in. It can be difficult for departments to handle issues where the matter is owned by multiple departments simultaneously. In these

circumstances, the City Office can act as a unifying actor. But, as pointed out by the respondent, this coordinating role could be improved further (Respondent 8, SK).

A couple of respondents, however, highlighted the need for improved collaboration within the municipality on a fundamental level. Not just in terms of increasing dialogue, but particularly in relation to ensuring there are people with the necessary skills for facilitating collaboration and dealing with complex problems. One person explained on how there is an increased need for "bridge builders", highlighting how there is an abundance of experts, but that it is assumed people have the ability to pass on this knowledge, think interdisciplinary, and work collaboratively (Respondent 2, FGK). Similarly, another respondent highlighted how engineers are not necessarily trained in complexity or systems thinking and there is a need for capacity building. Again, these types of skills need to be fostered within the organization for transformative change to be possible. The respondent emphasized the need to step out of silos and pay further attention to how people are working together (Respondent 5, FGK).

4.4.2 Common understandings of sustainability are established among actors

If common understandings of sustainability are established is highly related to the previously discussed point on whether there is a shared vision within the City of Malmö, in relation to sustainable transportation. And as discussed, there is an overarching consensus with shared understandings of the direction the municipality is headed in. One respondent pointed out however, that while agreement broadly exists on how Malmö should be planned and what sustainable development entails—in this case, in relation to decarbonizing transportation—the topic can sometimes be politically sensitive, which creates tensions. While common understandings of sustainability might exist internally within the City of Malmö, there is still a normative sensitivity in relation to how the municipality can work as they must adhere to the political context as well (Respondent 4, FGK).

While there are few voices who are in direct contention to decarbonization aims—and most respondents understood actors as having shared understandings of what decarbonized transportation entails—inconsistencies can be identified in relation to the pace of the transition, and perhaps in relation to what should be prioritized. One respondent said:

> The direction is the same, absolutely. It is just a question about nuances, how fast it should go, how much of a hurry we are in. And maybe also what we should invest in. […] Some people focus more on if we should reduce car dependency, travel in a different way, not have parking spaces. That work also takes place in Malmö, and then maybe the focus is more on that type of transition—the transition away from cars. Whereas I maybe focus more on the transition within cars [electrification]. But I would say we need to do both, at the same time, in a balanced way. (Respondent 8, SK)

In relation to external actors outside of the municipality, a similar stance can be identified even if it can vary greatly between actors. One respondent said in relation to suppliers, however, that there are few significant laggards, even if different perceptions on pace is common (Respondent 7, SK). On the other hand, it is also often that the private sector is keen to move much faster than the municipality (Respondent 7, 8, SK).

4.4.3 Actors collaborate to provide resources which can accelerate the transition

Actors can collaborate to provide resources which drives the transition forward. This can relate both to internal collaboration within the municipality, as well as providing resources outside of

the organization. One thing mentioned frequently throughout interviews was how Malmö wants to function as a testbed and support innovative actors in the city. Furthermore, Malmö as a municipality cannot do everything alone, and the ambition is largely to act as a facilitator and incentivize other actors to take measures. Respondents also highlighted how developers usually have a better understanding of the market, and how it is preferable that developers come with ideas themselves that the city then can support (Respondent 3, 4; FGK, 8, SK). On the other hand, this concurrently means that a lot of responsibility is, indeed, placed on developers in the city to be innovative. While the city is eager to provide resources, it often requires that a first step is taken by actors externally (Respondent 6, SBK; 8, SK).

Internally, actors collaborate in many ways to provide resources to each other. As a large municipality, many resources are available in Malmö (Respondent 3, FGK). For instance, a lot of knowledge exists within the organization. One example can be in relation to setting demands on transport during procurement processes. Malmö is a large enough municipality that there are people who can provide expertise to other departments on what level and type of demand is reasonable (Respondent 3, FGK; 7, SK). This is true for many other matters as well, and as elaborated on previously, many collaborative platforms exist both internally and externally on different topics where resources and information can be shared.

However, respondents did also mention that while collaboration works well in many ways, there are also instances where it can be improved. For instance, many municipal collaborations start from scratch each time, even though someone within the department may have engaged with the actor or sector previously. Stakeholder engagement could thus be streamlined to greater extents to increase operational knowledge (Respondent 5, FGK).

Another challenge can be administrative divisions as municipal departments are responsible for different areas in the city. This means that departments must collaborate on certain topics, but this can also be challenging. For instance, one department might be working with a project which, ultimately, falls outside of their own jurisdiction. This inhibits their ability to act as they cannot make the decision Respondent 3, FGK). In particularly, it can be unhelpful if the issue in question is not of equal priority to the other department. If the department with authority is not on board, the project will not take place (Respondent 8, SK).

4.5 Collaboration with regional actors

Apart from interviews within the City of Malmö, interviews were also held with a respondent each from Region Skåne and Skånetrafiken. This section will briefly explore the City of Malmö's work with visions, experiments, and collaboration in relation to these two central actors.

4.5.1 Collaborative visions

The respondents from Region Skåne and Skånetrafiken largely posited that they share the same visions as the City of Malmö. It was pointed out how they may have different points of departure and various priorities on certain details, but overall, similar perceptions on transitions towards a sustainable transportation system. The respondent from Region Skåne, for instance, highlighted the region's goal of being climate neutral by 2030 (Region Skåne, 2020; Respondent 9, RS). While visions are not explicitly organized between the region and the municipality, they nevertheless do align with each other in most regards.

The respondent from Skånetrafiken, however, highlighted a tension that exists in their own sustainability vision when considering broader mobility issues. Skånetrafiken's ambition is to stand for 40% of motorized trips in Skåne by 2030 (Skånetrafiken, 2021). Active modes of transport are entirely excluded from their sustainability vision, however. Admittedly, active

travel is not part of Skånetrafiken's assigned mission as a public transport provider. Nevertheless, if a person decided to shift from biking to public transport, this would be good in relation to Skånetrafiken's targets, but arguably, this is not favorable in the greater mission of achieving sustainable transport. The respondent, as such, highlighted how there may be a need to broaden the scope of Skånetrafiken's mission and include active modes of transport in their visions as well (Respondent 10, ST). This specific example from Skånetrafiken demonstrates a conflict of interest in the aims of the City of Malmö and Skånetrafiken.

Similarly, the different entities have different frames of reference and scopes. Needless to say, the City of Malmö focuses on the municipality, whereas Region Skåne and Skånetrafiken, naturally, have a broader, regional perspective. This also means that while their end-goals align, they can have different priorities; the regional actors, for instance, paying greater attention to the role of rural and sparsely populated areas (Respondent 9, RS; 10, ST). Different primary concerns, however, do not necessarily have to constitute a problem. For example, one of Malmö's challenges pertains to commuting and through-traffic, which in many ways is outside of the municipality's jurisdiction (Respondent 1, MF; 2, FGK). Thus, it can be beneficial that regional actors take on these perspectives.

Finally, in relation to visions, one thing which can be discussed is the pertinence of Region Skåne and Skånetrafiken's visions for the City of Malmö. While the directions between the regional actors and the municipality align, they are perhaps not considered much. The respondent from Skånetrafiken pointed out how their perception was that Skånetrafiken had comparably weaker visions than the municipality. Additionally, the public transport company has been quite slow in establishing a direction of movement. Consequently, the City of Malmö may not see the need to take Skånetrafiken into account when developing their own strategies as, arguably, Malmö is ahead of the public transport company (Respondent 10, ST). Likewise, Region Skåne also regarded Malmö as a progressive municipality who can act quite independently, accentuating the public planning monopoly which municipalities have as well (Respondent 9, RS).

4.5.2 Collaborative experimentation

When discussing experimentation and action, messages were mixed. On the one hand, both regional respondents explained how Malmö primarily works on projects independently and that they do not collaborate much on joint initiatives. On the other hand, both interviews also shared multiple examples on collaborative actions (Respondent 9, RS; 10, ST). Region Skåne is, for instance, involved in a lot of strategic work on broader issues, such as electrification, charging infrastructure, fossil free fuel, freight and logistics, bicycle and rail infrastructure, and so forth. A lot of the work is not necessarily dedicated to tangible projects, but on building coalitions and platforms for bringing people together and sharing information and experiences. These platforms can then be utilized by the involved actors and translated into action (Respondent 9, RS).

Skånetrafiken, in contrast, is more involved in concrete actions and trials in the city. The respondent pointed out, however, that Malmö—as opposed to many other cities in the region—is large enough to act on their own without waiting for Skånetrafiken as an actor. For instance, Malmö began working with mobility hub-solutions and bike rentals in the city independently—perhaps, because Skånetrafiken was too slow to initiate a project themselves. Collaborative action does take place though, and one idea that is being explored is if Malmö's bike rental program can be incorporated into the ticketing system for public transport. Similar solutions are also being considered in relation to commuter parking so that it is cheaper—or free—to park your car if the rest of the commute is conducted by public transport. Other projects relate

to, for example, improving signs at central junction points to aid travelers in understanding their mobility options (Respondent 10, ST).

It is clear from the interviews that regional experimentation does take place, in the sense that actions to decarbonize the transportation sector occurs on a regional level. However, as discussed in relation to experimentation previously, most examples are not necessarily radical, but often quite safe. Most actions also appear to be related to infrastructure or technology, with few actions targeting other dimensions or domains.

4.5.3 Regional collaboration

During interviews with municipal workers, as well as with the regional respondents, it was conveyed that the region takes a lot of responsibility in building collaborative platforms in relation to sustainable mobility and transportation (Respondent 1, MF; 2, 3, FGK; 6, SBK; 9, RS). These efforts relate to facilitating the dialogue between municipalities and the region on a general level, and a large focus is dedicated to developing networks and knowledge platforms on various topics. These platforms particularly concern topics which go beyond the extent of isolated municipal action (Respondent 9, RS). Examples include, for instance, electrification and freight which must take broader regional and national perspectives into consideration.

Overall, respondents highlight that the collaboration between the City of Malmö and the regional actors works well. It has improved in recent years, and the communicated perception was that there are many spaces for interaction between the City of Malmö and the regional entities (Respondent 9, RS; 10, ST). Many of the strongest examples of cooperation relate to public transport and freight. Municipal actors heavily emphasized the value provided by regional actors in these regards. For instance, one respondent highlighted work with Bus Rapid Transit (BRT) and how Malmö soon will have a fully electric bus fleet (Respondent 2, FGK), and another person commented on how efforts in relation to freight and logistics are heavily facilitated by the region (Respondent 3, FGK).

Even so, there are challenges in collaborating across an entire region. One difficulty, which was expressed by multiple respondents, is the fact that each actor has its own jurisdiction and point of departure. Municipalities have authority over their own land, and the region cannot control what happens in each city. Likewise, the City of Malmö does not have a say in what happens somewhere else. Furthermore, many topics are so broad that nobody has full control over the topic—charging infrastructure, for example, requires cross-collaboration between many types of actors. If the international perspective is included, in relation to primarily Denmark, the picture becomes even more complex (Respondent 2, 4, FGK; 9, RS; 10, ST).

The general impression from both regional and municipal respondents is that the different bodies—the City of Malmö, Region Skåne, and Skånetrafiken—inevitably do interact with each other, partly by necessity. Nevertheless, collaboration appears to work well in many ways. Many networks exist, allowing for knowledge dissemination and building awareness. However, while dialogue and knowledge platforms appear to be both prevalent and high functioning, less collaboration seem to exist within other domains.

5 Discussion

This study has examined how the City of Malmö works with reducing emissions from transportation from the perspective of the TM framework, focusing on visions, experiments, and collaboration. First, the findings of the study will be discussed in the following section, focusing on strengths and weaknesses. First, the findings will be discussed in relation to TM literature and the theoretical framework. Second, a more comprehensive discussion will be had discussing alignment between the different TM aspects, reflecting on transformative change in Malmö. The section concludes with a reflection on the results and the methodological choices made in this study.

5.1   Visions—strengths and weaknesses

RQ1 asks how the City of Malmö works with visions and goals for reduced emissions from transportation. In many ways, the findings demonstrate alignment with the TM approach, in relation to visions. The municipality has clear goals and departments throughout the organization have a well-established understanding of the problem at hand and appear to be working in the same direction. While a shared problem definition is essential (D. Loorbach, 2010; D. Loorbach et al., 2015), this is not sufficient in relation to the TM approach. The literature also highlights the need for an attractive and inspiring vision which can mobilize actors (Rotmans et al., 2001). In this regard, the City of Malmö does not fulfil the criteria of the TM approach as a strong, captivating vision does not clearly exist—especially not if the vision should function as a mobilizing agent. Even if a strong understanding of the direction may exist within the municipality, there does not exist an enticing and palpable vision to communicate externally. The "15-minute city" is one possible contender for such a vision. It is both understood as a captivating image of the future (Neij et al., 2023), but, arguably, also aligns with the city's goals of becoming a "close, dense, green mixed-function city", which is one of the prioritized objectives stated in the CP (Malmö stad, 2018a). The results do not find that Malmö necessarily must adopt the 15-minute city as a future vision, but to work in alignment with the TM approach, it would be advisable to develop a clear, inspiring vision for actors to work towards as current understandings of the future are not being presented in a marketable, attractive narrative.

Furthermore, in relation to visions, it may be helpful for the city to expand the type of mechanisms they use to envision the future. Currently, numeric goals dominate understandings of future directions in Malmö, but TM research also highlights the value in using other forms for approaching the future as well. This can include things such as images, narratives, and storytelling. As demonstrated by the literature, these types of complementary strategies of visualization can be valuable for understanding how a goal is reached, and is, indeed, key for developing imaginations of the transition (Nevens et al., 2013).

One of the key reasons why the City of Malmö could benefit from working further with envisioning, however, relates to competing interest being highly prevalent throughout the municipality. Goals are aligned on paper, but in practice, the departments have different priorities. Decarbonization goals are largely owned by the Environmental Department. While other departments also support the city's goals of climate neutrality by 2030, for instance, it is not necessarily of primary concern compared to other objectives. The result is that the organization as a whole works in a—somewhat—split manner.

As expressed by respondents, it is not always clear how the city will become green, climate neutral, accessible, dense, space efficient, and so forth, simultaneously. While these ambitions are all shared throughout the municipality, different departments—and different individuals within departments—will work with these goals to various extents. Significantly, the TM

literature does not only highlight the need to have a common end goal in sight, but furthermore, much emphasis is given to the process of developing said goals, aligning interests, and anchoring goals within organizations. This provides substance to the goals, and, importantly, guides *how* the transition can take place, rather than simply what the output of the transition should be (D. Loorbach, 2010; Nevens et al., 2013). This shared process of developing goals is one area within the municipality which could be improved. While direct contradiction does not exist in terms of ambition, a disparity is prevalent in relation to how different departments interact with various targets. Aligning perspectives within the transition is thus key and understanding how goals are achieved, not merely agreeing on results.

5.2 Experimentation—strengths and weaknesses

RQ2 asks how the City of Malmö works with experimentation, innovation, and scaling up for reducing emissions within transportation. As a city, Malmö is doing a lot. The city is ambitious and numerous projects are in place and trials are plentiful. The TM approach underscores how experimentation is important as the practical implementation of measures may be necessary to both gain information, and to gradually shift society toward a transition (Bulkeley, 2021; D. Loorbach, 2010). In this regard, Malmö is doing well, and a lot of action is taking place.

A critical aspect of TM, however, is conducting bold, radical experiments which can be of innovative value (D. Loorbach, 2010). Concerning this matter, the actions taking place in the City of Malmö can be critically examined. Certain endeavors can be understood as innovative or radical, for instance, the experimentation with nighttime and bike deliveries that is taking place, or the summer street-initiative, which is often understood as a radical intervention (Bertolini, 2020). Most of the actions Malmö are working with, however, are arguably not high-risk ventures. While it is valuable that the municipality is gradually restructuring society towards a transportation system with increased walking, biking, and public transport—and subsequently are investing in improved infrastructure withing these domains—most actions would not be considered as high-risk ventures. To align further with TM literature, more radical experimentation would need to take place.

Challenges in performing radical experimentation can be identified though. One relates to limited authority and dependence on political will. As explained by respondents, the role of a civil servant is bound by political decisions. Departments within the City of Malmö cannot go beyond political ambitions, and measures must have political acceptance. Consequently, the ability to be radical does not solely lie within municipal departments but is, also, fundamentally reliant on local politicians. On a related note, civil servants also must ensure that tax money is spent responsibly. Therefore, radical experimentation may be more easily conducted by other actors than the municipality, such as on initiative by politicians themselves, or by private actors.

While the research questions in this thesis separate processes of envisioning and experimentation, they are closely connected, and as forwarded by TM, should be intertwined processes. When discussing radical experimentation, therefore, it also relevant to consider visions. The City of Malmö has limited long-term visions—within TM, long-term referring to visions on 25-30 years—and furthermore, visions are rarely broken down to indicate what they entail in the short-term, as the TM approach argues should be done (D. Loorbach, 2010; Rotmans et al., 2001). This can be connected to the City of Malmö's ability to conduct radical experiments. Radical experimentation does not necessarily have to be instant, and it can be broken down into incremental steps. This is only possible though if there is a clear, bold aspiration to work towards. Each action does not necessarily have to be radical, provided that the overarching direction is. A recommendation could thus be to further efforts in improving links between long-term and short-term objectives, while concurrently pursuing radical change.

One of the most critical steps within experimentation is the ability to scale up successful experiments. The TM literature underscores the difficulties in scaling (Smeds & Acuto, 2018), and this is experienced in Malmö as well. Some findings are expected and align with previous research, such as money being a common constraint towards upscaling. It is not unsurprising either that updating legal documents is key for creating conditions for scaling up, and that a lack of legal support can be an inhibiting factor.

The literature also emphasizes the role of reflexivity and learning, especially for prompting further change. The spread and scaling of the "summer streets" in Malmö was attributed to a positive response from citizens and effective dialogue, which ties into processes of learning. Likewise, when trialing alternative school lunch deliveries, the learning which took place between school kitchens and sharing of good experiences was accentuated to have encouraged more actors. These examples also demonstrate the importance of communication and how having a high-functioning dialogue between actors is necessary for enabling learning. While the need to establish collaborative networks is prominent throughout TM literature, the significance of communication itself is rarely emphasized, although, perhaps, tacitly implied.

The role of communication can also be discussed in relation to politicians as most things, ultimately, are political decisions. One respondent highlighted how scaling up successful experiments in many ways is a pedagogical challenge towards politicians. Consequently, it is not only important that learning takes place—to scale an experiment—but that lessons from said experiment also are conveyed to relevant actors. This also links to the question of who is involved in a transition arena and which skillsets they possess, which is further discussed in Section 4.4.1.

The experiences in relation to scaling in Malmö, however, largely confirm previous findings. Scaling up is difficult, and most scaling which takes place is the scaling out and repetition of experiments, and there are no clear processes of how the city works with scaling up to higher levels of governance.

5.3 Internal collaboration—strengths and weaknesses

RQ3 asks how the City of Malmö works with internal collaboration for reducing emissions from transportation. TM theory forwards how a transition arena should be established with actors from different domains, which then collectively develop a shared vision and understanding of the problem. It should be noted, clearly, that the City of Malmö has not explicitly aimed at following a TM approach, even though this thesis assesses the municipality's work in relation to TM. The work the City of Malmö has initiated with Climate Transitions Malmö in relation to transportation, however, could arguably act as the initial transition team.

Furthermore, while a formal transition arena does not exist, many networks and platforms with relevant actors are well-established—the climate contracts, for instance. Many of these networks act in silos though, either working exclusively within one department at the City of Malmö, or isolated by a specific topic. It could be valuable, however, to bring visionary actors together from these different domains and strive for collaboration on a more fundamental and transformative level.

When establishing such an arena, however, TM literature underscores how a necessary balance is required between niche and regime actors. Considering regime players, specifically, they are generally understood as required for enabling a transition, particularly in terms of providing resources. Up until that point is reached, though, regime-players often take on an inhibiting role (Grin et al., 2010). This largely corresponds to the experience in Malmö where FGK can be understood as a central regime player. There are actors within FGK who are forward-thinking

and visionary. But the findings also demonstrated how FGK may be limited in their visionary abilities due to their responsibility of the transportation system, and the extensive knowledge of current traffic conditions. It would therefore be wise to consider this if establishing a transition arena, and while FGK may be essential and therefore should be included, frontrunners should be chosen wisely, and the arena should not be limited to actors from within FGK.

One of the most critical findings of the research, which largely corroborates the theory, is the importance of who is involved in a transition in relation to their abilities and competencies. TM literature highlights how actors should be open and able to take on complex, interdisciplinary problems, as well as have strong collaborative skills and the ability to spread and explain visions throughout their networks. The same need was highlighted by a couple of respondents, largely from the perspective the City of Malmö is lacking this competence. Additional support is needed in addressing complex problems, as well as bridging dialogue between experts. This is also highly interconnected with the previous discussion on conflicts of interest and how department's easily work in silos.

5.4 Collaboration with regional actors—strengths and weaknesses

RQ4 asks how the City of Malmö works with external, regional collaboration in relation to reducing emissions from transportation. One of the main reasons why this question is asked is due to the intercity nature of transportation, and the inability to limit the topic to the geographical boundary of a city. Solutions must, thus, also occur on a regional level, and it is therefore relevant to examine how the City of Malmö collaborates with regional actors—in this case, Region Skåne and Skånetrafiken.

First, visions can be discussed, as one of the key messages of TM is the need to establish shared visions and organize actors to work in one unified direction (D. Loorbach, 2010). In the case of external collaboration, visions are shared on a general level, but something which can be discussed is Skånetrafiken's mission, which currently is limited to public transport exclusively. This means that increasing active modes of travel is not in the interest of the public transport company. While Skånetrafiken is not actively dissuading walking and biking, the actor, however, is arguably not as aligned as it could be in terms of working in a unified direction along with the City of Malmö. While a similar critique could be aimed towards Region Skåne, in the sense that they have a different approach towards climate neutrality 2030 than the City of Malmö, focusing more on rural populations than Malmö does, this does not necessarily have to be a disadvantage. Instead, this, arguably, complements the municipal visions of the City of Malmö by contributing with a more rural perspective—especially, as respondents from Malmö particularly emphasized the challenge of commuting and through traffic.

Joint actions do take place between the City of Malmö and regional actors, especially in relation to, for instance, public transport, which Skånetrafiken has the assigned responsibility over. However, one takeaway from the findings is that the municipality and region primarily seem to collaborate through joint platforms and efforts of knowledge building and sharing. While it is valuable that these platforms exist and bring actors together, it could be valuable if the collaboration between the City of Malmö and regional actors was expanded and included resource-sharing to greater extents, also beyond knowledge transfers.

5.5 Transforming transportation in Malmö

This section will briefly discuss the results conjointly, reflecting on the alignment between the different aspects, transformative change, and touch on issues which do not fall as clearly within one of the main aspects. While this thesis examined visions, experimentation, and collaboration

separately, the TM approach advances how these processes should be heavily intertwined. A question to ask, then, is to which degree these processes are unified within the City of Malmö.

A general trend is that a highly amicable relationship exists within the City of Malmö. Departments get along with each other, resources are often shared, and cross-sectoral networks exist within certain domains. However, as alluded to previously, collaboration does not necessarily exist on a deep, fundamental level. Moreover, the municipality's divided, organizational structure may not facilitate this type of collaboration either. Subsequently, regarding transportation, FGK is by far the most significant actor. It should be noted that a lot of aspiration and commitment can be found within FGK, but in terms of collaboration, the relationships become skewed due to FGK's dominance of the topic.

If this relationship—which equally stands true for other departments, but regarding other topics—is considered in relation to visions, it becomes evident as to why and how competing interests easily arise. It should be reiterated, that conflicts of interest are not due to any direct opposition of goals and departments agree on targets. It is difficult to plan a perfect city, however, where all goals are met instantly. Indeed, it may be impossible. As a consequence of departments having ownership over different topics, departments will also, in practice, work inconsistently against the various targets. Thus, a certain level of distance can be identified between collaborative practices and visions, as visions often are more closely connected to one of the departments.

The connection between experimentation and visions has already been briefly touched upon in Section 5.2. Building on this discussion, it is worth exploring the relationship between experimentation and visions further. First, it can be recognized that the experiments carried out by the City of Malmö predominantly do align with the municipality's visions. However, the case previously made though, is that a richer, more radical set of experiments could be facilitated more effectively if Malmö improved its ability to translate long-term goals into tangible actions in the short-term. Currently, the city primarily works with quantitative targets for the year 2030. Achieving such goals, however, requires civil servants to comprehend the implications of these targets in the short-term, and this can be difficult. If visions were more comprehensive, however, and better at capturing *how* change is taking place and what a transition towards decarbonized mobility would look like within the municipality, this would guide action further. Again, however, the significance of collaboratively developing visions must be stressed here, as the aim is to establish a shared direction within the municipality and align interests.

Finally, a note can also be said on politics. A continual insight throughout interviews was the challenge of working as a civil servant within political boundaries. Ultimately, political decisions determine the direction of the city, and these conditions may consequently change on a regular basis in line with political cycles. It should be emphasized that respondents were not questioning the democratic structure or processes at hand. Nevertheless, the political climate does restrict the realm of movement for civil servants. This can be experienced in a highly tangible manner, for instance, certain measures have been declined by the City Council. But indirectly, it also restricts the visionary role of municipal workers, as they, ultimately, do not have authority over certain decisions.

5.6 Reflection on results and methodological choices

The results of this study can be reflected upon in relation to the theoretical and methodological choices which have been made, as these choices influence the results of the study. First, this study used a theoretical framework based on the TM approach to analyze how the City of Malmö works with decarbonization of transportation. Within this framework, the concepts of visions, experimentation, and collaboration were focused on. While this framework was useful

for studying the topic and could provide insight to how the City of Malmö's work with reducing emissions from transportation could be guided further, another type of theoretical framework would have produced a different type of results.

Within the field of sustainability transitions, there are different analytical frameworks which could have been employed, TM being one of them. For instance, while the MLP was considered in this thesis, it could have been used as the primary theory to guide the data collection and analysis. If so, the focus would have been shifted towards understanding the interactions between niche, regime, and landscape levels further, how windows of opportunity arise, and how the relationship between these different levels influences the break-through of niche innovations (Köhler et al., 2019). Similarly, Strategic Niche Management (SNM) is another related framework on transitions. While the foundations are similar between SNM and TM, the field of SNM often has a more technical approach with a focus on innovation trajectories, even if many concepts between the two fields are shared (Köhler et al., 2019; Raven et al., 2010).

Second, within the theoretical framework of TM, this thesis and its research questions focuses on the key concepts of visions, experimentation, and collaboration, as the literature highlights these aspects as critical for enabling transformative change. While these research questions are justified and this thesis manages to provide insight within this regard, further examination of TM practices is encouraged.

Considering the methodological choices of this thesis, a note can be said on generalization. Qualitative research—and case studies in particular—rarely try to lay claims on producing generalizable findings. This stands true for this thesis as well. The strength of this thesis, however, lies in its particularity and insights for this specific context. Broad generalizations can potentially be inferred though, and this research can contribute to analytical generalization in relation to the theory on TM (Yin, 2014). The aim of this research was not to produce generalized findings though, and the recommendations of this thesis should most likely only be considered within the cultural, geographical, and temporal context in which the study took place.

6 Conclusions and recommendations

This chapter presents the conclusions and recommendations of this thesis. First, conclusions are presented, which reports the main findings on how the City of Malmö works with visions, experimentation, and internal and regional collaboration within decarbonization of transportation. Second, recommendations for the City of Malmö are presented on how the municipality could improve their work processes in relation to decarbonizing transportation to drive transformative change.

6.1 Conclusions

The aim of this thesis was to explore transformations towards a decarbonized transportation system in the City of Malmö. The TM approach was used to assess the municipality's work in relation to three key concepts: visions, experimentation, and collaboration. To guide this research, the following research questions were formulated:

RQ1: How does the City of Malmö work with visions and goals for reduced emissions from transportation?

RQ2: How does the City of Malmö work with experimentation, innovation, and scaling up for reducing emissions from transportation?

RQ3: How does the City of Malmö work with internal collaboration for reducing emissions from transportation?

RQ4: How does the City of Malmö collaborate with regional actors for reducing emissions from transportation?

In relation to visions, there are clear numeric goals related to reduced emissions and modal splits. There are also many keywords used within the municipality—such as "space-efficient", "green", "close", "healthy", among others—which captures the envisioned direction for Malmö. However, the municipality works less with other forms of visioning, such as using images, narratives, or storytelling. While a more vibrant, holistic vision can be found in the city's CP, this is still very broad and does not necessarily offer a compelling vision, even if a direction is clear. Instead, alternatives such as the "15-minute city" could be considered as a possible contender for an inspiring vision, which aligns with the city's goals.

Throughout the municipality, there is agreement on goals and the desired direction Malmö should head in. However, what constitutes a challenge is the tendency for departments to focus on different goals and the prevalence of conflicting interests. Contradictions do not exist in terms of disagreement on results, but rather, what objectives people are prioritizing in practice. Uneven prioritization of goals can also be linked to which tools the municipality has access to, and how well these tools capture different benefits. Predominantly, it is understood that tools rarely are as capable at recognizing social benefits as, for instance, traffic-related ones. Subsequently, this also influences which measures are focused on and what type of goals are prioritized.

The visions the City of Malmö have aim to overturn the current regime and are distinguished by scenarios where walking, biking, and public transport dominate the transportation system, as opposed to cars. When discussing visions, the municipality primarily works with goals for 2030. While goals exist on other timeframes, these are not utilized to the same extent, nor are goals regularly broken down into interim objectives. This ties into how the city works with experimentation and how closely experiments are tied to visions. With a wide range of actions

taking place in Malmö, certain experiments can be understood as novel and radical, while many actions remain quite conventional. If radical visions, thus, were broken down into clearer interim objectives, bolder experimentation might be more easily achieved.

A large variety of actions and experiments are being conducted in Malmö, and these have a reinforcing effect on each other and propel transition paths further by gradually reshaping society. Actors are also encouraged to take on their own action perspectives, as demonstrated, for instance, by the city's work with climate contracts, and the municipality is eager to act as a testbed for experimentation and provide resources to frontrunners. In terms of experimentation conducted by the City of Malmö, technology-focused projects may be more prominent compared to soft measures, even if both occur. Likewise, electrification initiatives are perhaps overrepresented in practice in relation to their prevalence in governing documents and are less connected to the overarching visions of the City of Malmö, even if respondents agree that electrification will be necessary alongside efforts to reduce travel and shift towards active and public modes of transport. Considering what type of experimentation which takes place and if experiments are radical, many respondents also questioned if, perhaps, stronger requirements may be needed. Of high importance, however, is ensuring that successful experiments are scaled up. While positive examples exist, scaling nevertheless proves to usually be a difficult task.

In relation to collaboration, a formal transition arena does not exist. Most transportation issues are also predominantly handled by FGK, and different priorities between departments can inhibit collaboration. A lot of partnerships do exist, however, such as the Climate Transitions network, along with many other platforms related to different topics. Common understandings also seem to be established among actors, even if there may be diverging opinions in relation to the pace at which decarbonization of the transportation should take place. The one exception may be in relation to politicians where climate mitigation still can be a sensitive topic.

Finally, in relation to regional actors, visions seem to be aligned. Skånetrafiken is somewhat limited by their assignment to only focus on public transportation, however. Joint efforts take place and collaborative practices are relevant, however, this is predominantly true in relation to establishing various networking platforms and bringing actors together for dialogue. Inherent challenges also exist in cooperating due to jurisdictional limitations and working within different spaces of operation.

6.2 Recommendations

This section will present recommendations to the City of Malmö which can guide the municipality in their work towards transformative change within decarbonization of the transportation system. Seven recommendations for the City of Malmö have been identified and are listed below.

First, the City of Malmö should establish a formal transition arena with actors from different domains. Many partnerships and relations already exist throughout the city, and the municipality could utilize the already existing working group within FGK which is responsible for the transition area of mobility, within the Climate Transitions Malmö initiative, to develop an arena and create a safe space for frontrunners.

Second, when establishing a transition arena, it is important that people who are included have strong collaborative skills, can approach complex and interdisciplinary problems, are open to new ideas, and are strong communicators with the ability to bridge dialogues between actors and disseminate knowledge throughout networks. This should be prioritized when considering which frontrunners to involve.

Third, it is recommended that the City of Malmö adopts and promotes a more captivating and inspiring vision which can be communicated externally and mobilize actors. One possible alternative for such a vision could be the "15-minute city" which aligns with the direction the municipality is currently working towards.

Fourth, the City of Malmö should work with a greater variety of tools when envisioning the future, not just focusing on numeric goals. This can include images, narratives, storytelling, among other strategies. Furthermore, it should be a collaborative operation where the process of envisioning is central to align interests within the transition. It is key that the full process of how change takes place is being imagined, which various envisioning tools can facilitate, and not just focusing on final results.

Fifth, more radical experimentation is encouraged. To manage this feat, it may also be advisable to strengthen work with breaking down visions into interim objectives. Thus, radical experimentation can be conducted in incremental steps, assuming clear connections exist between long-term visions and short-term action.

Sixth, scaling up successful experiments is important, but often challenging. A recommendation for the City of Malmö would therefore be to work further with developing methods and strategies for scaling up promising experiments and accelerating innovation further.

Seventh, the City of Malmö may aim to expand the collaboration with regional entities further and consider which regional resources and capacities which would complement the municipalities work.

6.3 Recommendations for future research

This thesis has used TM as an entry point to explore how municipalities can drive transformations towards a decarbonized transportation sector. The literature on TM is extensive, both in relation to transportation, and in relation to urban governance. The current body of literature also comprises many case studies on TM in different urban contexts, but most focus on the design and implementation of TM, and few focus exclusively on transportation. This thesis takes an evaluative approach to examine how the City of Malmö works with transportation and concludes in recommendations to guide the municipality further. This study, thus, expands the knowledge on how municipalities can contribute to sustainable transitions within the transportation sector, utilizing insights from TM to guide this analysis. This thesis also demonstrates how the governance practices of TM can be utilized to assess municipal work.

This thesis will become a part of an incredibly vast field of literature studying decarbonization of transportation. Even so, knowledge is currently not sufficient on how cities can tackle mobility and reduce emissions from the transportation sector. As such, further research within the area can only be encouraged. Considering the context and insights of this thesis, however, a few recommended avenues for further research can be recommended.

First, the limitations of this thesis could be explored further in future research. While this thesis tentatively explored the relationship toward regional actors, this could be done to much greater extents. Mobility is, ultimately, a topic which cannot be limited to one—or even a few— jurisdictions, and it is essential that cross-jurisdictional action is understood further. This poses an interesting, but challenging, field of research as mobility is predominantly experienced locally, but can transgress even national boundaries. Thus, an urban or regional perspective does not provide sufficient knowledge to tackle this problem. Moreover, a much wider range of actors which operate in the urban environment could be incorporated as well to provide a broader understanding of the key actors in decarbonizing transportation. This could, for instance,

include property developers, transport and delivery companies, local businesses, civil society, among others.

Another limitation relates to the single-case study approach, and it would similarly be valuable to understand how other cities in Sweden work with visions, experimentation, and collaboration in relation to decarbonizing transportation. Additionally, each aspect could be addressed further, and it would similarly be valuable to have more extensive knowledge on how municipalities can work with visions, experimentation, and collaboration. Much uncertainty still exists in relation to how municipalities effectively can contribute to transformations towards decarbonized transportation systems.

Second, it would be pertinent to increase knowledge on how TM practices can navigate political processes. The findings highlighted how civil servants are locked by political decisions, and it would be advisable to further understand how transformative change can be pursued by municipalities within this dynamic.

Third, this thesis confirmed the need for capacity building among individuals involved with transformative processes. While it is established that collaborative, interdisciplinary skills are needed within transition arenas, it would be valuable for further research to explore how this capacity can be fostered within municipal organizations.

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Appendix

Appendix I – Interview guide

As interviews were conducted in Swedish, this guide has been translated into English.

Introduction

- What is your role within [department/organization]?
- How does you and [department/organization] work with transportation?

Visions

- What do visions and goals of a decarbonized transportation sector look like?
    - What do long-term visions look like? (~25 years)
    - What do short-term visions look like? (5–15 years)
- How do you work with these visions at [department/organization]?
- What documents does your [department/organization] use which describes these visions/goals?

Experimentation

- What kind of measures/experiments do you work with within transportation?
    - What does the relationship look like between measures/experiments and visions?
- How does [department/organization] work with testing innovative solutions for reducing emissions from the transportation sector?
- How do you identify good measures/experiments within transportation?
- How do you work with scaling up successful innovations or solutions?

Collaboration

- Which role does [department/organization] take in reducing emissions from the transportation sector in Malmö?
- Which actors do you collaborate and interact with (in relation to transportation)?
    - Internally?
    - Externally?
- Is your perception that you share the same visions for decarbonizing transportation with other actors?
- What works well in your collaboration with other actors? What are the opportunities?
- What does not work well in your collaboration with other actors? What are the challenges?

Concluding remarks

- Where do you see the greatest opportunities for decarbonizing transportation in Malmö?
- Where do you see the greatest challenges for decarbonizing transportation in Malmö?
- Is there anything else you would like to add or discuss?
- Is there another relevant person/department you would recommend I talk to?

Appendix II – Coding framework

- **Visions**
  - o Clear, inspiring vision
  - o Shared visions
  - o Connections between long-term and short-term goals
  - o Modified visions
  - o Improve or overturn regime
  - o Social dimensions

- **Experimentation**
  - o Radical experimentation
  - o Connection to vision
  - o Multidimensional experimentation
  - o Furthering innovation/transitions
  - o Empowered actors
  - o Reinforcing experiments
  - o Learning
  - o Scaling

- **Collaboration**
  - o Transition arena, actors from different domains
  - o Common understandings
  - o Collaboration, provision of resources