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Urban Futures in Focus: Imaginaries and Barriers for Urban Climate Neutrality in EU Mission Cities

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Abstract

Urban climate neutrality has emerged as a critical goal for sustainable urban development, with the European Union's Cities Mission aiming to achieve 100 climate-neutral and smart cities by 2030. However, the term "climate neutrality" holds diverse interpretations among stakeholders, leading to inconsistencies and potential negative outcomes. This study investigates the dominant sociotechnical imaginary for urban climate neutrality within the context of the Cities Mission, focusing on the cities of Stockholm and Amsterdam. It examines the key narratives contained in the dominant sociotechnical imaginary and perceived barriers to its implementation. Through qualitative research methods, including semi-structured interviews and document analysis, six key narratives and five categories of barriers were identified. The narratives are: (1) Sustainable mobility and transport, (2) Community engagement and just transition, (3) Frontrunners in urban climate action, (4) The city as an experiment, (5) Green economy and business innovation, and (6) The city as a complex system. Meanwhile, the identified barriers encompass: (1) legal and regulatory barriers, (2) policy-making and political barriers, (3) governance and administrative barriers, (4) financial and investment barriers, and (5) consumption and behaviour-change barriers. Findings reveal overlaps and contradictions between narratives suggesting opportunities for integrated policies. Furthermore, barriers are found to shape narratives, providing insights for adaptive strategies. Overall, the findings indicate that addressing legal, political, governance, financial, and behavioural barriers will help to facilitate the successful implementation of urban climate neutrality initiatives.

Keywords: Climate-neutrality, Cities Mission, urban, sociotechnical imaginaries, barriers

Executive Summary

Urban areas are significant contributors to environmental degradation, yet they also serve as critical hubs for innovation and sustainable development. Increasingly, cities are participating in initiatives to combat climate change and promote sustainability. One such initiative is the European Union's (EU) Cities Mission for 100 Climate Neutral and Smart Cities by 2030, launched by the European Commission in 2021.

Despite its increasing popularity, climate neutrality is an ambiguous and mutable term. Different cities and stakeholders can have their own visions, interpreting the term in their own way and envisioning various implementations and outcomes for an urban climate-neutral future. Inconsistencies and ambiguities in these visions can lead to negative outcomes, such as policy inefficiencies, inconsistent development, and social inequalities.

For the successful implementation of the Cities Mission, and to gain a better understanding of the diverse visions for a climate-neutral future held by the Mission cities and the stakeholders involved in the Cities Mission, it is crucial to facilitate the alignment of these various visions. The concept of sociotechnical imaginaries provides a valuable lens to understand these collectively held visions of desirable urban futures, particularly at the intersection of science and technology. Sociotechnical imaginaries are essential because they not only describe desirable futures but also influence them through their performative power. In particular, dominant sociotechnical imaginaries, endorsed by influential stakeholders such as national and local governments and international organisations, significantly influence the trajectory of urban development. Investigating the specific constituents of the dominant sociotechnical imaginary for urban climate neutrality in the context of the Cities Mission offers insights into the collective vision that drives this initiative. However, various obstacles hinder the implementation and realisation of this dominant sociotechnical imaginary.

This study seeks to investigate the dominant sociotechnical imaginary for urban climate neutrality within the context of the Cities Mission, and the barriers impeding its realisation. Specifically, the aim of the study is to identify the narratives contained within the dominant sociotechnical imaginary for urban climate neutrality, and the perceived barriers hindering the implementation of this sociotechnical imaginary.

The specific research questions guiding the study are:

RQ1: What are the key narratives contained in the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?

RQ2: What are the perceived barriers impeding the implementation of the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?

To address the stated research questions, this thesis adopts a qualitative research approach. To gain an in-depth and comprehensive understanding, a case study methodology is employed, focusing on the Mission cities of Amsterdam and Stockholm, as well as the EU and national governance levels of the Cities Mission. Data collection included 11 semi-structured interviews with representatives from different levels of governance involved in the Cities Mission, including the Cities Mission Board, the NetZeroCities project, Viable Cities, and the municipalities of Stockholm and Amsterdam. A document review of strategic climate documents from Stockholm and Amsterdam was also conducted to complement the interview data. To address the first research question, a narrative analysis of the interview and documentary data was conducted, allowing for the identification of the key narratives. To

address the second research question, a thematic analysis of the interview and documentary data was conducted, revealing perceived barriers hindering the implementation of the dominant sociotechnical imaginary.

The analysis identified six key narratives underlying the sociotechnical imaginary for urban climate neutrality in the Cities Mission: (1) Sustainable mobility and transport, (2) Community engagement and just transition, (3) Frontrunners in urban climate action, (4) The city as an experiment, (5) Green economy and business innovation, and (6) The city as a complex system.

Meanwhile, five categories of perceived barriers were identified through thematic content analysis: (1) legal and regulatory barriers, (2) policy-making and political barriers, (3) governance and administrative barriers, (4) financial and investment barriers, and (5) consumption and behaviour change barriers.

Through the conceptual framework developed for this study, it was revealed that the narratives for climate neutrality can overlap, intersect, and even contradict one another. This suggests an opportunity to develop integrated policies to capitalise on overlaps between narratives. Moreover, it points to a need to address contradictions within and between narratives for more coherent policies, and to recognize and acknowledge contradictions to enhance collaboration and build trust with stakeholders.

In addition, it was found that barriers to implementation can feed back to influence narratives contained in the dominant sociotechnical imaginary. This interaction can be leveraged to develop adaptive strategies, aligning narrative goals with feasible implementation pathways.

Additional recommendations are made for policymakers and urban stakeholders, corresponding to certain barriers identified in the study. Specifically, it is recommended that restrictive legal barriers inhibiting experimentation are lowered, national support structures are established to facilitate collaboration between government agencies, and policy labs are created to guide practitioners through national laws and regulations and facilitate innovative policy development. To address political barriers, transparent communication and active collaboration with the public and stakeholders are recommended to ensure the continuity of climate initiatives. To address financial barriers and increase municipalities' access to funding, the establishment of one-stop shops, which serve as centralised hubs to streamline financial processes and provide easier access to funds and resources for climate actions is recommended. Lastly, to address consumption, collaborative approaches that engage diverse stakeholders are recommended to influence individual and collective behaviour.

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Abbreviations

CCCs	Climate City Contracts
CO2	Carbon Dioxide
EU	European Union
Km	Kilometre
NGO	Non-governmental organisation
RQ1	Research question one
RQ2	Research question two
R&I	Research and innovation
USA	United States of America

1 Introduction

1.1 Problem Definition

Cities, as epicentres of human activity, contribute significantly to environmental degradation, with over two-thirds of the world's energy consumption and more than 70% of global CO2 emissions originating from urban areas (International Energy Agency, 2008). This urban energy use is projected to rise significantly, reaching 73% of the global total by 2030 (International Energy Agency, 2008). In the face of escalating climate challenges, the imperative to foster transformative urban sustainability has propelled cities worldwide into ambitious initiatives aimed at achieving climate neutrality (Shabb et al., 2022). One such effort is the European Mission for 100 Climate Neutral and Smart Cities by 2030 ('the Cities Mission'), a collective endeavour, launched in 2021, which seeks to transform 112 cities into resilient, low-carbon entities by 2030 (European Commission, 2021).

At the heart of this initiative lies not just a technical transition but a profound socio-technical transformation, that is driven by the visions and sociotechnical imaginaries held by urban stakeholders (Tozer & Klenk, 2018). Sociotechnical imaginaries, as coined by Jasanoff and Kim (2015), can be understood as visions of desirable futures that are collectively embraced, institutionally stabilised, and publicly enacted, particularly at the intersection of science and technology. These sociotechnical imaginaries are powerful and can have a substantial impact on policy development and decision-making (Delina, 2021; Rudek, 2022). However, the specific contours of climate-neutral urban futures often remain uncertain, ill-defined, or subject to disagreement (John et al., 2015; Tozer & Klenk, 2018), which can lead to policy inefficiencies, inconsistent development, and social inequities (Jasanoff & Kim, 2015).

Understanding the role of sociotechnical imaginaries in energy transitions has been identified as an important issue in both academic and practical literature (Rudek, 2022; Von Wirth et al., 2020). For instance, von Wirth et al. (2020) identify imaginaries as a key research theme in the 100 Social Sciences and Humanities priority research questions for renewable energy in Horizon Europe. Building on this, Rudek (2022) underscores the importance of understanding the role of imaginaries and narratives for achieving just and effective energy transitions. Meanwhile, in the frame of the Cities Mission, the importance of a shared vision for the effective implementation of urban climate initiatives is emphasised. A report from the Transnational Cooperation on the Missions Approach notes that there is a need to "collectively envision desired futures as guideposts and orientation for mission implementation" (TRAMI, 2024, p. 13). Similarly, an interim assessment of the Cities Mission advocates for the translation of the mission into tangible narratives in order to engage stakeholders and enable the effective and just realisation of the Mission's objectives (Kaufmann et al., 2023). These insights highlight the significance of sociotechnical imaginaries and tangible narratives for achieving energy transitions and urban climate neutrality.

Overall, the pivotal role of narratives and imaginaries in describing and shaping energy transitions and urban sustainability initiatives makes them key objects of interest in the context of the Cities Mission. However, the realisation of the Cities Mission's target of achieving urban climate neutrality by 2030 is hindered by various implementation barriers. By unravelling the sociotechnical imaginary for urban climate neutrality in the Cities Mission and shedding light on the challenges that hinder its realisation, this study seeks to contribute to the effective implementation of the Mission and urban initiatives for climate neutrality more broadly, aligning with global efforts to address climate change and promote sustainable urban development (Tozer & Klenk, 2018).

1.2 Aim and Research Questions

This study aims to investigate the dominant sociotechnical imaginary for urban climate neutrality within the context of the Cities Mission, and the barriers impeding its realisation in order to address the above-described research problem. Specifically, it seeks to identify the narratives contained within the dominant sociotechnical imaginary for urban climate neutrality, and the perceived barriers hindering the implementation of this sociotechnical imaginary. This study will focus on the cities of Stockholm and Amsterdam, which are part of the Cities Mission, as well as the Mission's national and European Union (EU) level governance, to gain a comprehensive understanding of the narratives and perceived barriers to achieving urban climate neutrality.

The following research questions (RQs) will guide this investigation:

> **(RQ1) What are the key narratives contained in the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?**
>
> **(RQ2) What are the perceived barriers impeding the implementation of the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?**

1.3 Scope and Delimitations

As outlined above, this empirical study explores the dominant sociotechnical imaginary for urban climate neutrality, the narratives embedded in it, and the barriers impeding its implementation within the context of the Cities Mission. There are several points relating to the scope and delimitations of this study that are worth mentioning.

The Cities Mission has the dual objectives of "climate neutral and smart cities". However, this study will centre on the "climate neutral" aspect, as opposed to the "smart" aspect of the Mission. This decision is based on the evolving dynamics surrounding the inclusion of "smart" within the Mission's scope, as indicated by Kaufmann et al. (2023). In addition, the complexities associated with the integration of smart technologies warrant a more comprehensive investigation beyond the scope of this study. Therefore, to maintain clarity and focus, this study will concentrate on exploring narratives and barriers specific to urban climate neutrality.

In addition, this study focuses on the dominant sociotechnical imaginary for urban climate neutrality, which is defined as the prevailing vision endorsed by key stakeholders and does not delve into alternative sociotechnical imaginaries. Alternative sociotechnical imaginaries, which may be proposed by NGOs, community groups, and other stakeholders could offer diverse perspectives on urban climate neutrality. However, due to its limited scope, this study prioritises an in-depth examination of the dominant sociotechnical imaginary to gain a nuanced understanding of the primary narratives and barriers shaping and influencing the Cities Mission.

The research encompasses multiple governance levels: the city level, the national level, and the EU level. At the city level, this study includes two case study cities: Stockholm and Amsterdam, both of which are part of the Cities Mission. The case study approach was selected since it accommodates an in-depth exploration of the local narratives and perceived barriers at the urban level (Yin, 2009). At the national level, the study incorporates the perspectives from Viable Cities, which represents the Swedish national perspective on urban climate neutrality. Due to the absence of a dedicated national-level perspective for the Netherlands within the scope of this research, no equivalent analysis is conducted for the

Dutch national level, which introduces a limitation regarding the comprehensiveness of national-level insights. At the EU level, the study explores perspectives from the Cities Mission Board and the NetZeroCities initiative. By encompassing multiple governance levels, this research aims to provide a holistic understanding of the narratives and barriers within the context of the Cities Mission, while simultaneously gaining an in-depth understanding through the case study approach. Nonetheless, it is acknowledged that not all governance levels have been included (e.g., transnational) and that Stockholm and Amsterdam present unique contexts and characteristics which may affect the generalisability of the results.

It is key, here, to note how sociotechnical imaginaries have been conceptualised in this study. Given the novelty of sociotechnical imaginaries as an analytical concept, they have been conceptualised in various ways across existing literature, leading to variations in their boundaries and scope (Rudek, 2022). This study seeks to investigate the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission, gathering insights from various governance levels of the Mission to gain a comprehensive understanding of this SI. Because the boundaries of a sociotechnical imaginary are relatively ambiguous (Rudek, 2022), it could be argued that each governance level possesses its own distinct sociotechnical imaginary, which may overlap with one another. However, for the purposes of this study, a holistic approach, which encompasses multiple governance levels is adopted to examine the overarching, dominant sociotechnical imaginary guiding efforts towards urban climate neutrality within the Cities Mission. Thus, this study's main focus is not to compare differences in the sociotechnical imaginaries across governance levels, but rather to investigate the broader, collective sociotechnical imaginary for urban climate neutrality within the framework of the Cities Mission. This broad focus is reflected in the conceptual framework (see section 3.4).

Next, due to the focus on the Cities Mission, for which the planning started in 2019 (Kaufmann et al., 2023), the temporal scope of the study focuses mainly on the time period from 2019 to May 2024, when the data collection ended. Specifically, the document analysis focuses on documents published between 2019 and 2024, while the semi-structured interviews were conducted between March and May 2024. It is important to acknowledge that the findings may not fully capture any subsequent developments or changes in narratives and barriers that may have occurred after this time frame.

By delineating the scope and boundaries of this research, the study acknowledges its focus on specific urban contexts, governance levels, and temporal frame. These delimitations are intended to provide a concentrated and detailed analysis that aligns with the research aim and questions, while recognizing that the findings may not be universally applicable to all cities or national contexts involved in the pursuit of urban climate neutrality.

1.4 Ethical Considerations

Researcher honesty and personal integrity

The research is related to the Cities Mission and has been supervised by an academic and practitioner who is involved in the Cities Mission. However, the research was not funded or supported by the Cities Mission or another external organisation. Moreover, no individual or organisation unduly influenced the analysis or subsequent conclusions.

Ethical responsibilities to the subjects of research

To ensure that participants participated willingly in the research, informed consent processes emphasised the voluntary nature of participation, allowing individuals to make autonomous decisions about participating in the research. The information and consent form can be found in Appendix A. No identifiable harm or disadvantage is anticipated for participants. Strict

confidentiality measures were in place to protect participants and their responses, ensuring a positive and secure research experience.

The outcomes of the research
The research findings have no detrimental impact on the subjects involved. The researcher is committed to presenting results objectively and upholding the reputation and privacy of participants.

Handling and storage of data records
Measures to protect sensitive information, including encryption and anonymisation were employed. Access to data was restricted, with digital records being stored on a password-protected computer, and physical records being stored securely. Precautions were taken to ensure that in case information is revealed, it cannot cause harm to participants or others.

1.5 Audience

This thesis is intended for a diverse audience, including academics, policymakers, urban planners, and community groups engaged in advancing urban sustainability, particularly within the context of the Cities Mission. Given the intersectoral nature of the research, the findings aim to contribute to both academic discourse and practical policy formulation.

First, researchers interested in the fields of urban studies, environmental sociology, sustainable development, and sociotechnical imaginaries may find this study relevant. The investigation into the dominant sociotechnical imaginary for urban climate neutrality contributes to existing literature on sociotechnical imaginaries and urban sustainability, while also providing a novel methodological and conceptual approach to examining and analysing sociotechnical imaginaries, which could stimulate further research and theoretical developments in these fields.

Secondly, policymakers and urban planners involved in developing and implementing strategies for urban sustainability and climate action can benefit from the insights generated by this research. By examining the dominant sociotechnical imaginary for urban climate neutrality within the context of the Cities Mission, policymakers can better understand the narratives driving current initiatives (Rudek, 2022) and the barriers hindering their realisation. This understanding can inform the design of more effective policies and strategies to accelerate progress towards urban climate neutrality.

Thirdly, community groups, local citizens, and other advocates for sustainable urban development could leverage the findings of this research to advocate for more inclusive and holistic approaches to urban climate governance. By highlighting the narratives that shape perceptions of urban climate neutrality and the systemic barriers that hinder progress, this research could help environmentalists advocate for transformative change and mobilise support for community-driven initiatives aimed at achieving climate neutrality in cities. Ultimately, this thesis seeks to engage a broad audience across academic, policy, practitioner and community spheres. By examining the dominant sociotechnical imaginary and perceived barriers within the context of the Cities Mission, this study seeks to provide actionable insights and theoretical contributions that can inform policy, practice, and further research in the field of urban sustainability.

1.6 Disposition

Chapter 1 (Introduction): This chapter introduces the research topic and problem, outlines the aim, and presents the research questions. It provides information on the scope, ethical considerations, and intended audience of the study.

Chapter 2 (Background): This chapter provides information on the Cities Mission, presenting a contextual background for the study. It also presents practitioners' perspectives collected from a mini-pre study, which set the stage for this study.

Chapter 3 (Literature Review): This chapter critically reviews and synthesises existing literature on sociotechnical imaginaries, particularly in energy research, exploring literature relevant to the research topic. Moreover, it examines existing literature and research on barriers and challenges to implementing climate neutrality. Finally, it presents the conceptual framework developed and used to guide the research.

Chapter 4 (Research Design and Methodology): This chapter outlines the research design, the data collection methods, and the data analysis methods employed in this study.

Chapter 5 (Findings): This chapter presents the main findings of the research, addressing each research question systematically. It provides a detailed exploration of the key narratives contained in the dominant sociotechnical imaginary for climate neutrality in the Cities Mission and presents the key barriers to implementation of the dominant sociotechnical imaginary for urban climate neutrality in the context of the Cities Mission.

Chapter 6 (Discussion): This chapter discusses the implications of the findings in the context of existing knowledge and research. It discusses the efficacy of the conceptual framework and proposes specific adaptations. The conceptual approach, methodology, and limitations of the study are also reflected upon.

Chapter 7 (Conclusion): This chapter concludes the study by addressing the aim and research questions. The practical implications of the study are also discussed, particularly for non-academic audiences. Finally, recommendations for future research in the field are presented.

2 Background

This chapter provides background information relevant to the study. Firstly, a general overview of the Cities Mission is provided. Second, the findings from a pre-study are presented, which reveal practitioners' perspectives that support this study's research focus.

2.1 The EU Mission for 100 Climate-Neutral and Smart Cities by 2030

In 2017, the EU adopted an approach known as the mission approach, to tackle pressing societal challenges faced by modern European societies (Kaufmann et al., 2023). Embedded within the Horizon Europe research and innovation framework programme, the EU's flagship funding initiative aimed at driving scientific excellence and innovation across Europe from 2021 to 2027, the European Commission adopted five key missions (European Commission, 2024). These missions are:

1. *Adaptation to Climate Change: support at least 150 European regions and communities to become climate resilient by 2030*
2. *Cancer: working with Europe's Beating Cancer Plan to improve the lives of more than 3 million people by 2030 through prevention, cure and solutions to live longer and better*
3. *Restore our Ocean and Waters by 2030*
4. *100 Climate-Neutral and Smart Cities by 2030*
5. *A Soil Deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030* (European Commission, 2024)

Inspired by the ambition and cooperative ethos of the Apollo mission to the moon, the mission approach and associated EU Missions represent a novel strategy for tackling complex and interconnected issues, often characterised as "wicked problems" (Shabb et al., 2022). This approach seeks to transcend the conventional role of research and innovation solely as drivers of economic growth and technological progress. Instead, it integrates research and innovation with novel approaches to governance, collaboration, and citizen engagement (European Commission, 2024). In doing so, the Missions seek to mobilise resources and expertise toward ambitious and targeted goals (Shabb et al., 2022).

The fourth mission, for 100 Climate Neutral Cities by 2030, which was launched in September 2021 (Kaufmann et al., 2023), has two broad objectives, namely "to deliver at least 100 European climate-neutral and smart cities by 2030" and "to ensure that these cities also act as experimentation and innovation hubs for others to follow, to enable all European cities to become climate-neutral by 2050" (European Commission, 2021, p. 13). Beyond the two overarching objectives, the Mission also encompasses seven specific objectives, as outlined in the Mission implementation plan (see Appendix B).

The timeline for the Mission's objectives spans from 2021 to 2050, encompassing several stages. It begins with an early delivery stage, spanning from 2020 to 2022, during which the foundational elements of the Mission are established. This phase included the selection of participating cities, the preparation of implementation and investment plans by these cities, and the appointment of a mission board and leader (Kaufmann et al., 2023). In April 2022, a total of 112 cities, from each EU Member state and from 12 other countries associated with Horizon Europe, were selected to participate in the Cities Mission. Subsequently, the main implementation phase unfolds from 2021 to 2030, starting with the creation and endorsement of the Climate City Contracts (CCCs). This phase focuses on the reduction of Scope One and Scope Two emissions, i.e., those that are directly emitted by the cities and those indirectly associated with the consumption of purchased electricity, heat, and cooling (European Commission, 2021). The CCC contracts, though non-binding, serve as pivotal documents

wherein each city delineates its objectives, targets, and strategic action plans aimed at achieving this climate neutrality by 2030 (Krogh Andersen & Jordan, 2020). CCCs are developed through a collaborative co-creation process engaging the respective cities, national and regional authorities, local citizens, and other relevant stakeholders. Upon the signing of a city's CCC by the cities themselves, the city is poised to commence the implementation phase, executing the provisions outlined in their CCC (European Commission, 2021). Ultimately, the expectation is that this pioneering group of 100 cities will serve as trailblazers, inspiring and guiding other European cities toward achieving climate neutrality by 2050 (European Commission, 2021).

The Cities Mission aligns with the broader imperatives of the European Green Deal, emphasising a city level focus to drive transformative change. The key aims of the European Green Deal, namely, to achieve climate neutrality by 2050, and to cut emissions by at least 55% compared to 1990 levels by 2030, and to increase the share of renewable energy in the EU's energy mix, underscore the urgency and ambition of Europe's commitment to combat climate change (European Commission, 2019). By focusing on cities as engines of innovation and sustainability, the Cities Mission leverages the European Green Deal's targets to promote local climate action and resilience (Shabb et al., 2022).

Beyond complementing the goals of the European Green Deal, the Cities Mission also plays a role in advancing progress towards the Sustainable Development Goals set forth by the United Nations (European Commission, 2021). By prioritising climate action and sustainability at the urban level, the Cities Mission directly supports Sustainable Development Goal 11, "Sustainable Cities and Communities," promoting inclusive, safe, resilient, and sustainable urban development. Moreover, the Mission's emphasis on reducing energy consumption and greenhouse gas emissions aligns with Sustainable Development Goal 13, "Climate Action," which seeks to combat climate change and its impacts. Additionally, the Cities Mission's focus on fostering innovation, economic growth, and social equity in urban areas resonates with various other Sustainable Development Goals, including Sustainable Development Goal 8, "Decent Work and Economic Growth," and Sustainable Development Goal 10, "Reduced Inequalities." By leveraging the synergies between the European Green Deal and the Sustainable Development Goals, the Cities Mission offers a holistic and integrated approach to addressing pressing global challenges while advancing sustainable development at the local and regional levels.

Climate Neutrality in the Cities Mission

The concept of climate neutrality is ambiguous and still evolving, and there is no consensus on a universally accepted definition of what climate neutrality entails for an urban area (European Commission, 2021). Within the framework of the Cities Mission, climate neutrality is defined across three scopes: Scope 1 involves direct greenhouse gas emissions originating within the city's geographic limits, including sources like buildings, industry, transport, waste treatment, agriculture, and forestry (European Commission, 2021). Scope 2 encompasses indirect emissions from grid-supplied electricity and heating/cooling consumed within the city (European Commission, 2021). Although not currently factored into the Mission's calculations, Scope 3 emissions are acknowledged as significant and may be incorporated in the future, covering activities beyond the city's boundaries such as waste treatment, energy transmission, transportation, as well as private consumption (European Commission, 2021).

2.2 Practitioners' Perspectives from a Pre-Study

To investigate the relevance of this thesis' research focus on sociotechnical imaginaries within the realm of applied urban sustainability and climate action, a mini pre-study was undertaken. As part of this pre-study, semi-structured interviews were conducted with two practitioners involved in Sweden's national strategic innovation programme, 'Viable Cities'. Launched in 2017, before the launch of the Cities Mission, the Viable Cities programme shares the goal of achieving urban climate neutrality by 2030 and has served as a source of inspiration for the Cities Mission (Shabb & McCormick, 2023). Given these parallels, it was anticipated that the practitioners engaged in the Viable Cities programme could provide insights into the real-world significance of sociotechnical imaginaries for urban climate neutrality, thereby shedding light on the relevance of this thesis.

The pre-study yielded two key findings. Firstly, it highlighted the value of imagining climate-neutral futures and future innovation more broadly, and the influence of these visions of the future. As articulated by one Viable Cities representative:

> *We develop as humans and also as organisations based on the images that we have of the future and the questions we ask ourselves. So, in order to learn, in order to change - because innovation is about learning and change - we need to have this idea of the future, because that puts a purpose to the changes we are going through and I think that we have not explored or learnt enough about this. We need to become better at describing the future in a positive way* (personal communication, 11th of December 2023).

Secondly, the pre-study highlighted the importance of collaborative and creative approaches to envisioning the future. Both interviewees expressed a need for more inclusive and participatory processes so as to engage diverse stakeholders in collectively shaping climate-neutral future visions. They emphasised the importance of ensuring that individuals see themselves reflected in these visions and are actively involved in co-creating them, since this means that they are more likely to embrace the transition.

Overall, the implications of this pre-study are significant for the research focus of this study. The findings validate this study's focus on sociotechnical imaginaries by highlighting their real-world relevance and importance in the context of urban climate neutrality. Specifically, the emphasis on the value of imagining climate-neutral urban futures suggests that the exploration of key narratives within the dominant sociotechnical imaginary is relevant, since it suggests that these narratives can shape stakeholders' acceptance of and actions towards climate goals.

3 Literature Review

This literature review seeks to discuss current knowledge and identify knowledge gaps in the topics of sociotechnical imaginaries for urban climate neutrality, and barriers to implementing climate neutrality, particularly in an urban context. To achieve this objective, a comprehensive search strategy was employed across various scholarly databases and search engines, including Google Scholar, SCOPUS, and LUBSearch. The review included academic, peer-reviewed, open-access journal articles and book chapters in English, supplemented by grey literature.

The first focus of the review was directed towards exploring methodologies and approaches used to anticipate and plan for the future, particularly in the context of climate neutrality and urban landscapes. Key search string combinations included terms such as "futures," "futures thinking," "scenarios," "visions," "imaginaries," "urban," "climate neutral" and "carbon neutral" to capture relevant literature in this domain. Subsequently, the review honed in on the exploration of sociotechnical imaginaries, again with a focus on energy research and urban landscapes, employing search string combinations like "imaginaries," "sociotechnical imaginaries," "narratives," "climate neutral," "carbon neutral," "energy," "transition," "cities," and "urban".

The second phase of the review investigated the existing literature on barriers to achieving and implementing climate neutrality, particularly in urban contexts. Key search terms included: "climate neutral," "carbon neutral," "net-zero," "cities," "urban," "barriers," "challenges," and "limitations". In light of this study's focus on the Cities Mission, relevant literature on this initiative was specifically sought out. However, since the Cities Mission was launched fairly recently, in 2021, much of the literature on the Mission is not yet officially published or is only available in the form of reports. Therefore, the decision was made to include grey literature in the review, such as reports from relevant research institutes and programmes. Overall, this review provides a general overview of sociotechnical imaginaries and barriers to implementing urban climate neutrality, identifying pertinent gaps in the existing literature, underscoring the imperative for further research, and setting the stage for the present study. It also culminated in the development of the conceptual framework which serves to connect the concepts of sociotechnical imaginaries, narratives, and implementation barriers in the context of urban climate neutrality, and to guide this study.

3.1 Socio-technical Imaginaries for Urban Climate Neutrality

3.1.1 Urban Futures and Methodologies

There are many different ways to think about the future. In particular, in the domains of urban development and energy transition research, which inherently imply a forward-looking perspective (Rudek, 2022), a range of methodologies have been employed to predict, envision, and influence future landscapes, social dynamics, and technological advancements (Tozer & Klenk, 2019). Notably, within this methodological spectrum, the concept of sociotechnical imaginaries emerges as a pivotal construct for conceptualising collective visions or shared understandings of desirable futures that guide technological development, policy-making, and social practices within society (Jasanoff & Kim, 2015).

Initially coined by Jasanoff and Kim to analyse nuclear power regulations in Korea and the USA, sociotechnical imaginaries were first defined as "collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects" (2009, p. 120). Since this initial conceptualisation was limited to analysis at the national and cross-national level, the authors later broadened the definition to

"collectively held, institutionally stabilised, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" (Jasanoff & Kim, 2015, p. 4), thus acknowledging the role of local, regional, and global actors in articulating sociotechnical imaginaries. Following its redefinition, the concept has found increased application as an analytical concept, particularly within energy research.

A distinction is made in the literature between dominant and alternative sociotechnical imaginaries. Dominant sociotechnical imaginaries are understood as the imaginaries that have the greatest public and institutional investment and support (Miller, 2020), are institutionalised, and are promoted by influential actors within a society or specific field (Rudek, 2022). These imaginaries gain traction through acts of power and coalition building and are characterised by their significant influence over policymaking, governance, and public discourse (Delina, 2021). In contrast, alternative sociotechnical imaginaries encompass those which challenge or diverge from the dominant sociotechnical imaginary, articulating visions for different sociotechnical arrangements that reflect different values and ideas of progress (Hudlet-Vazquez et al., 2023). These imaginaries are often promoted by marginalised groups, grassroots movements, or non-governmental organisations (NGOs) (Delina, 2021). Alternative imaginaries coexist alongside dominant imaginaries and compete with them for materiality (Delina, 2021). However, for a sociotechnical imaginary to become widely recognized and influential, it must possess performative power and be continually reenacted through policies, strategies, technology, and societal practices (Rudek, 2022; Miller, 2019; Wentland, 2016).

3.1.2 Applications of Sociotechnical Imaginaries

Sociotechnical imaginaries are increasingly employed in energy research, in particular as an analytical tool for examining sustainable technologies and energy transitions. For instance, at the level of individual sustainable technologies and innovations, authors Ballo (2015), Engels and Münch (2015), Vesnic-Alujevic et al. (2016), Levenda et al. (2019), and Quitzow & Rohde (2022) have applied sociotechnical imaginaries in the context of smart grids, highlighting how different sociotechnical imaginaries shape perceptions of smart grid technologies and influence decision-making processes surrounding their adoption and implementation in various national and regional contexts. In a similar vein, Mutter (2021) explored the role of electric vehicles in future visions for a fossil-fuel-free Sweden, revealing the emergence of a sociotechnical imaginary which positions electric vehicles as a central technology for achieving a fossil-fuel-free future.

Expanding beyond individual technologies, other scholars have explored the application of sociotechnical imaginaries to the broader energy transition, particularly at the level of the nation-state. For instance, in their seminal article, Jasanoff and Kim (2009) compared sociotechnical imaginaries for nuclear power in the United States and South Korea, revealing how the divergent national imaginaries contributed to distinct responses to nuclear challenges and catastrophic events in each context. Meanwhile, Delina explored conflicting sociotechnical imaginaries for coal use in the Philippines (2018) and for energy futures in Thailand (2019), noting how power structures influence which imaginary becomes dominant, and which are marginalised. In a similar vein, Rabiej-Sienicka et al. (2022) mapped dominant and alternative sociotechnical imaginaries for the energy transition in Poland to understand the broad opposition to decarbonisation in the country, finding that coal and natural gas are broadly valued, particularly for energy security.

Looking specifically at the transition to carbon neutrality, Carvalho et al. (2022) investigated sociotechnical imaginaries for the energy transition in the context of the Portuguese roadmap for carbon neutrality by 2050, highlighting the emergence of multiple sociotechnical

imaginaries pertaining to the country's energy transition, each advocated by distinct social actor groups. The imaginaries they identified are "Modernization and techno-economic development", "Green economy", "Energy citizenship", and "Just transition", each representing a unique perspective on how to navigate the complexities of achieving carbon neutrality in Portugal.

A few studies have explored sociotechnical imaginaries for the transition to carbon neutrality at the municipal level. Namely, Tozer and Klenk (2018) analysed discourses in the carbon governance texts of the founding members of the Carbon Neutral Cities Alliance, a transnational climate governance network, to identify the storylines underlying cities' sociotechnical imaginaries of urban carbon neutrality. They identified five storylines in urban carbon governance texts: 1. The diverse meanings of carbon neutrality 2. The new economy of carbon control 3. The city as a laboratory 4. Technological fixes and the modern city and 5. Reframing what it means to be a 'good' urban citizen. Their study reveals diverse interpretations of the sociotechnical pathways for achieving carbon neutrality.

In a later article Tozer and Klenk (2019), examined the building and energy sector configurations that inform sociotechnical imaginaries of carbon neutrality, as represented in the policy documents of the Carbon Neutral Cities Alliance, finding that imaginaries for urban climate neutrality involve complex combinations of technological and social elements. Specifically, the authors identified the configurations of "the District Energy City", "the Zero Net Energy City" and "the Natural Gas Transition City", noting that distinct configurations are preferred in different cities.

Overall, as articulated by Rudek (2022, p. 224) in his review of sociotechnical imaginaries in energy research, the literature reveals them to be powerful tools for understanding, governing, and performing energy transitions. Existing research has explored and applied the analytical concept to various contexts, including at local, national, and international levels. However, Rudek (2022) notes that there is a lack of research that investigates these imaginaries across various governance levels. Moreover, the literature on sociotechnical imaginaries indicates varying conceptualisations of the concept, where researchers' understandings of sociotechnical imaginaries, storylines, and configurations appear to overlap. In the frame of this study, these conceptualisations are broadly understood to be narratives.

3.1.3 The Influence of Sociotechnical Imaginaries

The significance of sociotechnical imaginaries lies in their dual role: not only do they describe desirable futures, but, due to their performative nature (Kuchler & Stigson, 2024; Smith, 2009), they also actively influence and dictate said futures through their repeated performance (Jasanoff & Kim, 2009; Tozer & Klenk, 2019). As such, while not strictly deterministic, sociotechnical imaginaries have been found to play a role in shaping the trajectory of development by influencing policy and governance decisions, research trajectories and fund allocations, as well as societal actions and responses to innovation (Jasanoff & Kim, 2013; Tozer & Klenk, 2019).

Sociotechnical imaginaries have been found to influence policy and governance pathways and structures. As stated by Jasanoff and Kim (2013), imaginaries guide the formulation and implementation of policies which shape regulatory frameworks and institutional practices for managing technological change. For example, Levenda et al. (2019) demonstrated how variations in sociotechnical imaginaries for smart grids in Portland, Oregon, and Phoenix, Arizona shape different approaches to innovation governance in the respective cities. Moreover, Tozer and Klenk (2019) examined configurations of carbon neutrality in the building and energy sector, which feed into the dominant sociotechnical imaginary for carbon neutrality and drive policy outcomes. Thus, by informing policy and governance decisions,

sociotechnical imaginaries shape the sociotechnical landscape and governance structures within which technological innovations unfold.

Sociotechnical imaginaries have also been found to impact research trajectories and influence the allocation of funding for technological development and innovation. Investigating sociotechnical imaginaries for smart cities, Miller (2020) found that by defining desirable future technological orders and social orders, these imaginaries shape research agendas, innovation pathways, and trajectories of technological design. Delina (2018) further noted that they can guide the allocation of resources, investments in research and development, and the direction of technological innovation towards preferred societal outcomes. Notably, fund allocations and investments for research projects and innovation initiatives are often aligned with the priorities and visions articulated within dominant sociotechnical imaginaries, thus influencing the trajectory of technological change and innovation (Delina, 2018; Rudek, 2022).

As well as influencing research and innovation, sociotechnical imaginaries influence societal actions and responses to technological innovation. For instance, examining energy policies in the US and South Korea, Jasanoff and Kim (2009; 2013) find that national sociotechnical imaginaries for nuclear power play a role in shaping societal responses to nuclear energy in the respective countries, including public acceptance and policy support. Meanwhile, investigating the adoption of smart grids in Norway, Ballo (2015) finds that citizen's responses to the technology are significantly shaped by national imaginaries of energy security and sustainability. By shaping public perceptions, values, and aspirations regarding new technologies, sociotechnical imaginaries can influence the public acceptance or rejection of technological solutions and shape the public discourse and engagement around them (Jasanoff & Kim, 2015; Tozer & Klenk, 2019).

Critically, sociotechnical imaginaries, particularly dominant ones, can justify the inclusion or exclusion of particular groups, such as citizens, from the decision-making process and the benefits of technological innovation (Delina, 2018; Jasanoff & Kim, 2009). As Beck et al. (2021, p. 149) report, the discourse surrounding imaginaries is intricately tied to questions of power and agency, specifically questions such as "who gets to imagine the future," and crucially, "whose visions and actions count?" These sentiments are echoed by Ballo (2015), who emphasises that it is often a limited number of actors that wield the capacity to materialise such imaginations, making the discourses surrounding them pivotal. Thus, the literature highlights questions surrounding the power dynamics inherent in sociotechnical imaginaries and envisioning the future.

3.2 Barriers to Implementing Urban Climate Neutrality

This section of the literature review explores existing research on barriers to implementing urban climate neutrality, with a particular focus on the Cities Mission. The literature review identifies several commonalities across key reports and papers by Ulpiani and Vetters (2023), Liakou et al. (2022), and Kaufmann et al. (2023) regarding the barriers to achieving urban climate neutrality. Ulpiani and Vetters (2023) analysed the challenges and risks European cities face in transitioning to climate neutrality. While limited literature was found on barriers in the context of the Cities Mission, two recent reports identifying barriers for Mission cities were identified. In their report, Liakou et al. (2022), identified key barriers based on surveys and focus groups with representatives from 64 participating cities. Kaufmann et al. (2023) presented an interim assessment report of the Cities Mission for the European Commission, which also outlined the various challenges faced by Mission Cities. The main barriers identified in this article and these reports are outlined below.

Governance and policy-making challenges are prominent themes. Both Ulpiani and Vetters (2023) and Liakou et al. (2022) highlighted the issue of fragmented responsibilities within municipal administrations, which complicates effective policy implementation and coordination across different government levels. Additionally, the misalignment between national and local policies is identified as a significant barrier, leading to inconsistencies that hinder cities' efforts to implement climate strategies effectively (Kaufmann et al., 2023; Liakou et al., 2022). Ulpiani and Vetters (2023) further emphasised the impact of short-term political cycles, which create uncertainty and disrupt long-term climate planning.

Financial barriers are another critical commonality. All three reports mentioned the significant financial hurdles faced by cities, including difficulties in securing external funding, ineffective public procurement processes, and the complexity of existing funding mechanisms (Kaufmann et al., 2023; Ulpiani & Vetters, 2023; Liakou et al., 2022) (Kaufmann et al., 2023; Liakou et al., 2022; Ulpiani & Vetters, 2023). Also, the need for significant initial investment, alongside financial uncertainties such as inflation and high fiscal risks, presented major obstacles (Liakou et al., 2022; Ulpiani & Vetters, 2023).

Several authors noted that capacity and knowledge gaps further complicate efforts towards climate neutrality. Both Ulpiani and Vetters (2023) and Liakou et al. (2022) highlighted the need for more skilled and trained personnel within municipal administrations to effectively manage climate projects. Additionally, the need for better platforms for strategic learning and knowledge-sharing is emphasised, indicating a gap in robust evaluation frameworks (Kaufmann et al., 2023; Liakou et al., 2022).

Finally, citizen engagement is identified as crucial for successful climate action across the literature. All three articles underscored the importance of engaging the community in climate initiatives. Limited capacity for community engagement and cultural barriers were flagged as significant challenges (Kaufmann et al., 2023; Liakou et al., 2022; Ulpiani & Vetters, 2023). Furthermore, poor communication and public apathy were highlighted as collaborative barriers that needed addressing (Ulpiani & Vetters, 2023).

Overall, the review of barriers impeding the implementation of urban climate neutrality, particularly within the Cities Mission, reveals that while specific challenges are often context-specific, common barriers emerge across the literature, including governance and policy challenges, financial barriers, capacity and knowledge gaps, and the need for effective citizen engagement.

3.3 Literature Review Conclusion

In conclusion, this literature review has synthesised current knowledge on sociotechnical imaginaries and the barriers to implementing urban climate neutrality, highlighting significant findings and identifying gaps that necessitate further research. First, the review underscores the significance of sociotechnical imaginaries, both as an analytical concept for understanding and articulating desired futures, but also in their performative nature, shaping policy, governance, and societal responses to technological innovation. While they were revealed to be increasingly common as an analytical concept in energy research, particularly in the context of the energy transition and sustainable technologies, there is limited research applying sociotechnical imaginaries in the context of urban climate neutrality, and none exploring them in the context of the Cities Mission. Moreover, narratives have not previously been employed as a lens for investigating sociotechnical imaginaries, although similar approaches have been used, for example examining storylines underlying the imaginary for urban climate neutrality (Tozer & Klenk, 2018).

Secondly, the review has outlined key barriers to implementing urban climate neutrality, particularly within the framework of the Cities Mission, emphasising governance and policy challenges, financial constraints, capacity gaps, and the necessity for robust citizen engagement. Notably, these studies have focused primarily on barriers perceived by actors at the city level and have not considered the perspectives of representatives at different levels of governance, such as national or trans-national. Lastly, the relationship between implementation barriers and the realisation of sociotechnical imaginaries remains unexplored. This study seeks to address these knowledge gaps, applying an approach that integrates sociotechnical imaginaries with the exploration of barriers to implementing urban climate neutrality. The conceptual framework outlines how these concepts are integrated for the purpose of this study.

3.4 Conceptual Framework

This section outlines the conceptual framework that was developed and employed to guide this study (depicted in Figure 3-1). The framework builds on concepts explored in the literature review, connecting them under the umbrella of urban climate neutrality, and providing a structured approach for exploring the research questions of this study. The framework's elements, how they interact, and how they align with the research questions of this study are outlined below.

The first element of the framework is the dominant sociotechnical imaginary for urban climate neutrality, understood as a collective vision of a desirable future that integrates social and technical elements. It is distinguishable from alternative sociotechnical imaginaries in that it represents the prevailing imaginary for urban climate neutrality that is endorsed by key stakeholders, including the national and local governments, international organisations, and major urban planners (Delina, 2021; Rudek, 2022). While not included in this framework, alternative sociotechnical imaginaries also coexist alongside the dominant one and interact and compete with it and each other for materiality (Delina, 2021). However, in the scope of this research the dominant sociotechnical imaginary is in focus as it reflects the primary objectives and strategies adopted by major governing bodies and institutions aiming for urban climate neutrality in the Cities Mission. For the purposes of this research, this imaginary is defined to encompass municipal, national, and EU levels.

The dominant for the purposes of this research for urban climate neutrality is composed of various narratives that collectively outline the desired future state and the pathways to achieve it. Notably, while the narratives contained within the sociotechnical imaginary for urban climate neutrality have not been explicitly explored in previous research, Tidwell and Tidwell (2018) and Rudek (2022) advocate for the exploration of narrative patterns for understanding sociotechnical imaginaries in energy research, while Tozer and Klenk (2018) have investigated the underlying storylines of the imaginary for urban climate neutrality within the Carbon Neutral Cities Alliance. Their work provides a foundation for understanding how narratives and stories can be examined to gain insights into a broader imaginary. To address RQ1, this study aims to identify and analyse the key narratives that constitute the dominant sociotechnical imaginary for urban climate neutrality, particularly in the context of the Cities Mission.

Next, through its performative power, as outlined in the literature, the dominant sociotechnical imaginary shapes urban space, development, and future trajectories (Tozer & Klenk, 2019); in other words, it is implemented. However, the implementation and realisation of the dominant sociotechnical imaginary for urban climate neutrality faces numerous barriers. These barriers can impede progress towards the imaginary and the desired outcome of achieving urban climate neutrality by 2030. Thus, RQ2 seeks to investigate and identify the

specific barriers that hinder the implementation of the dominant sociotechnical imaginary for urban climate neutrality, and the Cities Mission in particular.

By examining these narratives and barriers, this research seeks to provide a deeper understanding of the dominant sociotechnical imaginary for urban climate neutrality and identify the challenges that must be addressed to achieve the envisioned future state. This investigation contributes to the broader discourse on urban climate action and offers insights that can inform policy and practice in the pursuit of climate-neutral cities.

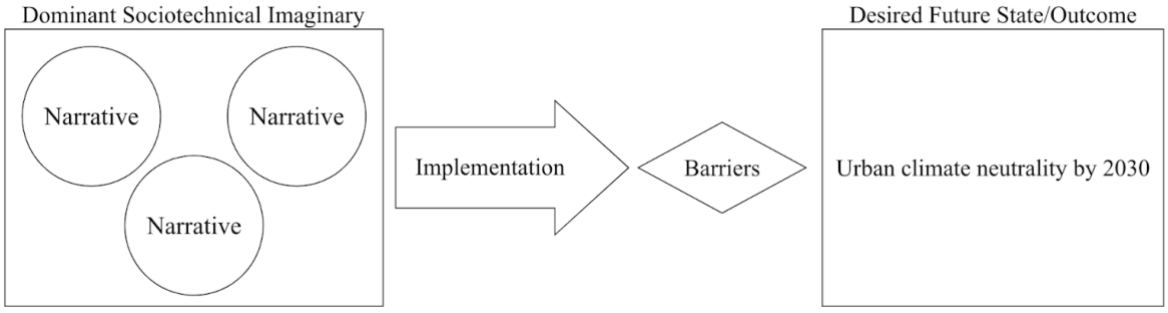

Figure 3-1. The conceptual framework, depicting the implementation of dominant sociotechnical imaginary for urban climate neutrality at municipal, national, and EU levels.

Source: Author's own

4 Research Design, Materials, and Methodology

A qualitative research approach was adopted for this thesis, due to its capacity to capture the nuanced complexities and subjective interpretations (Creswell & Creswell, 2017), which are inherent in sociotechnical imaginaries (Jasanoff & Kim, 2015). This qualitative approach is particularly appropriate for exploring sociotechnical imaginaries for climate neutrality, as it allows for an in-depth examination of the multifaceted dimensions shaping perceptions, beliefs, and practices related to climate action in urban contexts.

4.1 Research Design

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However, there are two key limitations associated with this qualitative approach, which should be acknowledged. Firstly, due to qualitative research's prioritisation of depth over breadth, the findings may not be easily transferable or generalisable to other contexts or populations (Denscombe, 2010). Secondly, the qualitative approach relies heavily on the subjective interpretations and perspectives of both the researcher and the participants. This can introduce bias, as the researcher's own background, experiences, and preconceptions may influence the data collection, analysis, and interpretation processes (Denscombe, 2010).

4.1.1 Ontological and Epistemological Perspective

The ontological perspective for this thesis aligns with constructivism, emphasising the socially constructed nature of reality. This perspective suggests that the phenomena under investigation are influenced by human perceptions and interactions (Creswell & Creswell, 2017). Given that sociotechnical imaginaries are inherently shaped by human perceptions, behaviours, and societal norms, a constructivist approach is particularly suitable for this study. By acknowledging the dynamic and socially embedded nature of sociotechnical imaginaries (Jasanoff & Kim, 2015), constructivism provides a framework for understanding how individuals and communities perceive and interact with climate-related technologies, policies, and societal norms within urban environments.

Epistemologically, an interpretivist stance is adopted, valuing subjective meanings and interpretations to understand the complex social phenomena within their context (Creswell & Creswell, 2017). This orientation informs the qualitative nature of the research, privileging in-depth exploration and understanding of participants' perspectives over positivistic measurements, which allows for the exploration of the complexities of narratives and barriers in the selected urban contexts.

4.1.2 Case Study Approach

A case study approach has been adopted as the research strategy for this research, examining two distinct EU Mission cities. As Flyvbjerg (2006) notes, case studies are valuable for investigating complex social phenomena in their real-world context, making them particularly well-suited for the examination of sociotechnical imaginaries and implementation barriers in urban settings. In alignment with this perspective, two EU Mission cities—Stockholm, Sweden and Amsterdam, the Netherlands—have been selected, offering distinct urban landscapes, governance structures, and socio-cultural contexts. This diversity is instrumental in

unravelling the multifaceted dimensions of the sociotechnical imaginary for climate neutrality, as well as for gaining diverse perspectives on perceived barriers.

The selection of these cities was based on two considerations. Firstly, the cities were selected due to their affiliation with the partners of the Breaking up Silos (BuS) project, a collaborative research project between the Swedish Institute of International Affairs, the University of Twente, the University of Lund, and the municipalities of Amsterdam and Stockholm. The project broadly aims to explore whether, and in what ways, the mission approach for achieving climate-neutral cities can initiate transformative change (Breaking Up Silos, 2023). This study intends to contribute to this broader project. Second, the selection was informed by practical considerations such as feasibility and accessibility for data collection purposes, namely access to stakeholders and interviewees. The research aims to not only generate context-specific insights but also contribute to broader theoretical discussions on the role of imaginaries in sustainable urban development. The analysis across these two cases enables a comprehensive exploration, enhancing the reliability, validity, and applicability of the findings (Denscombe, 2010), thus providing a robust foundation for the study's objectives. Notably, for the purpose of this study, the primary purpose of the case studies is not comparison, but rather to provide an in-depth understanding of the narratives contained in the dominant sociotechnical imaginary and implementation barriers in the Cities Mission and in these select Mission cities.

In accordance with Creswell and Creswell's (2017) guidelines for qualitative case study research, several methods of qualitative data collection were combined. Namely, semi-structured interviews (see section 4.2.2) and a document review (see section 4.2.3). This approach aligns with Denscombe's (2010) assertion that a key strength of the case study approach is that it enables researchers to leverage diverse sources, types of data, and research methods throughout the investigation.

4.2 Data Collection

4.2.1 Selection of Interviewees

The selection of actors and interviewees for this study was a crucial step in ensuring the comprehensive exploration of narratives and barriers for urban climate neutrality in the Cities Mission. To identify key stakeholders with expertise relevant to the research objectives and from different governance levels (municipal, national, and EU), a purposive sampling method was employed (Denscombe, 2010). This approach began with a small selection of potential interviewees provided by the thesis supervisor, who has expertise with the Cities Mission. These initial interviewees were strategically chosen for their direct involvement in the Cities Mission and expertise in urban transitions and sustainability. Through snowball sampling, these interviewees identified other relevant actors in their respective fields, organisations, or municipalities. In addition, further interviewees were identified through web searches and contacted via email or through the LinkedIn messaging service.

The selection criteria for interviewees prioritised individuals directly involved in the implementation of the Cities Mission, across various levels of governance. Since this thesis focuses specifically on the Cities Mission, the decision was made to prioritise those directly involved in the Mission, rather than in sustainable development more broadly. In order to gain perspectives across the municipal, national, and EU governance levels of the Cities Mission, representatives from specific organisations and entities spanning these levels were targeted. First, at the municipal level, interviewees from the Amsterdam and Stockholm municipal organisations, involved in or responsible for implementing the Cities Mission, were approached.

At the national level, representatives from Viable Cities were sought out. Viable Cities is a national Swedish strategic innovation programme, launched in 2017, which aims to achieve climate neutrality in selected Swedish cities by 2030 (Shabb & McCormick, 2023). Given its shared objective and the overlapping participation of certain cities, the program has historically collaborated with and provided guidance to the Cities Mission (Shabb & McCormick, 2023). It also serves as a project partner on the NetZeroCities project, described below (Prieto, 2024a). An equivalent counterpart was not identified at the national level in the Netherlands, which could be considered a limitation of the study as it may impact the comprehensiveness of the insights gathered from the Dutch perspective.

Next, at the EU level, representatives from two entities were sought: NetZeroCities and the Cities Mission Board. NetZeroCities is an initiative under the Horizon 2020 Research and Innovation Programme, which aims to offer support and solutions to cities involved in the Mission (Prieto, 2024b). Similarly, the Cities Mission board assumes a central role in guiding and advising on the strategic direction and implementation of EU Missions (Chomicz, 2022). It is composed of a total of 15 experts from the field of urban sustainability, including a designated Chair (Chomicz, 2022).

However, it is important to acknowledge that the selection process may have limitations. While efforts were made to ensure representation across different governance levels and organisations, inherent biases and limitations associated with purposive and snowball sampling methods have influenced the selection of interviewees (Denscombe, 2010). Moreover, while efforts were made to capture a diverse range of perspectives and expertise across governance levels, the sample size of key stakeholders interviewed may not fully capture the diversity of perspectives and experiences within the Cities Mission framework.

4.2.2 Semi-Structured Interviews

A total of 11 semi-structured interviews were conducted with selected actors to gain insights into their visions of urban climate neutrality within the Cities Mission and their perspectives on the perceived barriers to its implementation. A full overview of interviewees can be found in Appendix C, although interviewees names have been anonymised for the purposes of confidentiality and data protection. This anonymisation has ensured that the participants' identities are protected, allowing them to speak more freely about their experiences and perspectives without concern for potential repercussions (Saunders et al., 2015).

Interviews were conducted with representatives from various projects and institutions related to the Cities Mission, namely Amsterdam municipality, Stockholm municipality, Viable Cities, the NetZeroCities project, and the Cities Mission Board. These entities represent different governance levels of the Cities Mission framework, as outlined above. Notably, the interviewees are not official representatives of the respective municipalities and organisations, rather, they were selected for their personal expertise and involvement in the Cities Mission. This distinction is important as it highlights that the insights and perspectives shared during the interviews reflect the individuals' professional experiences and views, rather than the formal positions of their organisations.

Given that the interviews were semi-structured, the discussion outline remained flexible, allowing for adjustments based on the natural flow of conversation and the interviewee's responses. This approach enabled the interviewees to develop ideas and express themselves more broadly on the issues raised (Denscombe, 2010, p. 175), thereby facilitating the exploration of topics that the interviewer may not have initially anticipated (Silverman, 2011). This approach lent itself to the exploration of key narratives and barriers for urban climate

change since interviewees could freely elaborate on their experiences and perspectives without feeling constrained by a rigid interview structure.

Notably, all the interviews were conducted online, over Zoom. This format was chosen due to its convenience and accessibility since interviews could be conducted with participants located in different geographical locations. Additionally, the use of the online platform, Zoom, enabled the recording of interviews, ensuring accurate capture of the discussions for later analysis. While the absence of face-to-face interaction may have slightly diminished the rapport-building aspect of the interviews compared to in-person meetings (Denscombe, 2010), it nonetheless provided a practical and effective means of gathering qualitative data in a timely manner.

4.2.3 Document Review

A document review was selected as a second method of data collection to complement the semi-structured interviews. This approach was deemed appropriate due to the fact that the Cities Mission is largely in the planning stages, meaning that the official discourses on the transition to carbon neutrality are predominantly textual (Tozer & Klenk, 2018). Moreover, the use of multiple data sources, common to the case study approach, ensures the triangulation of the data, thus enhancing the validity of the findings (Denscombe, 2010). Two key documents were selected for the document review, one from Stockholm and one from Amsterdam. The documents were selected based on their relevance to the Cities Mission and urban climate neutrality more broadly (see Appendix D for an overview of the specific documents).

Firstly, in the case of Stockholm, its Climate City Contract, a document which outlines a city's climate goals, strategies, and action plans for achieving the Cities Mission (Shabb & McCormick, 2023), was selected for the document review. Stockholm's CCC was completed in 2023, however, since it is not yet publicly available, the CCC was obtained through direct personal correspondence with the relevant interviewees from the municipalities.

Since Amsterdam has not yet finalised or released a CCC, the most recent and comprehensive climate strategy document available, the Amsterdam Climate Neutral Roadmap 2050, was chosen for the document review. The roadmap, published in February 2020, outlines the targets and measures for various sectors, namely the built environment, mobility, electricity, industry and the harbour. Notably, the currency of this document is a limitation in that while it provides a comprehensive overview of Amsterdam's climate targets and measures, its publication date in February 2020 may not reflect the most current developments or revisions in Amsterdam's climate strategy. This is accounted for by the semi-structured interviews with city representatives, which provide a more up-to-date perspective on the city's targets.

4.2.4 Materials Collected

Table 4-1 Overview of data collected at the different governance levels of the Cities Mission

Governance Level	Data Collected	
EU Level	EU Mission Board • Two interviews	
	NetZeroCities • One interview	
National Level	**The Netherlands** n/a	**Sweden** Viable Cities • Four interviews
Municipal Level	Amsterdam • Two interviews • New Amsterdam Climate, Amsterdam Climate Neutral Roadmap 2050 (2020)	Stockholm • Two interviews • Cities Mission, Climate City Contract (2023)

Source: Author's own

4.2.5 Data Analysis

This study adopted two methods of data analysis to analyse the interview and documentary data, namely narrative and thematic content analysis.

Narrative analysis was employed to address RQ1, which focuses on identifying the key narratives contained within the dominant sociotechnical imaginary of the Cities Mission, particularly in the cities of Stockholm and Amsterdam and across the national and EU governance levels of the Mission. Since RQ1 explicitly investigates key narratives, an analytical approach that puts narratives at its centre was deemed appropriate. This methodological approach was chosen for its effectiveness in uncovering the underlying narratives and stories shared by interviewees and across the documentary data (Denscombe, 2010). Since sociotechnical imaginaries are understood as collectively held visions of desirable future states (Jasanoff & Kim, 2015), which inherently involve a mental image, or a 'story' that individuals have about the future, narrative analysis was considered suitable for identifying these narratives and how they are articulated. Moreover, the narrative analysis approach aligns closely with this study's constructivist ontological approach, in that it acknowledges the complexity and layers within narratives and stories (Flick, 2014), as well as the subjective construction of reality and the role of narratives in shaping individuals' perceptions and experiences (Creswell & Creswell, 2017).

Adopting Figgou and Pavlopoulos' (2015) typology of narrative analysis, this study followed a narrative analytical approach which focuses on the narrative content presented in the data, as opposed to the narrative structure. Additionally, an inductive approach to coding was adopted, whereby themes were developed from the data itself, rather than from predetermined categories (Denscombe, 2010). This coding approach also incorporated a latent analysis perspective, which seeks to uncover the underlying meanings and assumptions embedded within the narratives (Earthy & Cronin, 2008). Specifically, the data analysis process involved familiarisation with the data through the thorough reading of the interview transcripts and documentary materials. Next, codes were generated directly from the data in an open and flexible manner as part of the initial coding process, and then reviewed and grouped into broader themes, or narratives. Once these themes had been refined, the final step involved synthesising the themes into cohesive narratives that highlighted the dominant sociotechnical

imaginaries for urban climate neutrality. This process led to the identification of a total of six key narratives.

Thematic content analysis was employed to address RQ2, which seeks to identify perceived barriers to the implementation of urban climate neutrality in the context of the Cities Mission. Thematic content analysis involves the identification, analysis, and interpretation of patterns of significance–i.e., themes –within qualitative data (Clarke & Braun, 2017). The study followed the approach laid out by Terry et al. (2017), who advocate for an inductive approach to coding and theme development, where the researcher's subjectivity is central to the analysis process. Thus, the coding process and development of themes is seen as a subjective and interpretive process (Terry et al., 2017). This approach aligns with the ontological and epistemological stance of this research, in that it values the subjective meanings and interpretations of social phenomena (Creswell & Creswell, 2017).

Inductive coding of the interview and documentary data was conducted to identify recurring themes, patterns, and discourses related to the obstacles and challenges encountered in advancing urban climate neutrality initiatives. Themes were developed from the data, working 'bottom up,' rather than being used as a starting point for the analysis, which meant the analysis remained closely tied to the specifics of the data and the experiences of the participants (Terry et al., 2017). Moreover, the coding process was primarily semantic in nature, focusing on capturing the participants' explicit meanings rather than interpreting underlying meanings (Terry et al., 2017). This approach allowed for a grounded and context-specific understanding of the perceived barriers to implementing urban climate neutrality in the Cities Mission, ultimately leading to the identification of five categories of perceived barriers.

NVivo 14, a computer-assisted qualitative data analysis software, was used to facilitate the coding process for the narrative and thematic content analysis. All interview and document data were uploaded into NVivo and coded using the software. This approach streamlined the analysis, offering enhanced flexibility and structure, thereby aiding in the identification of key themes.

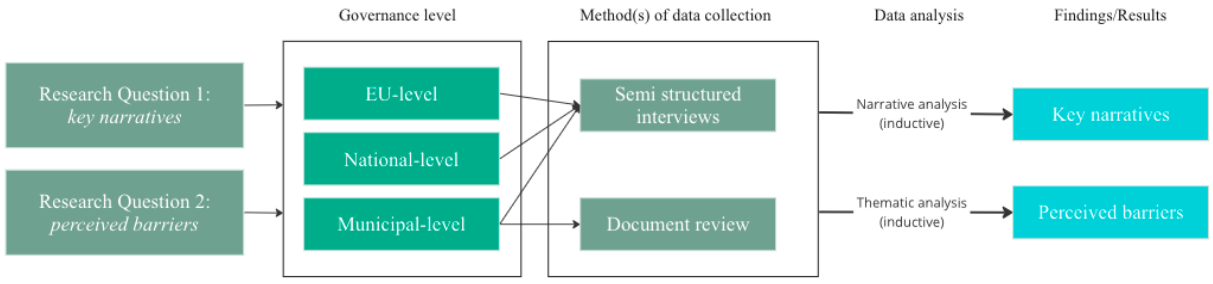

Figure 4-1. A visualisation of the research design

Source: Author's own

5 Findings

This chapter presents the findings of the research, responding to the two given research questions. Following an overview of Amsterdam and Stockholm's sustainability targets, the key narratives contained in the dominant sociotechnical imaginary for urban climate neutrality are identified and described. Next, the perceived barriers for achieving this imaginary are presented. The results draw on collected perspectives from different levels of governance of the Cities Mission, including the two case study Mission cities, Amsterdam and Stockholm.

5.1 Overview of the Case Study Cities

The following section provides a brief overview of the two case study cities, Stockholm and Amsterdam. It describes their respective climate goals and targets, in particular in relation to the Cities Mission. Despite their shared status as capital cities, each possesses distinct historical contexts and motivations driving their participation in the Mission.

This section outlines the specific targets and sub-targets made by each of these cities for achieving urban climate neutrality and urban sustainability more broadly. These targets are distinct from the sociotechnical imaginary for urban climate neutrality in that they represent concrete, measurable objectives set by municipal authorities to guide their actions and policies toward achieving climate neutrality. In contrast, the sociotechnical imaginary encompasses broader societal visions, values, and beliefs about what a climate-neutral city should look like and how it should function (Jasanoff & Kim, 2015).

5.1.1 Amsterdam, the Netherlands

Amsterdam, the capital of the Netherlands, is located in the North Holland province, approximately 25 km from the North Sea. It is the largest city in the country, spanning an area of 165.9 km² (University College London, 2019). With a population of 882,633, it is also the most densely populated city in the Netherlands (Statistics Netherlands, 2023). Amsterdam was selected in 2022 as one of the 112 cities in the Cities Mission (European Union, 2022). The city has not yet published a CCC.

According to a representative from Amsterdam municipality (personal communication, 26th of April 2024), the city's most recent targets include achieving a 60% reduction in Scope 1 and Scope 2 emissions by 2030 compared to 1990 levels, with the goal of achieving full climate neutrality by 2050. By 2030, the city also seeks to achieve a 50% reduction in primary raw material usage compared to 1990 levels and a climate-neutral municipal organisation. Notably, these targets are more ambitious than those expressed in the city's roadmap, the Roadmap Amsterdam Climate Neutral 2050, published in 2020 (Roadmap Amsterdam Climate Neutral 2050, 2020) and included in the document review of this study. Nonetheless, these targets do not adhere to the Cities Mission goal of achieving climate neutrality in scope one and two by 2030 (European Commission, 2021). As expressed by one representative from Amsterdam, "*we think it would be a fiction to pretend that we could achieve climate neutrality by 2030. We'd rather tell the honest story that we can't achieve that even if we would like to achieve it*" (personal communication, 26th of April 2024).

5.1.2 Stockholm, Sweden

Stockholm, the capital city of Sweden, stands as the country's largest municipality and serves as its political and economic centre. Located in the south-eastern part of Sweden, Stockholm holds prominence as a leading industrial area and has the second-largest port in the country. With an area spanning 215,92 km² (Rostang et al., 2021), Stockholm has a population of over

990,000 people, making it the most populous city in Sweden (Statistikmyndigheten SCB, 2023).

Stockholm's sustainability efforts can be traced back to 1976 when the city adopted its first comprehensive environment program (Stockholms Stad, 2023). Since then, the city has participated in various sustainability initiatives, for instance, becoming a member of the C40 cities network and joining the Swedish strategic innovation programme, Viable Cities (Stockholms Stad, 2024). Notably, Stockholm signed a CCC with the Swedish state under the supervision of the Viable Cities program in 2020, a contract which has been updated every year since (Stockholms Stad, 2024). Subsequently, the city signed a CCC with the EU in 2023, as part of the EU Cities Mission. This document is included in the document review of this study.

Under its Environment Programme, Stockholm initially sought to achieve a fossil-free status by 2040, as outlined in its Climate Action Plan for 2020-2023 (Stockholms Stad, 2020). However, in light of its participation in the EU Cities Mission and the pressing need for accelerated climate action, the city is in the process of updating the Environmental Programme and associated Climate Action Plan, setting the more ambitious target of achieving climate positivity by 2030 (Stockholms Stad, 2024). This target would require an 80% decrease in emissions compared to 1990 levels (Stockholm CCC, 2023, p.3).

In 2022, Stockholm was selected to be part of the Cities Mission. Since then, Stockholm was chosen as one of 26 cities to participate in the Pilot Cities Cohort 2 to receive additional expert support and funding under the EU's Horizon Europe program (Morgan, 2024), and in October 2023, along with nine other cities, was awarded the EU Mission Label for its robust plans to achieve climate neutrality by 2030 (European Commission, 2023). This label acknowledges the city's successful creation of Climate City Contracts, which outline comprehensive visions for attaining climate neutrality, complete with action plans and investment strategies.

5.2 Key Narratives for Urban Climate Neutrality

The following section presents the findings for RQ1 by outlining the key narratives contained in the dominant sociotechnical imaginary for urban climate neutrality. These narratives are drawn from the analysis of strategic documents and the semi-structured interviews with key stakeholders at different governance levels of the Cities Mission. Using narrative analysis, as outlined in section 4.2.5, six key narratives were identified: sustainable mobility and transport; community engagement and just transition; frontrunners in urban climate action; the city as an experiment; green economy and business innovation; and the city as a complex system. The identified narratives are presented in no particular order, and are not mutually exclusive, meaning that several narratives can exist simultaneously and can be mobilised by the same actor or actor group in the context of the dominant sociotechnical imaginary.

5.2.1 Sustainable Mobility and Transportation

Sustainable mobility and transportation emerges as a key narrative within the sociotechnical imaginary for urban climate neutrality. Particularly at the municipal level, there is an emphasis on the importance of transitioning towards sustainable transportation systems, electrified transport, and a focus on more active forms of mobility in order to achieve climate goals. In their respective strategy documents, both Stockholm and Amsterdam outline targets and measures for achieving more sustainable transport, identifying the transport and mobility sector as a key component in their transition. These targets and the associated visions are reflected in the interviews with the city representatives.

The Stockholm Climate City Contract of 2023 sets targets for reducing emissions from the transport sector by 80% by 2030 compared to 2010 levels, and a target to decrease total car traffic volumes by 30% from 2017 levels (Stockholm CCC, 2023). It also outlines measures to promote non-car transport (Stockholm CCC, 2023). These targets are echoed in the sentiments of the city representatives. As one Stockholm city representative states, "*I think it will be quite the same Stockholm [in 2030], but with some more electrified transport and more bikes and active forms of transport and walking. And not so much parking, within the city area at least.*" (personal communication, 10th of April 2024). Drawing inspiration from cities like Paris, the representative notes a focus on creating more liveable streets and shifting towards more active and sustainable forms of mobility. Zero-emission zones are seen as a key part of this transition, with one representative noting that in addition to one emission-free zone which is currently under development, they envision the establishment of multiple emission-free zones by 2030, further restricting the entry of fossil fuel cars and prioritising active and electrified forms of transportation (personal communication, 10th of April 2024).

Electrification is identified as a key element in Stockholm's narrative for future sustainable mobility. The CCC places emphasis on the promotion of electric vehicle uptake and usage through various measures, such as increasing charging infrastructure, implementing zero-emission zones, and providing citizens with information (Stockholm CCC, 2023). Moreover, both city representatives envisage an increase in electrified transport, envisioning a future where electric vehicles, combined with active transportation modes like biking and walking, dominate the urban mobility landscape (personal communication, 10th of April 2024; personal communication, 24th of April 2024).

Amsterdam's roadmap document sets out the aim of having emission-free traffic in the city by 2030 and seeks to boost more sustainable forms of transport, such as cycling, car-sharing, and public transport. As in Stockholm, emission-free zones are also viewed as central in Amsterdam's future transportation system. As expressed in the roadmap, which asks: "*Can you picture it? By 2030, Amsterdam's streets will be free of exhaust-emitting cars*", the city seeks to introduce

new low- and zero-emission zones, as well as tighten up existing ones, ultimately leading to a complete removal of fossil-fuel transport in the city, by 2030 (Roadmap Amsterdam Climate Neutral 2050, 2020, p. 2). Closely linked, a future in which the car is less prominent as a form of transport was described by both representatives from Amsterdam (personal communication, 12th of April 2024; personal communication, 26th of April 2024). One representative noted that while they envision that cars will still play a role in future transport, they imagine that cities can be designed so that cars are no longer a necessity, meaning that "*the car will become much less prominent, we'll have a huge cycle infrastructure and good public transport*" (personal communication, 12th of April 2024). They noted that they "*expect the car to go away, and that provides a lot of space to do other things, like to add more green*", a view mirrored by the other city representative, who highlighted the potential increase in public and green space as a result of the transition away from the car (personal communication, 26th of April, 2024). Overall, the narrative of sustainable mobility and transportation reflects a vision of cities where car use is minimised, and alternative and greener modes of transport are prioritised.

5.2.2 Community Engagement and a Just Transition

The engagement of local citizens and communities, particularly in the context of achieving a socially just transition, emerged as a prominent narrative across all governance levels, as well as in both case cities. This narrative emphasises the role of citizens as active and vital participants in the transition process, highlighting the importance of community engagement and co-creation. Furthermore, it underscores the principle of climate justice, ensuring that vulnerable groups are not left behind, and envisions a future city that is equitable and inclusive.

Community Engagement and Co-Creation

Members of the Cities Mission Board emphasised the value of community engagement and active citizen participation for driving urban climate neutrality. For instance, one of the board members highlighted the significance of genuine citizen involvement, stating, "*I'm a big believer in citizen involvement and not just for the sake of informing, or just participation, but in terms of city-making.*" (personal communication, 10th of April 2024). This sentiment was echoed by another member of the Mission board, who stressed the necessity of citizen activation and community-driven action, noting that public and private sectors alone cannot achieve climate goals without active citizen participation (personal communication, 22nd of April 2024). This representative also proposed the provision of spaces and frameworks where local communities can meet and create calls for action as practical ways to foster engagement.

At the city level, the role of citizens in making the climate transition relevant and effective is emphasised. In the case of Stockholm, the CCC (2023, p. 43) states that "*involvement of citizens is a priority area*", noting an emphasis on including young people and vulnerable groups. The document points to existing initiatives for engaging citizens, such as a digital citizen panel, which is used to gather public perspectives and ideas for the transition, and advocates for the development of further digital solutions to increase collaboration. Furthermore, it indicates a commitment to working with a range of perspectives and being open to new ways of thinking and working.

In Amsterdam, community engagement is similarly prioritised. For example, the roadmap document describes how thousands of citizens are already involved in initiatives across the city to save or generate clean energy and to share resources. Emphasising the importance of individual actions and behaviour change, it also directly addresses the citizens, noting: "*The next step is for climate-neutral to become the new normal. And that can't happen without you*", and *"We are asking every citizen of Amsterdam to play their part*" (2020, p. 2, p. 5). Thus, the citizens of Amsterdam are encouraged to play an active part in the energy transition. Furthermore, the

municipality will offer support for citizen initiatives, including technical, organisational, and financial assistance (Roadmap Amsterdam Climate Neutral 2050, 2020). This underscores the emphasis placed on co-creation, particularly with citizens and local communities, as a central element of the city's transition to climate neutrality.

Just Transition

Closely intertwined with the concepts of community engagement and co-creation, the narrative of a just transition focuses on a shift towards climate neutrality that is fair and inclusive, addressing social equity alongside environmental goals. Social justice was identified by representatives across municipal, national, and EU levels, as well as in the strategy documents of both cities, as a vital component of the energy transition and of climate-neutral futures.

The importance of social justice in climate-neutral cities was emphasised by representatives at the international level, from the Cities Mission Board, as well as from the national level, from Viable Cities. For instance, articulating their desired vision for a climate-neutral city, a mission board member noted that their vision of climate neutrality goes beyond a reduction of emissions. Instead, "*it is about providing life quality, improving the conditions in the city. It means that it's about cities as places for life; it's about urban innovation; it's about cities as living labs; and it's about the just transition. That means leaving no one behind, so doing it in a way that everybody can still afford to have a good life*" (personal communication, 22nd of April 2024). Correspondingly, a representative from Viable Cities emphasised the human element of the energy transition, stating that "*it's not about technology and digitalization, it's about people*" (personal communication, 18th of April 2024).

Amsterdam adopts climate justice as a guiding principle for the energy transition, as reflected in the following excerpt of the roadmap: "*In our vision, the city will only become climate-neutral if we conceive of the energy transition as a social transformation, if climate justice is adopted as a guiding principle, we work together, the municipality takes the lead in the process, and we take responsibility as a capital city*" (Roadmap Amsterdam Climate Neutral 2050, 2020, p. 7). This reflects an emphasis on climate justice and the inclusion of marginalised communities.

In Stockholm, the principle of a just transition is also emphasised as crucial for the city's transition. For instance, the CCC (2023) details initiatives aimed at promoting environmentally friendly behaviours, such as using public transport, while also working to reduce barriers for vulnerable groups. This approach ensures that sustainable options are not only viable but also the most accessible choice for all residents.

In summary, the narratives of community engagement, co-creation, and just transition are integral components of the urban climate neutrality agenda, resonating across governance levels and exemplified in the strategies of the Stockholm and Amsterdam municipalities. At the heart of these narratives is the recognition of citizens as active agents in driving the transition process, with initiatives aimed at fostering their participation and ensuring inclusivity.

5.2.3 Frontrunners in Urban Climate Action

Stockholm and Amsterdam are both keen to position themselves as frontrunners in urban climate action, striving to lead by example and inspire other cities around the world. This narrative underscores their commitment to ambitious climate goals and strategies aimed at significantly reducing emissions and driving the global transition to urban sustainability.

In Stockholm, the CCC outlines the city's aspiration to be a world leader in the climate transition. As the document states, "*Cities have an important role in the transition, and Stockholm aims*

to be a world leader in this process by reducing emissions and being a role model for others" (Stockholm CCC, 2023, p.3). This aspiration is further reinforced by the city's political goals, which include being a model for decreasing emissions and leading in the global efforts to implement the Paris Agreement (Stockholm CCC, 2023). Additionally, Stockholm supports Sweden's national goal to become the world's first fossil-free nation, actively participating in initiatives like Fossil Free Sweden to accelerate the climate transition (Stockholm CCC, 2023).

Representatives from Stockholm echoed this ambition. For instance, one representative highlighted the city's reputation for being a progressive leader in climate emissions, noting that "*we are one of the most progressive cities in the world when it comes to climate emissions*" (personal communication, 10th of April 2024). Another city representative (personal communication, 24th of April 2024) pointed to the ambitious targets set out in Stockholm's CCC, such as achieving climate positivity by 2030, contending that these targets, which go beyond those set by the Cities Mission, aligned with the city's frontrunner status. They also suggested that expanding the scope to include consumption-based emissions could further advance Stockholm's global leadership position.

Similarly, Amsterdam positions itself as a frontrunner in urban climate action, leveraging its status as a wealthy and influential city to drive sustainable change. The city's roadmap for climate neutrality articulates the city's responsibility to contribute significantly to the global transition to sustainability, asserting, "*We are responsible - as one of the most affluent cities in the world and the Dutch capital, Amsterdam is responsible for making a real contribution to the transition to a sustainable world*" (Roadmap Amsterdam Climate Neutral 2050, 2020, p. 7). Additionally, it highlights Amsterdam's success in facilitating electric transport through a broad range of measures, which it argues sets an example for other cities to follow.
Despite its achievements, Amsterdam city representatives provided a more nuanced perspective on the city's leadership status. For instance, one representative commented on the city's global reputation, noting that while Amsterdam is recognised internationally for its innovative ideas and international collaborations for climate action, there is a need to translate these ideas into actionable policies and internal organisational changes to make significant changes in climate action and solidify its frontrunner status (personal communication, 12th of April 2024).

In summary, both Stockholm and Amsterdam are committed to leading the way in urban climate action. Thus, the narrative of being a global leader and frontrunner in the transition to urban climate neutrality and urban sustainability more broadly was prominent in both cities, despite some hesitation from representatives about the validity of such claims.

5.2.4 The City as an Experiment

Cities are increasingly seen as experimental hubs for innovative climate action, learning, and co-learning. This narrative emphasises cities as living laboratories where new ideas can be tested, refined, and scaled, offering valuable lessons for broader application. This narrative was expressed across local, national, and EU governance levels.

Representatives from the Cities Mission Board underscored the importance of experimentation and shared learning. One representative highlighted the role of 'Lighthouse Cities' as hubs of innovation, whose insights and successful experiments can be adapted and replicated across Europe. Furthermore, they emphasised that cities are no longer seen merely as collections of problems but as arenas for pioneering solutions: "*We've seen many cities experimenting in a really good way. In the last, I would say 30 years...if you were to combine all the pilots, all the experiments that have been set up, if you put them together in a city, you're almost there*" (personal communication, 10th of April 2024). Thus, the representative indicated that, in a sense, "*the ideal city already exists*" through a combination of different cities' initiatives.

Another representative from the Mission Board, pointed out that learning is most effective when cities with similar challenges collaborate and exchange knowledge (personal communication, 22nd of April 2024). They elaborated that this peer-to-peer learning enriches both the advisors and those seeking guidance, facilitating mutual growth and adaptation. Thus, they highlighted the importance of meta-level discussions with cities to extract common challenges and solutions applicable to diverse contexts (personal communication, 22nd of April 2024).

Stockholm exemplifies this experimental ethos by positioning itself as a test bed for innovative solutions. A representative from Stockholm described their approach: "*We try to understand and co-create experiments of how we can change the system to make it more in line with the mission. And also the idea of scaling those things that actually work*" (personal communication, 10th of April, 2024). This iterative process involves starting with small-scale pilots, learning from them, and scaling successful initiatives. The Stockholm CCC also emphasises the city's active participation in international collaborations and networks, underscoring the value placed on sharing insights and learning from global peers.

Amsterdam's approach to experimentation is similarly robust, with a strong emphasis on innovation and collaboration. The city's roadmap document highlights the necessity of exploring new and previously unexplored paths, advocating for an environment that encourages trying out new ideas. Emphasising Amsterdam's focus on international collaboration, it states "*Together we are learning about what does and does not work, and thereby accelerating the transition in our own city and beyond*" (Roadmap Amsterdam Climate Neutral 2050, 2020, p. 42). A representative illustrated the unpredictable nature of this innovation process, noting how some solutions, like the rapid adoption of solar panels, can advance unexpectedly fast, while others, such as infrastructure changes for heating, reveal unforeseen challenges only upon implementation (personal communication, 12th of April 2024). Nonetheless, they underscored that this iterative learning process is crucial for advancing the energy transition.

A key element of the experimental narrative is the acceptance of failure as part of the learning process. For instance, a representative from the Mission board asserted that space for failure is essential in a mission-driven approach, allowing cities to innovate and learn without the fear of setbacks (personal communication, 10th of April 2024). According to this representative, this perspective is crucial for fostering a culture of resilience and continuous improvement. This perspective was shared by another representative from the board, who acknowledged the ambitious nature of achieving climate neutrality by 2030 and emphasised that the broader goal is to demonstrate that such a transition is feasible within a decade, even if individual experiments do not always succeed (personal communication, 22nd of April 2024). Amsterdam's roadmap similarly emphasises the need for space to explore new ideas and paths, noting that both successes and failures are integral to the learning process. The document states, "*Space is needed to try out new ideas and find out what does and does not work*" (Roadmap Amsterdam Climate Neutral 2050, 2020, p. 42).

Overall, by embracing experimentation, collaboration, and a willingness to learn from both successes and failures, the narrative of the city as an experiment was made evident in Stockholm and Amsterdam, as well as across governance levels of the Cities Mission. This narrative highlights the dynamic, evolving nature of urban climate action, where continuous learning and adaptation are key to achieving long-term sustainability goals.

5.2.5 Green Economy and Business Innovation

Another prominent narrative within the dominant sociotechnical imaginary for urban climate neutrality revolves around the concept of the green economy and business innovation. This

narrative highlights the importance of public-private partnerships, as well as the economic opportunities created by the transition.

Public and private partnerships and collaboration were identified as central to achieving climate neutrality by several stakeholders. For example, a representative from the Cities Mission Board highlighted the importance of public-private dialogues, arguing that these facilitate systemic change (personal communication, 10th of April 2024). They noted that such collaboration can extend beyond national borders, fostering a just and affordable transition. Furthermore, a representative from Viable Cities emphasised the growing interaction between cities and private companies (personal communication, 18th of April 2024). According to this representative, businesses increasingly see value in aligning with cities aiming for climate neutrality, which has benefits for both parties, since businesses can enhance their brand and employee satisfaction, while cities can gain momentum in their climate goals. As a result, they predicted that cities will increasingly become hubs for climate-neutral and sustainable businesses (personal communication, 18th of April 2024).

At the municipal level, the economic and business opportunities created by the transition, as well as the role of local businesses and industries in driving innovation were further emphasised. For instance, Stockholm's CCC (2023, p.3) outlines the city's goal of building a strong industrial sector and creating job opportunities through fossil-free practices, stating that "*Apart from achieving climate neutrality, this climate city contract also leads to several co-benefits. New job opportunities are already emerging in the energy, mobility and circularity sectors.*" Additionally, a representative from Stockholm highlighted the city's considerable existing collaborations with business actors, noting that future collaboration can build on these partnerships (personal communication, 10th of April 2024). Meanwhile, Amsterdam's roadmap (Roadmap Amsterdam Climate Neutral 2050, 2020) highlights the city's ambitions to accelerate the energy-efficient business market to foster innovation and efficiency within the business community and align economic activities with the city's sustainability goals. This emphasis underscores the city's commitment to leveraging economic activities for advancing climate goals and driving sustainable growth.

Overall, the narrative of business innovation and a green economy as central to climate-neutral cities reflects a vision of cities where economic prosperity is linked to urban sustainability. This vision was shared across different levels of governance, showing a unified commitment to integrating business innovation with environmental goals.

5.2.6 The City as a Complex System

Another prominent narrative which emerged within the sociotechnical imaginary for urban climate neutrality is the city as a complex system. This narrative emphasises the need for a holistic and systemic approach to achieving climate goals, recognizing that cities are intricate networks of interconnected elements that require coordinated efforts across various sectors and levels of governance.

At the heart of this narrative is the recognition that achieving net-zero emissions requires collaboration and coordination across traditional silos, a perspective which is central to the Cities Mission (Krogh Andersen & Jordan, 2020). A representative from NetZeroCities emphasised the importance of systemic thinking and coordination in implementing solutions at scale (personal communication, 25th of April 2024). They argued that traditional incremental methods have historically proven insufficient and highlighted the need for societal, governance, and mindset changes to complement technological solutions. Furthermore, they recognised the Cities Mission as a useful platform for this kind of systemic approach (personal communication, 25th of April 2024). Similarly, a representative from the Mission Board advocated for systemic change in the Cities Mission through public-private

dialogues and cross-border collaborations, rather than focusing solely on achieving net-zero emissions by 2030, arguing that such changes are a better indicator of the Mission's success than specific targets (personal communication, 10th of April 2024).

In Stockholm, the CCC (2023) acknowledges the inherently systemic nature of the transition to climate neutrality, noting that "*this insight will permeate the work process towards climate neutrality*". A representative from Stockholm elaborated that while technological solutions have contributed significantly to emission reductions, the city is "*now at a stage where [they] need to do system changes*", something that is only possible through a multitude of coordinated actions (personal communication, 24th of April 2024).

In Amsterdam, the importance of a systems perspective is illustrated by the holistic approach to climate neutrality and the Cities Mission. Representatives emphasised that the city is taking a broader approach to the Cities Mission, as one representative noted, "*We have a holistic vision of sustainability so it's not just neutrality*" (personal communication, 12th of April 2024). Alongside a goal to achieve carbon neutrality, the city reportedly integrates additional principles into its transition approach, such as nature inclusivity and circular economy principles (personal communication, 12th of April 2024; personal communication, 26th of April 2024).

Overall, the narrative of the city as a complex system highlights the interconnectedness of cities and the need for comprehensive, coordinated efforts to achieve urban climate neutrality. This perspective encourages innovative approaches that go beyond technology to include changes in governance, societal behaviour, and cross-sector collaboration.

5.3 Barriers to Implementation

This section will respond to RQ2 by outlining the barriers to implementing the dominant sociotechnical imaginary for urban climate neutrality in the context of the Cities Mission. It will explore the barriers expressed by representatives at various governance levels of the Cities Mission.

5.3.1 Legal and Regulatory Barriers

Legal and regulatory frameworks emerged as a key barrier for cities seeking to achieve climate neutrality. Respondents highlighted the entrenched nature of existing legal structures, which are seen to perpetuate outdated models and hinder the adoption of alternative approaches. For instance, a representative from the Cities Mission Board identified legal barriers hindering municipalities' ability to engage in community-led initiatives, noting that "*in most countries, there are no legal tools in place that will enable community-driven action. In fact, it's basically illegal*", and emphasising the need for legal tools that allow cities to engage in such initiatives (personal communication, 22nd of April 2024).

Legal barriers were also identified as hindering cities' ability to experiment. First, with regard to cities' procurement processes, it was emphasised that "*highly complex and long procurement processes make it almost impossible to do experimentation*", since legal barriers can hinder cities from collaborating with companies for pilot projects (Cities Mission board member B, personal communication, 22nd of April 2024). Similarly, risk aversion was identified as a significant barrier to experimentation, exacerbated by legal limitations on municipalities' ability to incur debt. Heightened regulatory scrutiny, particularly in the aftermath of the 2008 financial crisis, has reduced municipalities' capacity to invest in new projects. As articulated by a member of the Mission Board, "*Experimenting is not easy for municipalities. Producing debt is in many cases, not possible. They're not allowed*" (personal communication, 22nd of April 2024).

Several interviewees noted that national legislation is often not aligned with ambitions at the city level, thus impeding municipal climate initiatives. For instance, a representative from Stockholm municipality identified national regulations for parking as problematic for municipal authorities trying to move away from reliance on private vehicles (personal communication, 10th of April 2024). A similar sentiment was expressed by representatives from Amsterdam municipality, who cited the city's heating transition as a key area in which the absence of necessary laws and the slow pace of legislative changes at the national level impedes the local government's ability to implement essential measures, such as transitioning homes away from a natural gas supply (personal communication, 26th of April 2024; personal communication, 12th of April 2024). One representative noted that: "*in the Netherlands, the heating transition currently lacks a lot of laws and policies that local governments would need to actually be able to implement the transition*" (personal communication, 26th of April 2024). Another representative recalled that this disconnect has rendered certain investments into sustainable heating unfeasible, leading the municipality to scrap its planned investments (personal communication, 12th of April 2024). In response to these challenges, a national support structure has been established in the Netherlands to facilitate collaboration between municipalities and various government ministries (Amsterdam representative B, personal communication, 26th of April 2024). Additionally, a representative from Stockholm municipality emphasised the value of policy labs in guiding practitioners on how to navigate national laws and regulations (personal communication, 10th of April 2024).

In response to these challenges, several interviewees emphasised the necessity of systemic and transformative changes in the legal and regulatory sphere. One interviewee from the Mission board underscored the need for a paradigm shift in environmental law, advocating for

proactive measures to drive action forward rather than solely focusing on preventing harm. Initiatives like the European Green Deal, along with associated measures such as the EU taxonomy and corporate sustainability reporting directive, were cited as steps in the right direction (personal communication, 10th of April 2024). Others highlighted the importance of legal innovation to surmount barriers arising from national laws (Amsterdam representative A, personal communication, 12th of April 2024; Board member, personal communication, 22nd of April 2024)

5.3.2 Policy-Making and Political Barriers

Political decision-making and the dynamic nature of the political landscape were identified as a significant barrier to climate neutrality. In particular, the challenge of maintaining public support for climate initiatives was emphasised, as well as the importance of maintaining broader electoral success for political parties and policymakers that prioritise climate action.

A member of the Mission board emphasised the disruptive power of changing administrations as a result of elections (personal communication, 22nd of April 2024). They noted that such changes make it difficult for municipalities to maintain the continuity of climate policies and initiatives, since they can result in broader shifts within the administrative team, rather than just changes in leadership, such as the mayor and council majority (personal communication, 22nd of April 2024).

Several interviewees noted a significant shift in many countries to far-right ideologies and the ascent of political parties less inclined to prioritise climate action. According to the representatives, this shift can influence policy directions and hinder the adoption of ambitious climate agendas. For instance, a representative from Viable Cities stated, "*I always say that the most important thing you can do for the climate is to vote for the right politician*", noting that in recent Swedish elections, many people had voted for political parties that do not embrace climate mitigation measures (personal communication, 11th of December 2023). They attributed this voting behaviour to a lack of perceived relevance or inclusion in the future envisioned by climate action initiatives and emphasised the need for effective communication regarding climate issues in Sweden (personal communication, 11th of December 2023). Similarly, a representative from Amsterdam noted a political shift away from parties embracing climate goals in the Netherlands, which has impeded progress on climate action at the municipal level (personal communication, 26th of April 2024).

5.3.3 Governance and Administrative Barriers

Governance and administrative challenges emerged as significant barriers hindering progress towards climate neutrality. Interviewees highlighted various issues related to coordination between different governance levels and lengthy decision-making processes as impeding action.

First, complexities arising from the interaction between different levels of governance, in particular between national and local governments, were identified by several interviewees as a key challenge. For instance, a representative from Amsterdam municipality noted that "*on climate neutrality, I think currently the largest issue we have is on the one side, the lack of facilitating regulation from other government levels. You can see that we don't necessarily have the tools that we need to implement the transition*" (personal communication, 26th of April 2024). For instance, citing the example of Amsterdam's aspiration to establish a Zero Emission Zone, a representative noted that the implementation of such a measure was currently not possible, since the necessary traffic sign has not yet been approved by the National Parliament, highlighting the interconnectedness of political decision-making across different governance levels (personal communication, 26th of April 2024).

In a similar vein, representatives from Stockholm municipality highlighted the limited local autonomy over electricity production and emission levels (personal communication, 10th of April 2024; personal communication, 24th of April 2024). Specifically, one representative highlighted the challenge of reducing emissions from the electricity grid, which often falls outside the direct control of municipal authorities. They noted that while a significant portion of electricity in the Nordic region comes from renewable sources, local governments such as Stockholm have limited influence over the energy mix and broader energy infrastructure, restricting their abilities to influence the use of renewable energy (personal communication, 24th of April 2024). Furthermore, a Stockholm representative pointed out the impact of national level policies and regulations on local emission levels, particularly in sectors like transportation. Here, changes in national policies can have direct consequences for local emissions profiles (personal communication, 10th of April 2024). For example, shifts in the Swedish national policy regarding biofuel use in fossil fuels have put a pause on requirements to increase renewable fuel blends, which has led to a setback in emission reduction efforts (Stockholm CCC, 2023). According to the Stockholm representative, this has led to increased carbon emissions, particularly in the transport sector (personal communication, 10th of April 2024). Both representatives from Stockholm stressed the need for coordination between different levels of government to ensure that policies and regulations support rather than hinder efforts to reduce emissions (personal communication, 10th of April 2024; personal communication, 24th of April 2024).

A member of the Mission Board also highlighted difficulties related to the interplay between national and local autonomy, in particular regarding taxation and resource allocation (personal communication, 10th of April 2024). They noted that while local governments can rely heavily on funding from national taxation systems, the design and implementation of taxation policies are usually determined at the national level. This can constrain local governments' ability to raise revenue independently or to implement tax incentives or penalties to encourage sustainable behaviours. With regards to resource allocation, they noted that national governments tend to be in control of the allocation of resources, including financial support and infrastructure investments which are critical for local climate initiatives. Therefore, limited access to resources can hinder the implementation of such initiatives, as municipalities may lack the necessary funding or infrastructure support (Board member A, personal communication, 10th of April 2024).

Slow decision-making processes due to complex governance structures within the municipality were also identified as a challenge, particularly by those working at the city level. A representative from Amsterdam municipality noted that the decision-making process in large municipalities is often slow and complex (personal communication, 26th of April 2024). Additionally, the presence of numerous existing policies and stakeholders working on various initiatives adds further complexity to the process. This means that the introduction of new flagship initiatives, such as the Cities Mission, may face resistance and reluctance from stakeholders accustomed to existing policies and practices. In light of these challenges, the representative highlighted the need for streamlined governance structures that can effectively integrate and implement climate policies (personal communication, 26th of April 2024).

5.3.4 Financial and Investment Barriers

Barriers associated with finance and investment were identified by several actors, in particular by those at the city level and at the EU level. Key points include the critical role of finance in driving large-scale climate action initiatives, the clash between long-term climate benefits and short-term business and investment perspectives, and the challenges of accessing and effectively using existing funds due to fragmentation and bureaucratic hurdles.

Two members of the Mission Board emphasised the importance of finance and investment for driving the necessary scale and scope of climate action initiatives such as the Cities Mission (personal communication, 10th of April 2024; personal communication, 22nd of April 2024). Recognising that implementing changes requires significant upfront financial resources, they stressed that the long-term benefits, including those which are not immediately quantifiable in monetary terms, outweigh the initial costs. However, they pointed out barriers associated with the short-term perspective, which is often adopted in business plans, particularly in the aftermath of the 2008 financial crisis. Specifically, since the financial crisis, many investors prioritise returns within a relatively short timeframe, typically five to seven years (personal communication, 10th of April 2024). Significantly, this is not aligned with climate initiatives, which may not yield immediate returns within such a limited period.

Representatives from the municipal level also emphasised the importance of funding, as well as the challenges related to accessing it. For example, a representative from Amsterdam municipality pointed out the difficulty of securing the necessary funding for large-scale initiatives such as Amsterdam's heating transition (personal communication, 26th of April 2024). They posited that the transition will involve extensive home renovations in privately-owned housing, infrastructure development, and the adoption of alternative heating sources, all of which will incur significant costs. Moreover, they expressed doubts about whether the transition can be done in the near future, particularly due to concerns about funding sources, and distribution of costs among stakeholders.

Beyond the challenge of finding funding, accessing existing funds and developing business cases was also identified as a challenge for cities. According to a member of the Mission board, while there are many available funds and subsidies for cities, particularly in the EU, the challenge for cities lies in navigating the complexities of accessing these resources and applying them effectively (personal communication, 22nd of April 2024). Due to the fragmentation of funding sources across different time periods and programmes, as well as bureaucratic hurdles, cities often struggle to make proper use of funding: "*It's not an issue of money, it's an issue of accessing funds. It's an issue of combining them. It's an issue of having them all together at certain points, it's an issue of aligning them and streamlining them*" (personal communication, 22nd of April 2024). Moreover, they noted that securing investment often requires collaboration with other cities in the region to ensure scalability and financial viability, which can be a challenge for municipalities due to capacity constraints, including limited personnel and organisational resources (personal communication, 22nd of April 2024). Therefore, the board member advocated for so-called 'one-stop shops' that combine different funding programmes for cities.

5.3.5 Consumption and Behaviour Change Barriers

Some representatives identified the challenge of large-scale behaviour change and influencing consumption patterns among citizens as a barrier for cities to achieve significant emission reductions. Notably, while actors at the city level identified this as a significant barrier, actors at the national level highlighted unexplored opportunities for addressing consumption through collaborative governance.

Representatives from Stockholm municipality stressed the challenge of influencing individuals' behaviours. For instance, one representative stated that "*people can change the way they live their lives, or what they spend their money on and what they eat, or how they travel. But, of course, we can't control that as a municipality*" (personal communication, 10th of April 2024). This indicates a reluctance or perceived inability of cities to engage directly with consumption issues.

Meanwhile, at the national level, opportunities for addressing consumption through existing instruments were identified. For instance, a representative from Viable Cities noted that in the

case of Stockholm, measures addressing consumption tend to be deferred into the city's long-term plans, as they are perceived as too complex to tackle in the short term (personal communication, 24th of April 2024). According to the representative, addressing issues related to consumption is perceived as more challenging than tackling other issues, such as those related to mobility and transport. However, they suggested that municipalities often do not see the potential of collaboration for addressing complex challenges such as consumption. Specifically, while they indicated that cities such as Stockholm have a tendency to work in isolation, the representative argued that collaboration with other actors, such as businesses, community groups, and other cities, is a fruitful avenue for influencing citizens' behaviour and consumption patterns towards those which are more sustainable (personal communication, 24th of April 2024).

6 Discussion

This chapter discusses and critically reflects on the findings of this study. First, to situate the findings in the landscape of existing research, the identified narratives and barriers are compared to existing literature to reveal similarities, differences, and new insights. Next, the conceptual framework which guided this study is revisited. Based on the findings, certain adjustments are made, and a modified version of the framework is presented. Lastly, the methodological and conceptual approaches are reflected upon, and the limitations of the study are considered.

6.1 Narratives and Sociotechnical Imaginaries

This study has identified several key narratives underlying the sociotechnical imaginary of urban climate neutrality: sustainable mobility and transport, community engagement and just transition, frontrunners in urban climate action, the city as an experiment, green economy and business innovation, and the city as a complex system. These narratives offer a comprehensive view of how stakeholders and cities participating in the Cities Mission envision and pursue climate neutrality. In this section, these narratives are compared with existing research in the field. While no study has explicitly investigated narratives for climate neutrality, several studies have explored similar or adjacent concepts and topics, such as the storylines underlying sociotechnical imaginaries of urban carbon neutrality (Tozer & Klenk, 2018), sociotechnical configurations of carbon neutrality (Tozer & Klenk, 2019), and sociotechnical imaginaries of the energy transition (Carvalho et al., 2022). The findings from these studies are discussed in comparison with the narratives identified in this research to identify alignments and divergences.

This study identified "**Community Engagement and Just Transition**" as a key narrative for urban climate neutrality in the Cities Mission. This narrative aligns closely with sociotechnical imaginaries identified by Carvalho et al. (2022) in the Portuguese roadmap for carbon neutrality 2050, namely "Energy Citizenship" and 'Just Transition'. Carvalho et al. (2022) described "Energy Citizenship" as an imaginary where citizens are viewed as active agents of change in the energy transition, while the 'Just Transition' imaginary was understood as "highlighting the need for an inclusive and fair reconfiguration of sociotechnical and socioeconomic systems" (Carvalho et al., 2022, p. 2420). In the same vein, Tozer and Klenk (2018, p. 174) identified "reframing what it means to be a 'good' urban citizen" as a storyline which underlies sociotechnical imaginaries of urban carbon neutrality in the Carbon Neutral Cities Alliance. Similarly to the imaginaries described by Carvalho et al. (2022), this storyline emphasises the role of citizens as potential agents of change in the energy transition, through behaviour changes and sustainable decision-making. Thus, the "Community Engagement and Just Transition" narrative, which emphasises the active involvement of citizens in the energy transition through collaboration and co-creation, in particular, to ensure the inclusion of vulnerable groups, has significant parallels with the two sociotechnical imaginaries outlined by Carvalho et al. (2022) and the storyline described by Tozer and Klenk (2018). These parallels suggest that citizen involvement and socially just transitions are considered central to energy transitions across different contexts.

Next, the narrative of "**Frontrunners in Urban Climate Action**", as identified in this study, also aligns with certain sociotechnical imaginaries and storylines identified in existing research. Firstly, the concept of being a world leader in climate action aligns closely with the sociotechnical imaginary of "Modernization and Techno-Economic Development" as outlined by Carvalho et al. (2022). Within this imaginary, the energy transition is positioned as a means to attain economic and geopolitical leadership (Carvalho et al., 2022). This perspective resonates with the narrative of being a frontrunner in urban climate action, where

cities strive to lead by example and drive progress towards urban climate neutrality through their climate initiatives. Moreover, Tozer and Klenk (Tozer & Klenk, 2018) outlined the storyline of 'Technological Fixes and the Modern City,' which underscores the notion that cities must embrace sustainable technological innovation to remain competitive and maintain their stature on the global stage. Here, the emphasis on cities positioning themselves as international leaders through climate action aligns with the frontrunner narrative described in this study.

The narrative of "**The City as an Experiment**" resonates closely with the storyline of "the city as a laboratory" introduced by Tozer and Klenk (2018). The authors (2018) presented the storyline of "the city as a laboratory," which characterises urban areas as hubs of innovation and experimentation for climate solutions. Cities are portrayed as dynamic spaces where public and private actors collaborate to experiment with different approaches to address climate challenges (Tozer & Klenk, 2018). This is closely in line with the narrative expressed in this study, which sees cities as vital experimental hubs for innovative climate action and learning. This reflects a shared emphasis on cities for innovation and experimentation in other international initiatives such as the Climate Neutral Cities Alliance, that aim for urban climate neutrality.

The narrative of "**Green Economy and Business Innovation**" identified in this study is strongly aligned with the socio-technical imaginary of the "Green Economy" described by Carvalho et al. (2022) and the storyline of the "New Economy of Carbon Control" outlined by Tozer and Klenk (2018). Carvalho et al. (2022) described the 'green economy' sociotechnical imaginary as a paradigm where economic growth is closely coupled with sustainability and climate change mitigation. This imaginary highlights the decarbonization process as beneficial to the economy through the creation of new markets, business opportunities, and jobs within a carbon-neutral framework (Carvalho et al., 2022). The narrative identified in this study reflects these tenets by focusing on the economic opportunities created by the transition to a climate-neutral city, and the role of public-private partnerships in fostering sustainable business practices. Similarly, Tozer and Klenk (2018) described the "New Economy of Carbon Control" as viewing carbon control as a business opportunity within a framework of neoliberal economic competition. It underscores the role of market mechanisms and business innovation in driving the transition to a sustainable economy. This perspective is also echoed by the narrative identified in this paper, which highlights the economic benefits and opportunities associated with climate action, specifically urban climate neutrality.

Nonetheless, despite these similarities and parallels, certain narratives identified in this study are not fully reflected in the existing literature. Specifically, the focus on "Sustainable Mobility and Transport" and the narrative of "The City as a Complex System" are not prominently featured in the literature. However, overall, there is substantial alignment between the identified narratives and existing research.

6.2 Barriers to Implementation

This study identified several barriers to implementing urban climate neutrality. These barriers have been grouped into five overarching categories, namely legal and regulatory constraints, political and policy-making challenges, governance and administrative hurdles, financial and investment limitations, and issues related to consumption and behaviour change. The identified barriers align with and bridge those identified in existing research, specifically those outlined by Kaufmann et al., (2023), Ulpiani & Vetters (2023), and Liakou et al. (2022), while providing some new insights.

One of the significant barriers identified in this study is the complex legal and regulatory framework that often fails to support innovative climate actions. Rigid laws and a lack of coherence between national and local laws can hinder the implementation of new technologies and sustainable practices. While not explicitly mentioned in their report, parallels can be drawn between this barrier and those identified by Liakou et al. (2022), who discussed policy and governance challenges that included inflexible regulatory environments. Moreover, both Liakou et al. (2022) and Kaufman et al. (2023) pinpointed how differing national and local policies and regulations can impede progress, in line with the findings of this study.

Political and policy barriers are distinguished in this study from legal and regulatory barriers. According to the findings, political will is essential for the adoption of bold climate policies, but political cycles and shifting priorities can disrupt long-term sustainability plans. This finding is mirrored by Ulpiani and Vetters (2023), who emphasised the impact of short-term political cycles, which they argued can create uncertainty and disrupt long-term climate planning.

Governance and administrative barriers are also identified in this study. These include challenges related to coordination between different governance levels, as well as slow decision-making processes due to complex governance structures. Both Liakou et al. (2022) and Ulpiani and Vetters (2023) raised similar challenges, namely noting departmental silos and the fragmentation of responsibilities within municipal administrations, which can hamper effective coordination and mainstreaming of climate action.

Financial constraints and the lack of investment are critical barriers. This study has found that securing and streamlining funding for large-scale climate projects remains a significant challenge, and there is often a gap between the availability of funds and the financial needs of urban climate initiatives. Liakou et al. (2022), Kaufmann et al. (2023), and Ulpani and Vetters (2023) similarly emphasised the need for substantial upfront investment and the difficulties for cities to access and mobilise these financial resources, pointing to financial uncertainties and the fragmented nature of many funding options.

Lastly, changing consumption patterns and behaviours is another major barrier. This study has shown that, while achieving urban climate neutrality requires significant shifts in how citizens and businesses behave and consume resources, it is seen as a challenge which is unfeasible to address in the short term. In a similar vein, Liakou et al. (2022) highlighted the importance of public engagement and cultural shifts in achieving climate goals, while Ulpiani and Vetters (2023) noted that public apathy can hinder stakeholder engagement, and thus the effective implementation of urban climate initiatives.

Overall, the barriers identified in this study align closely with those found in the literature, particularly in the categories of policy, governance, and financial barriers. The findings of Kaufmann et al. (2023), Ulpiani and Vetters (2023), and Liakou et al. (2022) corroborate these barriers, illustrating a consistent picture of the barriers impeding the implementation of urban climate neutrality initiatives. However, this study contributes additional insights, for instance, it brings attention to the critical role of legal and regulatory frameworks, which are often overlooked or generalised in other reports. By identifying specific legal and regulatory constraints, this study underscores the need for coherent and supportive regulations and policies that can facilitate innovative climate actions at the local level. Additionally, this study's emphasis on consumption patterns and behaviour change highlights the need for a concerted effort to achieve these, aligning with, but also extending the discussion in existing literature. Addressing these barriers will require a holistic approach that considers the interconnectedness of legal, political, governance, financial, and behavioural factors, and fosters collaboration across all levels of government and society.

6.3 Revisiting the Conceptual Framework

In revisiting the conceptual framework developed for this study, the applicability of the framework is reflected upon. Overall, it is deemed that it has provided a structured approach for understanding and investigating the narratives embedded within the dominant sociotechnical imaginary for urban climate neutrality and the barriers to its realisation. However, in light of the study's findings, three key revisions are proposed to refine the framework and make it more reflective of the real world. Figure 6-1 depicts the revisions outlined below.

Firstly, rather than being discrete entities, the narratives contained in the dominant sociotechnical imaginary for urban climate neutrality were found, in some cases, to intersect. The overlap between narratives can be seen, for instance, between the narratives of "Frontrunners in Urban Climate Action" and "Green Economy and Business Development". Here, being at the forefront of urban climate action is presented not only as a moral imperative, but also as a means for cities to attract increased investment, new business opportunities, and innovation, demonstrating parallels between the two narratives. Additionally, the "Sustainable Mobility and Transportation" and the "Community Engagement and a Just Transition" narratives both emphasise the importance of improving life quality and liveability in cities, such as can be achieved through accessible and affordable public transport. These overlaps highlight the interconnectedness and complexity inherent in urban climate action.

Secondly, there are also instances in which narratives contradict one another and even exhibit internal inconsistencies, highlighting tensions and contradictions within the dominant sociotechnical imaginary. For instance, the narrative of "The City as a Complex System" underscores the need for systemic change and holistic approaches to achieving urban climate neutrality. This narrative appeared to coexist alongside the notion of continuity and minimal disruption to daily life, as expressed, for instance, under the "Sustainable Mobility and Transportation" narrative. Notably, in some cases, both narratives were expressed by the same representative. In addition, the "Sustainable Mobility and Transportation" narrative itself revealed internal contradictions. Namely, while advocating for reduced car traffic and even car-free streets, it also prioritised the promotion of EVs and related infrastructure. These contradictions within and between narratives underscore the complex and dynamic nature of the dominant sociotechnical imaginary for urban climate neutrality and the challenges of navigating diverse narratives.

Thirdly, the barriers to implementing urban climate neutrality are found to interact dynamically with narratives, influencing the perceived feasibility and pathways of achieving climate goals. This study has shown that barriers, whether real or perceived, can shape and influence narratives by delineating what is deemed achievable, what pathways are considered viable, and which mechanisms are deemed effective in advancing urban climate action. For instance, the perceived challenges in changing public consumption behaviour, particularly at the city level, correlate with a lack of emphasis on this aspect in the cities' narratives for urban climate neutrality. Additionally, this feedback is exemplified in Amsterdam's adoption of a target for achieving climate neutrality by 2050 instead of aligning with the Cities Mission's target of 2030, reflecting the perception of barriers impeding more ambitious goals. Thus, it is proposed that there is a feedback loop between barriers and narratives, wherein barriers can influence the narratives that stakeholders prioritise, ultimately influencing the strategies and actions undertaken in the implementation phase.

Overall, these revisions to the conceptual framework underscore the complexity and dynamic nature of urban climate action, characterised by intersecting and contradicting narratives

within the dominant sociotechnical imaginary, and feedback between barriers and narratives. By incorporating these insights, the framework becomes more reflective of the complexities inherent in urban climate neutrality efforts. Moreover, by integrating an understanding of intersecting and contradictory narratives, internal narrative tensions, and the dynamic interaction between barriers and narratives, stakeholders can refine urban development strategies and policies. Specifically, this approach allows for more inclusive policies that accommodate diverse perspectives, it identifies potential areas of resistance, and it promotes adaptive strategies to overcome barriers. Ultimately, this leads to more effective initiatives for achieving urban climate neutrality.

The specific practical implications of these findings are further discussed in section 7.2.

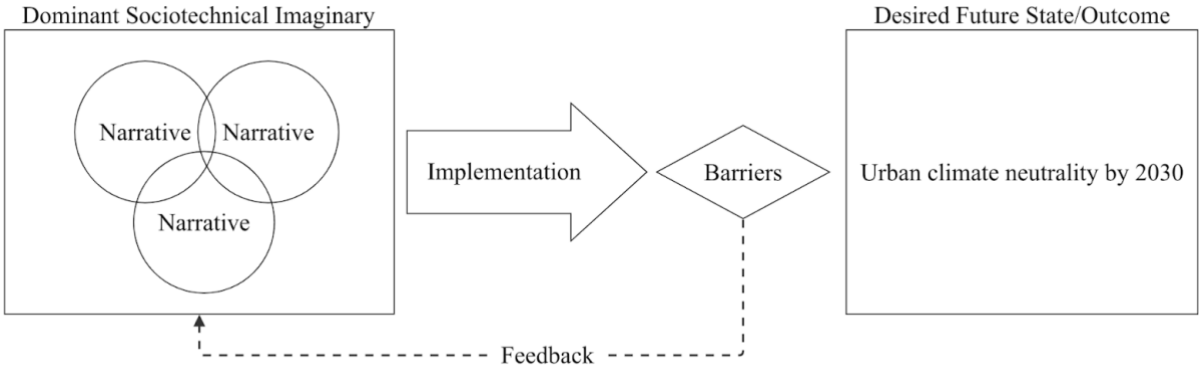

Figure 6-1. The revised conceptual framework, depicting the implementation of the dominant sociotechnical imaginary for urban climate neutrality at municipal, national, and EU levels.

Source: Author's own

6.4 Critical Reflections and Limitations

In this section, the results of the study are critically reflected upon. Having discussed and identified how the findings of this thesis addressed the identified research problem, the significance, as well as the limitations of the research and the findings from a methodological and conceptual standpoint, are considered.

6.4.1 Reflections on the Methodological and Conceptual Approach

Several aspects relating to the methodological and conceptual approach adopted in this research are of significance. Firstly, the constructivist ontological and interpretivist epistemological approach adopted in this study recognises the constructed nature of reality and understands knowledge as derived from the interpretation of social actors' experiences and meanings (Creswell & Creswell, 2017). This perspective informed the selection of data collection methods of semi-structured interviews and document analysis, as well as the use of narrative analysis to analyse the collected data. These methods facilitated the identification of the narratives underlying the dominant sociotechnical imaginary to urban climate neutrality in the Cities Mission, revealing how different stakeholders conceptualise and approach climate-neutral urban futures (RQ1). Moreover, this approach informed the investigation of perceived barriers for implementing climate neutrality (RQ2). By focusing on stakeholders' interpretations and experiences, the study was able to uncover nuanced insights into the challenges they face in implementing urban climate neutrality. The constructivist and interpretivist approach also enabled a deeper understanding of how these barriers are perceived differently by various stakeholders, depending on their roles, interests, and contexts.

Reflecting further on the specific methods of data collection and analysis, the use of semi-structured interviews with representatives at different governance levels of the Cities Mission and from the two case study cities, alongside document analysis of strategy documents is significant. Notably, while previous studies on sociotechnical imaginaries for climate neutrality have individually employed similar methods—such as document review by Tozer and Klenk (2018; 2019) and semi-structured interviews by Carvalho et al. (2022)— to the best of this author's knowledge, the combined use of these methods in this study offers a novel approach. By integrating these data-collection methods, this study expands the methodological repertoire, offering a more holistic understanding of sociotechnical imaginaries for urban climate neutrality. Moreover, the use of narrative analysis to identify the narratives contained sociotechnical imaginaries was not found in the literature that the author reviewed. Therefore, this presents a novel approach to the analysis of sociotechnical imaginaries and the narratives embedded within them.

Lastly, the conceptual framework developed in this study has provided a structured approach to the research by connecting the concepts of sociotechnical imaginaries, narratives, and implementation barriers in the context of urban climate neutrality. Moreover, by incorporating an understanding of intersecting and contradictory narratives, internal narrative tensions, and the dynamic interaction between barriers and narratives, the revised framework acknowledges the complexities and dynamics inherent in socio-technical transitions (Geels, 2018), particularly in the transition to urban climate neutrality. This enhances the framework's theoretical robustness and its applicability to real-world contexts and scenarios.

6.4.2 Critical Reflections and Limitations

There are several limitations to this study, related to the conceptual and methodological approach, as well as with regard to the broader scope of the findings, that should be considered. Firstly, in light of the qualitative nature of the research, it is important to consider both the qualitative reliability and validity of the research (Creswell & Creswell, 2017).

Qualitative reliability can be understood as the consistency and stability of the research process and results, including the extent to which they can be replicated (Creswell & Creswell, 2017). In this study, several factors threatened the reliability of the research. First, the semi-structured nature of the interviews allowed for some variations in the questions asked across interviews, potentially impacting the consistency of data collection. Additionally, the inductive coding of the data introduced subjectivity in identifying key narratives and barriers for the dominant sociotechnical imaginary for urban climate neutrality. To address these threats to reliability, this study adhered to the recommendations of Yin (2009) by thoroughly outlining the methods for data collection and analysis (see Chapter 4), as well as including the interview guide used in the semi-structured interviews (see Appendix E). These steps seek to facilitate the replication of the study by providing a framework for data collection.

Qualitative validity can be understood as the accuracy of the findings (Creswell & Creswell, 2017). Specifically, the results of this study are limited in their external validity, which relates to the extent to which the findings can be generalised or applied to other contexts (Creswell & Creswell, 2017). The external validity of this study's findings may be limited due to several factors. The study employed a case study approach, providing in-depth insights into specific cities and levels of governance. Specifically, the study focused on two Northern European capital cities, Stockholm and Amsterdam, both of which are advanced in climate action. While the case study approach offers rich detail, it may not capture the diversity of experiences across a broader range of cities involved in the Cities Mission or other initiatives for urban climate neutrality. Additionally, a limited number of representatives (11) were interviewed, meaning that the perspectives and opinions of these interviewees may reflect individual viewpoints rather than consensus or prevailing attitudes within the respective organisations or governance bodies, potentially leading to skewed or non-representative results. However, despite these limitations, it should be noted that the intent and value of qualitative case study research, as outlined by Creswell and Creswell (2017), is not to achieve generalisability, but rather to develop a detailed understanding of a specific case or phenomenon.

Nevertheless, certain validity strategies were incorporated to enhance the overall validity of the findings. Namely, the use of both documentary sources and semi-structured interviews allowed for triangulation of data sources (Creswell & Creswell, 2017). Also, while the researcher's bias may have influenced the data collected (Creswell & Creswell, 2017), efforts were made to mitigate this bias. Interview questions were formulated to avoid leading or influencing the interviewees' responses, minimising the potential for bias. Despite these measures, the possibility of researcher bias cannot be discounted and should be considered when interpreting the findings of this study.

Further limitations relating to the scope of this study can be reflected on. Significantly, this study investigated the narratives contained within the *dominant* sociotechnical imaginary for urban climate neutrality, and the barriers impeding its implementation. Thus, alternative imaginaries which can exist in parallel with the dominant imaginary (Longhurst & Chilvers, 2019; Rudek, 2022) were not explored. These can be represented by various actors such as NGOs and community groups, and expressed across different sources, for instance in pop culture (Rudek, 2022). This focus on the dominant sociotechnical imaginary may overlook innovative or grassroots approaches that could provide valuable insights into overcoming barriers and achieving climate goals.

Therefore, while the findings of this study provide a window into the narratives underlying the dominant sociotechnical imaginary and the barriers for achieving urban climate neutrality in the selected cities and governance levels, caution should be exercised when generalising these findings to other settings. Future research endeavours could replicate and validate these findings across a more diverse range of cities and governance contexts to enhance the

generalisability and external validity of the results. Moreover, they could investigate alternative imaginaries to provide a more comprehensive understanding.

7 Conclusion

This chapter concludes the thesis by addressing the posed research questions and providing a summary of the main findings. Additionally, practical implications and recommendations for non-academic audiences are given. Finally, the academic implications of the research are addressed in the form of suggestions for further research.

7.1 Addressing the Research Questions

The aim of this study was to investigate the dominant sociotechnical imaginary for urban climate neutrality in the context of the Cities Mission, specifically by identifying the key narratives contained within the dominant imaginary and the barriers impeding its implementation. The study focused on the cities of Stockholm and Amsterdam, as well as on the national and EU levels of governance within the Cities Mission. With this focus, the study sought to address the following two research questions:

RQ1: What are the key narratives contained in the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?

In addressing RQ1, this study has shed light on the dominant sociotechnical imaginary for urban climate neutrality within the Cities Mission by investigating the key narratives contained within this imaginary. Through a narrative analysis of climate strategy documents from Stockholm and Amsterdam, and semi-structured interviews with representatives from the municipal, national and EU level, six key narratives were identified:

1) Sustainable Mobility and Transport,
2) Community Engagement and Just Transition,
3) Frontrunners in Urban Climate Action,
4) The City as an Experiment,
5) Green Economy and Business Innovation, and
6) The City as a Complex System.

Collectively, these narratives shed light on the dominant imaginary that guides efforts towards urban climate neutrality. Moreover, the identification of these narratives provides insight into the shared visions and aspirations of stakeholders at various levels of governance, namely, municipal, national and EU levels, contributing to a more comprehensive understanding of the socio-technical dynamics shaping the Cities Mission.

Additionally, through the lens of the conceptual framework, parallels, inconsistencies, and tensions were identified within and between narratives. This analysis provides insights into the complexities of the dominant imaginary and highlights areas where further exploration or alignment may be needed to enhance the effectiveness of urban climate strategies.

RQ2: What are the perceived barriers impeding the implementation of the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?

In addressing RQ2, this study has revealed several perceived barriers hindering the implementation of the sociotechnical imaginary for urban climate neutrality, specifically in the context of the Cities Mission. The barriers were identified through a thematic analysis of climate strategy documents from Stockholm and Amsterdam, and semi-structured interviews with representatives from the municipal, national and EU levels. The identified barriers have been grouped into five broad categories, namely:

1) legal and regulatory barriers,
2) political and policy-making barriers,

3) governance and administrative barriers,
4) financial and investment barriers, and
5) challenges in addressing consumption and behaviour change.

By systematically analysing and categorising these barriers, the study provides insights into the multifaceted challenges hindering the implementation and realisation of the dominant imaginary for urban climate neutrality within the Cities Mission.

Furthermore, the application of the conceptual framework unveiled a dynamic interplay between these barriers and the narratives within the dominant imaginary. Specifically, it was found that real or perceived barriers in the implementation of urban climate neutrality can significantly influence the narratives prioritised by practitioners, thus shaping the strategies and actions prioritised or undertaken to achieve climate goals.

7.2 Practical Implications and Recommendations for Non-Academic Audiences

There are several practical implications and recommendations arising from this study that hold relevance for non-academic audiences, including policymakers, urban planners, and practitioners involved in the Cities Mission and other climate action initiatives.

RQ1 investigated the narratives underlying the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission, as expressed by actors at various governance levels. These narratives provide insight into how actors in Stockholm, Amsterdam, and at different governance levels of the Cities Mission conceptualise the transition to urban climate neutrality, and how they envision a climate neutral future. Put simply, they help address the question: "what are cities aiming for?". Understanding the narratives underlying the dominant imaginary is valuable in that it impacts real-world strategies and outcomes, including practices, policies, fund allocation, and research trajectories, as outlined in the literature (Delina, 2018; Jasanoff & Kim, 2015; Rudek, 2022; Tozer & Klenk, 2018). Therefore, recognising these narratives can foster more coherent and effective collaboration among stakeholders by providing a structured framework to align objectives across governance levels, identify key priorities, and tailor interventions to specific local contexts.

Moreover, there are certain practical implications and recommendations that can be made and deduced based on the finding that key narratives in the dominant sociotechnical imaginary for urban climate neutrality exhibited overlaps and contradictions. First, in light of the parallels between narratives, it is suggested that policymakers design integrated policies that leverage the synergies between different narratives. This holistic approach ensures that various policy objectives are aligned and mutually reinforcing. Next, with regard to the contradictions, identifying and addressing contradictions within and between narratives could help stakeholders navigate the inherent tensions in urban climate action. For example, by acknowledging these tensions, policymakers can develop more coherent and realistic policies that balance conflicting goals, such as promoting electric vehicles while advocating for reduced car usage. Moreover, recognising and acknowledging contradictions can build trust and facilitate more effective collaboration with stakeholders.

The second component of this research investigated the perceived barriers hindering the realisation of urban climate neutrality by 2030, with a focus on unravelling the obstacles to implementing the dominant sociotechnical imaginary unpacked through RQ1. Understanding these barriers is pivotal as it offers insights into the complexities and challenges faced by cities in their journey towards sustainability. Moreover, it was found that there is a feedback loop, by which barriers influence narratives in the dominant imaginary for urban climate neutrality.

Policymakers can leverage this dynamic interaction between narratives and barriers to develop adaptive strategies. For instance, if financial constraints are a significant barrier, policies can be adjusted to prioritise cost-effective measures and seek innovative funding solutions, aligning narrative goals with feasible implementation pathways.

Recommendations for Addressing Specific Barriers

Next, alongside identifying barriers, interviewees also presented potential solutions and recommendations, offering valuable insights for policymakers, urban planners, and stakeholders. By leveraging these proposed solutions, cities can navigate challenges more effectively, thereby accelerating progress towards achieving climate neutrality and fostering a sustainable future.

Legal and regulatory constraints were perceived as significant barriers to the implementation of the Cities Mission. Outdated and restrictive legal frameworks, along with discordance between national and local legislation, were identified as key obstacles to progress. To overcome these challenges and foster experimentation and innovation in cities—such as through procurement or investment in new projects—it is crucial to lower restrictive legal barriers that impede urban experimentation. Additionally, to facilitate collaboration between cities and other government agencies, the establishment of national support structures is recommended. This model, the National Cooperative Structure, successfully implemented in the Netherlands, can help streamline regulatory processes and enhance inter-departmental and inter-agency coordination. Furthermore, implementing policy labs, as seen in Stockholm, can provide valuable guidance to practitioners navigating national laws and regulations, enabling smoother policy implementation.

Next, policy-making and political challenges can impede progress towards urban climate neutrality. The dynamic nature of politics, where a change in administration can affect the continuity of climate action and initiatives, is particularly problematic. This issue is exacerbated by a perceived shift towards ideologies and parties, which interviewees noted are generally less inclined to prioritise such initiatives. In response, transparent communication and active collaboration with the public and stakeholders is recommended. This ensures they understand and support the transition, see themselves in the vision for a climate-neutral future, and thus support climate action and vote for parties that press their politicians to prioritise such initiatives.

Governance and administrative challenges can impede progress towards urban climate neutrality, particularly due to limited local autonomy and slow decision-making processes resulting from complex governance structures. Effective coordination between different levels of government is essential to ensure that policies and regulations support rather than hinder efforts to reduce emissions. Additionally, there is a need for streamlined governance structures that can effectively integrate and implement climate policies. Simplifying and aligning governance processes can help local authorities act more decisively and efficiently in their climate initiatives.

Financial and investment barriers significantly impede progress towards urban climate neutrality. A short-term perspective in business plans and expectations for quick investment returns make it challenging to secure, access, and combine funds for long-term climate initiatives. Establishing one-stop-shops can help streamline financial processes and provide easier access to the necessary funds and resources for implementing climate actions. These centralised hubs can support cities in navigating the complexities of climate finance and facilitating more effective investment in sustainable projects.

Addressing consumption and behaviour change is seen as particularly challenging in the transition to urban climate neutrality. Influencing individual and collective behaviour requires substantial effort and strategic interventions. To overcome these challenges, collaboration and collaborative governance are recommended. Collaborative governance involves the active involvement of various stakeholders, including local communities, businesses, and policymakers, in decision-making processes related to sustainable consumption practices. By fostering collaboration and engagement among these diverse groups, cities can develop more effective strategies for promoting behaviour change and fostering a culture of sustainability. This approach emphasises the importance of collective action and partnership in addressing complex challenges associated with consumption and behaviour change.

7.3 Recommendations for Future Research

While this study has provided valuable insights into the narratives and barriers surrounding urban climate neutrality within the context of the Cities Mission, there are several avenues for future research, which were not in its scope, that warrant exploration. By addressing these research gaps, scholars and practitioners can further enhance the understanding of urban climate neutrality and contribute to the development of effective strategies for sustainable urban development and successful implementation of the Cities Mission.

Firstly, the concept of sociotechnical imaginaries has proven to be a valuable analytical tool for understanding and exploring socio-technical initiatives and actions such as the Cities Mission. This indicates that future research could benefit from the further application of sociotechnical imaginaries in different urban contexts, particularly to better understand how collective visions shape urban climate neutrality efforts and the roles various stakeholders play in these processes. Moreover, the conceptual framework developed in this study provides a structured approach to examining these imaginaries and their realisation, thus making the concept more operationalizable. This framework could be applied to various contexts, revealing the diverse narratives and barriers that impact and shape sociotechnical transitions. In particular, the concept of sociotechnical imaginary, and this framework in particular, are useful in the field of energy and transition research, where understanding the interplay between future visions and practical implementation is crucial for fostering sustainable and equitable energy systems (Longhurst & Chilvers, 2019).

With regards to RQ1, which investigated the sociotechnical imaginary for urban climate neutrality, future research could consider the role of alternative imaginaries, particularly those of non-experts. As Tidwell and Tidwell (2018, p. 107) suggest, "non-expert visions of the 'good life' represent a critical and understudied aspect of why particular energy policies succeed or fail" (p. 107). Thus, understanding these alternative visions can provide deeper insights into the societal acceptance and success of energy policies and climate initiatives. Such imaginaries could be investigated through various data sources and methodologies. While this study employed semi-structured interviews and document analysis to investigate the dominant imaginary in the Cities Mission, data sources such as pop culture and media depictions of sustainable urban transitions and climate neutrality are under-explored (Rudek, 2022). For instance, examining movies, television shows, literature, social media discussions, and other forms of popular culture could reveal how non-experts envision and engage with concepts of sustainable living and climate action. These sources could provide insight into alternative narratives and imaginaries for urban climate neutrality, such as those held by the general public and community groups. This approach can highlight the divergence or alignment between expert-driven policies and public perceptions, potentially uncovering gaps in communication and engagement strategies.

Through RQ2, this study explored the perceived barriers to implementing urban climate neutrality, specifically the dominant sociotechnical imaginary of urban climate neutrality in the frame of the Cities Mission. Investigating the effectiveness of proposed solutions, such as those presented in section 7.2, to the barriers identified in this study could provide actionable insights and help tailor strategies to the unique challenges and opportunities of diverse cities. To reach a better understanding of which solutions work best in specific contexts and why, future research could assess how factors like local governance structures, economic conditions, and community engagement influence the success of diverse solutions. Additionally, examining the scalability of successful solutions could prove useful, in that it could help effective solutions to be adapted and implemented in different urban environments, making them more versatile and applicable across a broader range of cities.

One specific area that warrants further research is the differences among governance levels. While this study took a holistic approach to examining the narratives and barriers across the local, national, and EU governance levels of the Cities Mission, future research could take a more comparative stance. For example, researchers could compare narratives at different levels of governance to understand how they align or diverge in priorities, strategies, and perceptions of urban climate neutrality. Such comparative analysis could reveal how policies and initiatives are shaped by the specific contexts and mandates of each governance level and highlight areas where different governance levels may face tensions or conflicts. This could help facilitate coordinated action and enable the scaling up of successful climate initiatives.

While this thesis focused on the Cities Mission, specifically within the EU context and the municipalities of Amsterdam and Stockholm, future research could benefit from a broader scope. Investigating other cities involved in the Cities Mission, including non-capital cities, could provide a more comprehensive understanding of urban climate neutrality. Furthermore, exploring cities at various levels of maturity in climate action, different sizes, and geographical locations, as well as those outside the EU context, could offer valuable comparative insights, revealing how diverse cities approach climate neutrality.

Additionally, conducting longitudinal studies to track how imaginaries for urban climate neutrality evolve over time would provide dynamic insights into the shifting priorities, challenges, and strategies in climate governance. This long-term perspective can inform more resilient and adaptive policymaking. Moreover, a longitudinal perspective of how barriers to implementation change and evolve over the course of the Cities Mission could provide valuable insights for more resilient and adaptive policymaking.

Finally, this study focused on the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission. Since the Cities Mission seeks to achieve 100 climate-neutral and smart cities by 2030, future research could investigate the sociotechnical imaginary for "smart" cities. The concept of "smart" cities encompasses the integration of advanced technologies and data-driven solutions aimed to improve urban living conditions, enhance sustainability, and optimise city management (Batty et al., 2012). Given the rapid technological advancements and increasing integration of digital infrastructure in urban environments, understanding the sociotechnical imaginaries for smart cities is crucial (Miller, 2020). Future research could examine how smart technologies are envisioned and implemented, the socio-technical dynamics involved, and the potential barriers to realising these technologies within urban environments, such as data privacy and cybersecurity. Additionally, comparative studies between the sociotechnical imaginaries for climate-neutral and smart cities could highlight synergies and conflicts, offering a comprehensive understanding of how these dual objectives can be harmonised to achieve holistic urban sustainability. By broadening the scope to include the sociotechnical imaginaries for smart cities, researchers could contribute to a more integrated approach to achieving the ambitious goals of the Cities Mission.

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Appendix A – Interview Consent Form and Information Sheet

Futures in Focus: Unravelling Socio-Technical Imaginaries for Urban Climate Neutrality in EU Mission Cities

CONSENT FORM

This form is to ensure that you have been given information about the thesis project (see Information Sheet on the other side) and to give you opportunity to confirm that you are willing to take part in this research. For all activities below, please indicate which applies to you:

☐	I have been **familiarised** with the project, I have had the possibility to ask questions and I have received satisfactory answers to my questions
☐	As a research participant, I am aware of my **right to withdraw participation** at any time
☐	I give my consent that the interview can be analysed for the purposes of the thesis
☐	I give my consent to **be identified by my organization**
☐	I understand that the results of the research will be presented so that **no information can be traced to me personally**
☐	I give my consent that a record of my interview can be **safely stored** for future reference

Note: Your participation is voluntary. As an interviewee, you do not have to answer all the questions that are asked; you reserve the right to refuse or cease participation in the interview process without stating your reason and may request to keep certain materials confidential.

Please, sign below to confirm your consent:

	Participant(s)	Researcher
Name(s)		Jasmine Chakravarty
Signature(s)		
Date(s)	25 July 2024	25 July 2024

INFORMATION SHEET

Title: Futures in Focus: Unravelling Socio-Technical Imaginaries for Urban Climate Neutrality in EU Mission Cities

Researcher: Jasmine Chakravarty, Master's student at the International Institute for Industrial Environmental Economics (IIIEE), Lund University (MESPOM programme)

Institution: International Institute for Industrial Environmental Economics (IIIEE), Lund University

Supervisor: Björn Wickenberg, bjorn.wickenberg@iiiee.lu.se

Research Topic:
This research is being conducted as part of a master's thesis. The thesis delves into the socio-technical imaginaries (i.e., collectively held visions of the future) associated with urban climate neutrality, within the European Mission for 100 Climate Neutral and Smart Cities by 2030, specifically in the cities of Stockholm and Amsterdam. It seeks to understand the construction of socio-technical imaginaries for urban climate neutrality, and how these imaginaries impact urban climate strategies. Specifically, the research seeks to answer the following research questions:

A) What are the key narratives contained in the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?

B) What are the perceived barriers impeding the implementation of the dominant sociotechnical imaginary for urban climate neutrality in the Cities Mission?

Data Management
All the data for this project is collected and stored in accordance with the General Data Protection Regulation (GDPR) 2016/679 of the European Union. More information about GDPR implementation at Lund University can be found: lunduniversity.lu.se/gdpr. All the research materials, including the participants' data will be securely stored during the continuation of the thesis project on a password protected electronic device. At any stage of the research project, the research participants have a right to gain access to their own personal data, request its correction or deletion or limitation to processing of data as well as they can file a complaint about how their personal data is used.

For any enquiries regarding this research, please contact:

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Appendix B – The Specific Objectives of the EU Mission for 100 Climate Neutral and Smart Cities by 2030

Table 8-1 The specific objectives of the EU Mission for 100 Climate Neutral Cities by 2030.

Number	Description
1	To develop and support a "demand driven" and city-focused process, based on research and innovation, and focused on the preparation of Climate City Contracts (CCC) including investment plans for deployment of innovative and smart solutions for climate neutrality.
2	To support tailored research and innovation (R&I) pilots and demonstrators within the mission platform to be funded by Horizon Europe and to scale-up and replicate solutions developed in past R&I programmes.
3	To develop synergies and complementarities and facilitate mutual support with existing Commission initiatives, including those policies focused on delivering co-benefits of climate neutrality, while reducing administrative costs for cities related to the need to work with many different EU initiatives on similar issues.
4	To give access to city administrations and their local businesses to EU-wide skills and expertise and help cities connect in international networks (e.g., Global Covenant of Mayors, URBACT) in order to accelerate learning, replicability and scaling-up of solutions through sharing of good practices and joint actions and ultimately serve as an inspiration for cities across the world.
5	To help cities develop, where necessary, the administrative, financial and policy capacity through innovative governance to overcome a silo approach and to ensure buy-in and commitment from citizens, local public and private stakeholders (i.e., industry, businesses) as well as regional and national authorities.
6	To put in place a strong and transparent system of measuring and monitoring the progress towards climate neutrality for cities building on existing practice and methodologies.
7	To increase the level of assistance from national, regional and local authorities as well as from National Promotional Banks (NPBs), municipal banks and private sector investment, through regulatory, funding and financing levers to help cities implement the mission. Where cities selected by the mission are also part of the entities that engage in the Climate Adaptation Mission (Objective 2), synergies will be sought between cities and these entities to ensure that climate neutrality activities also take into account climate adaptation requirements and vice versa.

Source: (European Commission, 2021, p. 16)

Appendix C – Overview of Interviews Conducted

Table 8-2 Overview of interviews conducted.

Governance Level	**Organisation/ Actor Group**	**Title (anonymised)**	**Date**	**Number of interviews** Total: 11
EU Level	Mission Board for the EU Mission for 100 Climate Neutral and Smart Cities by 2030	Mission board member A	10th of April 2024	3
		Mission board member B	22nd of April 2024	
	NetZeroCities	NetZeroCities representative	25th of April 2024	
National Level	Viable Cities	Viable Cities representative A	11th of December 2023 (pre-study)	4
		Viable Cites representative B	22nd of January 2024 (pre-study)	
		Viable Cites representative C	18th of April, 2024	
		Viable Cites representative D	24th of April 2024	
Municipal Level	Amsterdam Municipality	Amsterdam representative A	12th of April 2024	2
		Amsterdam representative B	26th of April 2024	
	Stockholm Municipality	Stockholm representative A	10th of April 2024	2
		Stockholm representative B	24th of April 2024	

Source: Author's own

Appendix D – Overview of Documents Included in the Document Review

Table 8-3 Overview of documents included in the document review.

Case City	Stockholm, Sweden	Amsterdam, the Netherlands
Document	Climate City Contract, EU Cities Mission	New Amsterdam Climate; Roadmap, Amsterdam Climate Neutral 2050
Publication Date	April 2023 (not publicly available)	March, 2020
Number of Pages	45	47

Source: Author's own

Appendix E – Interview Guide

Futures in Focus: Unravelling Socio-Technical Imaginaries for Urban Climate Neutrality in EU Mission Cities

INTERVIEW QUESTIONS

Professional & City Overview

- Can you describe your background and current role and responsibilities at X?
- Can you provide a brief overview of X's sustainability objectives and targets? Have these changed since X became an EU Mission city?

Conceptualising a Climate Neutral Future

- Can you describe your ideal vision for a climate neutral X?
- Can you describe the methods or processes used to develop the vision for a climate-neutral X in 2030? Have you encountered concepts like visioning, scenario planning, or imaginaries in your work?

Achieving Climate Neutrality

- What key elements are essential for achieving climate neutrality in X by 2030? (e.g., renewable energy, transportation, green infrastructure)
- What are the main barriers and/or challenges to achieving climate neutrality by 2030 in X? How do you think these can best be overcome?
- Do you believe these views are shared by other stakeholders in the urban sustainability field?

Decision Making Processes

- Can you describe the process of how decisions are made about which strategies and projects are prioritised for achieving climate neutrality in X?
- How does the overall vision for a climate-neutral city translate into specific action plans and strategies?
- Who do you believe are the primary actors or stakeholders involved in shaping the vision for urban sustainability in X?
    - Have you developed a Climate City Contract? If so, who was involved in the development of this?

Conclusion

- Is there anything you would like to add?
- Do you know any stakeholders who would be relevant to interview/contact?