Covid-19 couldn't car less?

Examining the pandemic's effects on urban mobility and the implications for a carbon-neutral and inclusive transition. A case study from Hamburg, Germany.

Anna Schellenberg

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LUCSUS
Lund University Centre for Sustainability Studies

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Abstract

The global pandemic of Covid-19 has drastically changed the behaviour of citizens around the world. This research aims to identify actions that ensure low-carbon, inclusive forms of mobility that respond to the behavioural changes during Covid-19. The city of Hamburg, Germany, and its problems with transport-related emissions and socio-economic inequalities serve as a representative case study. The results of a conducted survey, show that the pandemic has both led to carbon-low and carbon-intensive behavioural changes. Desirable behaviour changes for the Post-Covid-19 future are defined based on Sen's capabilities approach. This research concludes that in order to react to the behavioural changes related to the pandemic, a restriction of car traffic and structural changes are needed, which comes with a series of challenges connected to governmental organizations and power dynamics. To overcome these challenges this research suggests participation practices according to the Right to the City narrative.

Zusammenfassung

Die globale Covid-19 Pandemie hat das Verhalten der Menschen auf der ganzen Welt drastisch verändert. Diese Forschung zielt darauf ab, Maßnahmen zu identifizieren, die kohlenstoffarme, inklusive Formen der Mobilität sicherstellen, welche auf die Verhaltensänderungen während Covid-19 reagieren. Die Stadt Hamburg, und ihre Probleme mit verkehrsbedingten Emissionen und sozioökonomischen Ungleichheiten dient als repräsentative Fallstudie. Die Ergebnisse einer durchgeführten Umfrage zeigen, dass die Pandemie sowohl zu kohlenstoffarmen als auch zu kohlenstoffintensiven Verhaltensänderungen geführt hat. Wünschenswerte Verhaltensänderungen für die Post-Covid-19-Zukunft werden auf der Grundlage des Befähigungs-Ansatzes nach Sen definiert. Diese Forschung kommt zu dem Schluss, dass, um auf die Verhaltensänderungen im Zusammenhang mit der Pandemie zu reagieren, eine Einschränkung des Autoverkehrs und strukturelle Veränderungen erforderlich sind, was mit einer Reihe von Herausforderungen verbunden ist, die mit staatlichen Organisationen und Machtdynamiken zusammenhängen. Um diese Herausforderungen zu überwinden, schlägt diese Forschung Partizipationspraktiken gemäß dem Recht auf Stadt Konzeptes vor.

Keywords: Covid-19, Hamburg, Right to the City, capabilities, sustainability, mobility

Word count: 11 984

Acknowledgements

Here I am at the end of four and a half month of writing a thesis not only in the middle of a global pandemic but about the pandemic. My eyes I tiered of the hours and hours of screen time and my brain is drained, but before this thesis comes to an end and with it my education, I would like to thank the wonderful people around me who supported me in this process and with who I would have definitely not reached the finish line.

I want to thank my wonderful thesis group, thank you, dear Amanda, and Josephine, for the weekly check ins, where often our weekend plans were more exciting than anything thesis related, you really made the High School Musical song “we’re all in this together” come true. Thank you, David, for being a wonderful supportive reinsuring supervisor, you have taken away my fear of theory (or at least some of it) and successfully navigated me through the challenging jungle of writing a thesis. I couldn’t have asked for better support.

With the hand in of my thesis and the hopefully successful defence, my time as a Master student of the LUMES program ends. I want to thank all the teachers who showed me how enthusiastic teaching can look like, who challenged my world view and shared their knowledge with me. I want to thank all my wonderful classmates who brought a million and one perspectives to the classroom and who it was such a pleasure to work with. Thank you, Alicia, Cara, Mia, Lena, and Laura, for making Lund my home, for all the support, love and all the beautiful moments. Thank you for crying, laughing, and celebrating with me, while continuously saying the mantra “it’s just a thesis”. I don’t want to imagine what studying looks like without such amazing friends as you are next to me.

And as I’m writing the long list of thanks, I of course don’t want to miss my wonderful family. Thank you, Mama, Papa and Maxim, for supporting me, for making me believe that I can achieve anything, for letting me go to Sweden, for forcing all the people around you to fill out my thesis survey, for sending me chocolate and listen to my stories and daily struggles.

Last but not least, this thesis builds on hundreds of voices of the citizens of Hamburg. I want to thank each individual who took the time to fill out my survey, who reflected on his/her/their time during Covid-19 and helped me to answer my questions. In a time of extreme zoom fatigue and uncertainty, I want to thank all the experts who took the time and patience to take part in an interview. Thank you for sharing your thoughts!

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List of Abbreviations

GHG = Greenhouse Gas Emissions

RQ = Research Question

GDP = Gross Domestic Product

SDG = Sustainable Development Goal

WHO = World Health Organization

RTTC = Right to the City

QCA = Qualitative Content Analysis

SS = Sustainability Science

1 Introduction

1.1 Introduction to the case

The Covid-19 global pandemic has shaken up societal structures and changed the world in various ways. Along with many other changes, it temporarily caused a reduction of greenhouse gas emissions (GHG), and decreased pressures on ecosystems (Abu-Rayash & Dincer, 2020; Freire-Gonzalez & Font Vivanco, 2020; Rume & Islam, 2020), while further increasing global inequalities (Kanda & Kivimaa, 2020). The changes in society connected to Covid-19 have opened an emerging discourse in the sustainability field, featuring more than 1000 publications in the last year (Web of Science, 2021). On one hand, the pandemic has been identified as an opportunity to foster sustainable development (Tretter et al., 2020), yet on the other hand, it has been called out as hindering the implementation of the Sustainable Development Goals (SDGs) (Naidoo & Fisher, 2020).

While we are fighting the Covid-19 crisis, we find ourselves in another crisis, the climate crisis. Increases in GHG emissions and the impact on the wellbeing of the global population have led to a "need for an effective and progressive response to the urgent threat of climate change" (United Nations, 2015, p. 1). Among other countries, Germany has dedicated itself to mitigate climate change and implement the SDGs (Federal Republic of Germany, 2016).

77% of the population of Germany lives in urban areas (World Bank World Development Indicators, 2018), while globally, 70% of the population is expected to live in urban areas by 2050 (Un-Habitat, 2008). Cities are therefore important when it comes to the governance of climate change (Kern, 2019) and sustainable development (McCormick et al., 2013). Ensuring sustainable mobility[1] and transportation "plays a key role in achieving a sustainable urban environment" (Moeinaddini et al., 2015, p. 30). For example, the global transportation sector accounts for 25% of global CO_2 emissions (Fuglestvedt et al., 2008), the connected particulate matter affects health (Wolkinger et al., 2018), and it is responsible for large changes in land use. Urban sustainable mobility exemplifies how climate change and sustainable development are an interconnected topic (Robinson & Herbert, 2001). Therefore, when sustainable development is brought up in this thesis, it also entails the reduction of GHG emissions to mitigate climate change.

[1] Mobility for this thesis is defined as: "the ability to move freely or be easily moved" (Cambridge University Press, 2008) for a definition what sustainable mobility behaviours are, see chapter 4.2.2

1.2 Research aim

Joining the Covid-19-related societal changes with the need for a sustainable and carbon-neutral transition, I investigate inner-city mobility behaviours in the City of Hamburg during Covid-19. Hamburg and its two million inhabitants (Statistisches Amt für Hamburg und Schleswig-Holstein, 2020) is the second biggest city in Germany, with the highest GDP per capita (Novy & Colomb, 2013) and a current social democratic and green government (Hamburgische Bürgerschaft, n.d.), which makes it a representative case for many cities in Germany struggling for urban sustainability. Gaglione (2020) suggests that the changing demand for mobility during Covid-19 is challenging local decision-makers due to insufficient information. This research, therefore, aims to close this information gap by asking the following research question (RQ 1): **How has inner-city mobility in the City of Hamburg changed during Covid-19?**

Scholars suggest that the Covid-19 related changes will not last for long if it is not followed by adaptive actions (Freire-Gonzalez & Font Vivanco, 2020; Rume & Islam, 2020). Therefore, by building upon the results of RQ1 the research continues to explore the RQ2 and RQ3: **Using Covid-19 as a departure point, what are possible pathways for ensuring inclusive and carbon-neutral forms of mobility in the Post-Covid-19 future?** and **What are possible challenges and barriers in the implementation of the identified pathways?**

1.3 Navigating this Thesis

Chapter 2 presents the sustainability approach and regulations implemented by the City of Hamburg to contain the spread of Covid-19. Chapter 3 then introduces the theoretical approach and analytical framework used to investigate the case and answer the RQs, followed by Chapter 4 which presents the research design and data collection methods. Chapter 5 answers RQ1, while Chapter 6 answers RQ2 and 3. Chapter 7 discusses the results by identifying recommendations, the contribution to sustainability science (SS) and limitations. Finally, this thesis concludes by summarizing the central findings of this research and suggesting future research.

2 Background

2.1 Sustainability transition in Hamburg

2.1.1 'Sustainability' approach taken by the City of Hamburg

Before the pandemic, the City of Hamburg took measures to facilitate a sustainability transition, gaining a reputation as a leader in sustainability, exemplified by Hamburg winning the European Green Capital Award in 2011 (Rudden et al., 2015). Aligned with the recognition of its sustainable development, Hamburg brands itself as a green and sustainable city (Demaziere, 2020). Even though it is known for its sustainability, Hamburg is one of the only cities in Germany that does not have a documented sustainability strategy (Krellenberg et al., 2019). Therefore, the following approach taken by the City of Hamburg is identified by reviewing governmental reports and academic journals. As Hamburg is a so-called city-state, it follows the government of Germany and its dedication to the Agenda 2030[2], which strongly guides sustainability actions.

Progress in achieving the different SDGs resulting from the Agenda 2030 is measured with different indicators such as GDP, unemployment rates and the share of women in leading positions (Freie und Hansestadt Hamburg, 2016). What is characteristic of all the indicators is that they are quantitatively and often monetarily measurable. This aligns with the City of Hamburg's goal of working towards a 'Green Economy' (Bürgerschaft der Freien und Hansestadt Hamburg, 2017). Speck and Zoboli (2017) define a Green Economy as a "multiple-dividing growth paths combining economic benefits with environmental and social outcomes" (p. 142), which is based on the belief that it is possible to decouple economic development from environmental limits (Speck & Zoboli, 2017).

The adaptation of a Green Economy approach aligns with Hamburg's history of neoliberal governance, identified as such by several scholars (Birke, 2016; Fraeser, 2015; Vogelpohl & Buchholz, 2017; Wiesemann, 2014). In the mid-1980s, Hamburg launched a growth-oriented policy framework called the 'Enterprise City'[3] (Birke, 2016), followed by the guiding 'Growing City'[4] principle to attract companies and highly skilled professionals (von Beust, 2004). In 2010 the City of Hamburg reconsidered for the first time its neoliberal approach and agreed on 'Growth with Foresight'[5], first introducing a sustainability perspective to its policy framework (Senat Hamburg, 2010). In recent years,

[2] The Agenda 2030 is the plan for the implementation of the 17 SDGS (United Nations General Assembly, 2015).
[3] Enterprise City = 'Unternehmen Hamburg'
[4] Growing City = 'Metropole Hamburg – Wachsende Stadt'
[5] Growth with Foresight = 'Wachsen mit Weitsicht – Grenzen des Wachstums'

the neoliberal approach has been challenged by different social groups and movements (see Chapter 2.1.3) (Novy & Colomb, 2013; Vogelpohl & Buchholz, 2017).

2.1.2 Mobility in Hamburg

In 2017, the transportation sector in Hamburg accounted for 28.3% of the CO2 emissions (Statistisches Amt für Hamburg und Schleswig-Holstein, 2018b) and ≈12.6% of the total urban area was used for traffic (Statistisches Amt für Hamburg und Schleswig-Holstein, 2018a). The transportation sector includes railway, road, air traffic, coastal shipping, and inland water transport. In addition to its significant environmental impact, access to mobility is crucial for interdependency and freedom (Schwanen & Ziegler, 2011) making it an important part of social sustainability and wellbeing (Grieco, 2015).

Hamburg has acknowledged the importance of mobility and it is a core element of its adaptation of the Agenda 2030 (Bürgerschaft der Freien und Hansestadt Hamburg, 2017), with the vision to provide a "reliable, convenient and low-emission" form of transport to all citizens (Hamburg Behörde für Stadtentwicklung und Umwelt, 2014, p. 41). The aim is to enhance cycling, to transition to emission-free buses, to shift the ownership of cars by providing car-sharing options, expanding the public transport network (Hamburg Behörde für Stadtentwicklung und Umwelt, 2014), and ban private cars in the city centre by 2034 (Nieuwenhuijsen & Khreis, 2016).

There are different academic evaluations on the effectiveness of the measures taken by the City of Hamburg. A study by Buehler et al. (2017) suggest that Hamburg successfully increased the share of bike trips by investing in the required infrastructure. It also states that car ownership is decreasing, but only slowly. The public transport system is praised for its extensiveness, but the costs are expensive (Buehler et al., 2017) making it not universally and equally accessible (Menzel, 2016).

2.1.3 Reflections on governance of sustainability transition of Hamburg

While the government presents Hamburg as a successful sustainability leader (Freie und Hansestadt Hamburg, 2016), increasing inequalities are challenging the sustainability narrative. A severe housing crisis, increasing segregation and many cases of gentrification have impacted the wellbeing of citizens, especially those most underserved (Birke et al., 2015; Kemper & Vogelpohl, 2020; Scheller & Thörn, 2018). The fact that Hamburg does not have a sustainability strategy is identified as one of the reasons why social sustainability is often pushed out of the picture by economic interest (Menzel, 2016) and the lack of targets results in little coordination between the different city strategies (Krellenberg et al., 2019).

Not only did the City of Hamburg fail to include the third pillar of sustainability in their governance structure, but the neoliberal approach is often labelled as a failure by different researchers. Menzel (2016) argues that the City's attempt to detach economic growth from the environmental footprint failed. Meanwhile, sustainability problems such as high pollution levels, "high flood risks due to storms and sea-level rise, social divide, rising rents and a constantly growing city" (Krellenberg et al., 2019, p. 3) further pressure the city's wellbeing. A study conducted by Raddatz and Mennis (2013) found that people with a background with migration or poverty are disproportionately affected by pollution levels, which results in not only an environmental problem but also a problem of environmental justice.

As a response to the housing crisis, gentrification, and social repression, the Right to the City (RTTC)[6] movement formed in Hamburg in 2009. The movement identifies neoliberal city planning and the dominant capitalistic structures as the main reasons for the social sustainability problems (Netzwerk Recht auf Stadt, n.d.). Vogelpohl and Buchholz (2017) states that, even though counter neoliberal policies and projects are more frequently endorsed since 2009 (change of government), social policies under a continued neoliberal approach will further exacerbate inequalities and result in a 'Urbanism of Inequality' (Kemper & Vogelpohl, 2020; Rinn, 2018).

2.2 Covid-19 in the City of Hamburg

On February 28, 2020 the first case of Covid-19 was registered in the City of Hamburg (NDR Info, 2020b) and with increasing cases around the world the WHO classified the spread of the Covid-19 virus as a pandemic on March 11, 2020 (Adhanom Ghebreyesus, 2020). After a drastic increase in cases and first deaths, the government of Germany and so the government of Hamburg enforced the first regulations. Many of the regulations were and are following the restrictions announced by the government of Germany (*Bundesregierung*). Hamburg is one of the few city-states of Germany, being a city and a federal state at the same time, which leaves a great share of the political power to the city itself (Fraude & Lloyd, 2010), and the power to change and adopt regulations. The governance of the Corona pandemic and the main regulations enforced are presented in Figure 1.

[6] Right to the City = Recht auf Stadt

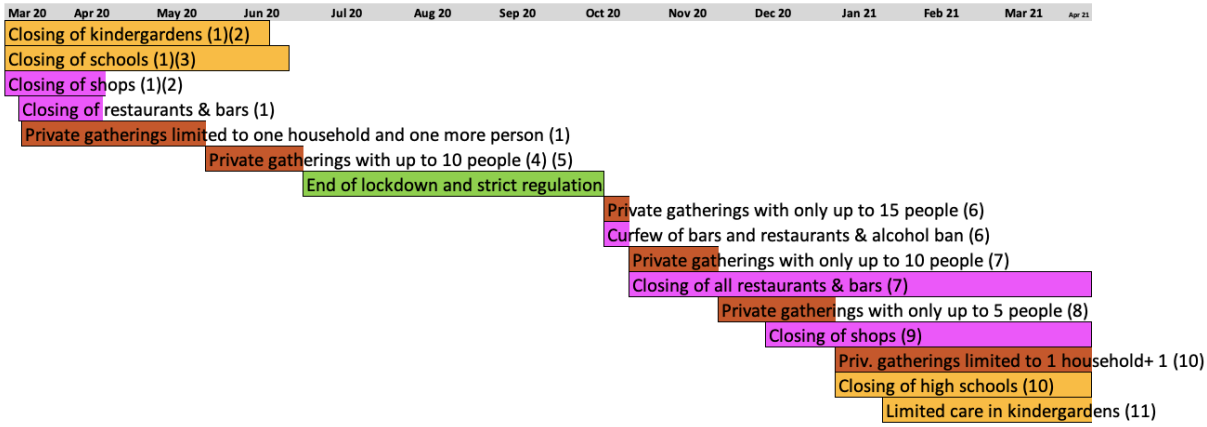

Figure 1. Overview of the enforced Corona regulations in Hamburg March 2020 – 9th of April 2021. Own Figure. Yellow = regulations concerning education; Purple = regulations affecting the gastronomy and the retail sector; Dark orange = regulations affecting the number of people allowed to meet. Green = time period with low regulations in place. Own figure based on secondary sources: (1) NDR Info (2020a); (2) ZDFheute (2020); (3) tagesschau.de (2020) (4) Presse- und Informationsamt der Bundesregierung (2020); (5) Senatskanzlei Hamburg (2020a); (6) Senatskanzlei Hamburg (2020b); (7) Senatskanzlei Hamburg (2020c); (8) Senatskanzlei Hamburg (2020d); (9) Hamburg Journal (2020); (10) Senatskanzlei Hamburg (2020c); (11) Senatskanzlei Hamburg (2021)

3 Methodology

3.1 Research design and Methodological perspective

For this research, I chose a case study design with the City of Hamburg being a representative case. Since Hamburg is "a broader category of which it is a member" (Bryman, 2012, p. 70) it can be used as an example for other cities during Covid-19 and a city struggling to transition towards a sustainable state. The research follows a weak constructivist approach, while I accept that the real world is knowable which is reflected in the chosen methods, I acknowledge that the created knowledge would most likely differ depending on the theory of entry and the chosen methodology (Khalifa, 2010; Robbins, 2020). The results of the research are shaped by the theoretical approach chosen; a different theory would have asked different questions and therefore got different results. While theory guided the general framing of the RQs, the generation of themes and categories was inductive. To answer the RQs, I take a mixed-methods approach using quantitative and qualitative data, which is used in a scenario where neither qualitative nor quantitative data alone are sufficient to answer the RQs (Tashakkori & Creswell, 2007).

The research in this thesis is structured by adopting the division of Pre Covid-19, Peri Covid-19, and Post Covid-19 time periods (see Figure 2). In the Pre Covid-19 period the aim is to understand the sustainability transition of Hamburg from a holistic point of view. Special attention is given to challenges that were faced in the enforcement and implementation. The data used for understanding the Pre Covid-19 circumstances is based on secondary data from a narrative literature review (Bryman, 2012).

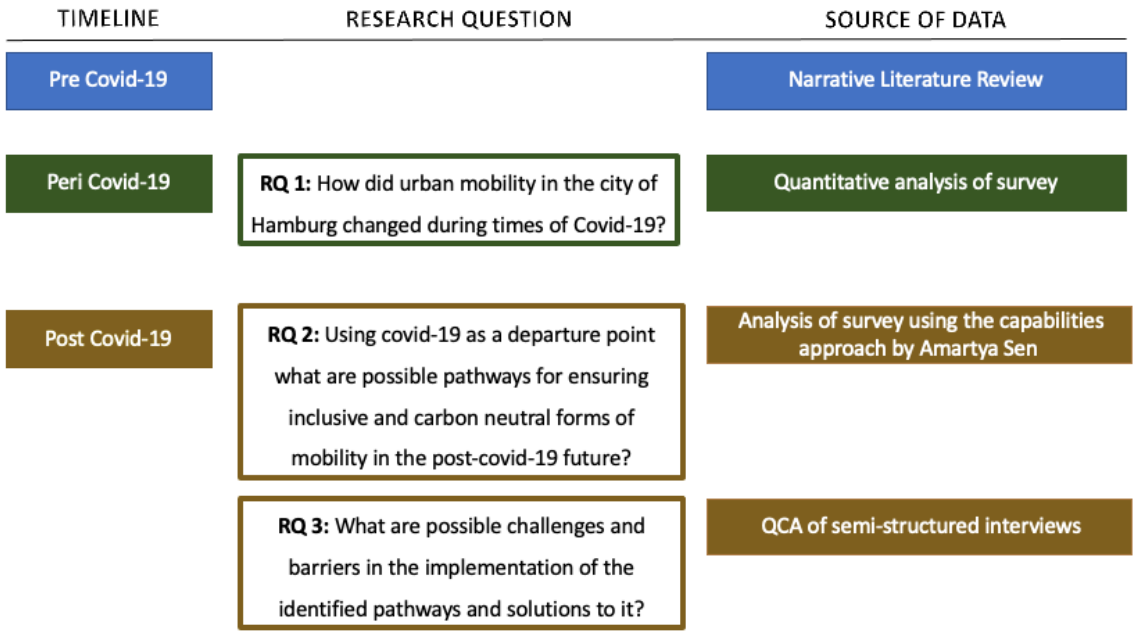

Figure 2. Research strategy and design. Own Figure.

3.2 Data collection and Analysis

3.2.1 Survey

To answer the first RQ, I conducted a survey with a total of 14 open and closed questions, targeting residents of the City of Hamburg[7], aiming for a diverse group of respondents taking into consideration age, gender, income, and neighbourhood of residency. The survey questions are guided by the capabilities approach (see chapter 4.2.1.1) with the aim to unravel the change of capabilities and resulting functionings using questions about behaviour shaping circumstances and means available. I conducted the survey using 'Google Forms', and a list of all the survey questions can be found in Appendix 1. I mainly distributed it through neighbourhood Facebook groups where it reached 226,693 members of different groups. The survey was open for responses for a total of seven days (05-12 January 2021), which resulted in 647 responses. To not guide the answer of individuals and to achieve as broad a picture as possible, the survey included primarily open questions. Part of the data analysis was coding the open questions of the responses using overarching themes, to be able to convert the qualitative data into quantitative data (Given, 2008). This allowed the comparison between different behavioural patterns of social groups. Following the coding process, I carried out several descriptive statistical analyses, comparing the data of different groups, including the development of maps using the Geographical Information System Program QGIS 3.10.

The first phase of data collection encountered some errors. First, in the design of the survey a clerical mistake was made, instead of defining the two age categories 35-44 and 45-54 years old the categories were named 35-54 and 45-54 years old. Because of this error, the two overlapping age categories had to be condensed. Second, the representativeness of the survey is limited. A common phenomenon in online surveys is the non-participation of men, leading to a gender bias in results (Dunn et al., 2004), which was also observed in this survey. 77.3% identified as women and only 21.1% identified as men, leading to an overrepresentation of women and an underrepresentation of men. Furthermore, due to the use of non-probability recruitment methods for the survey, there is a certain bias in the responses. By using Facebook groups to distribute the survey only a certain type of people who are active in those groups are represented. For example, it is likely that people of older age are less active on social media and therefore not well represented in the survey results. A higher representation of the people living in Hamburg would increase the accuracy of this research.

[7] The survey targets all citizens of Hamburg that are older than 16 years old.

3.2.2 Semi-structured expert interviews

To discuss the possible pathways for a Post-Covid-19 future I conducted semi-structured interviews, which allowed a general framing of the interviews while still preserving the possibility to ask further questions (Bryman, 2012). The interviews aimed to understand how different groups could benefit from the suggested pathways, what challenges could arise in the implementation and who are change agents. By asking indirect questions related to inequalities in access and power, the interviews followed the RTTC narrative and Sen's idea of wellbeing and development. Due to the ongoing Covid-19 pandemic, all interviews were conducted in German using Zoom or phone calls.

To be able to understand the implications of the different pathways holistically, I conducted eleven expert interviews with representatives of the government, relevant authorities, associations, and NGO's. A list of all interviewees can be found in Appendix 2. The interviewees were evaluated to be relevant by myself or suggested by other interviewees following a snowball selection method (Goodman, 1961). Each interview started with questions regarding the perceived changes in mobility during Corona and the mobility vision of the institution. Following the general questions, the survey results concerning mobility were presented and questions regarding possible pathways asked (for the interview guide see Appendix 3). I conducted a qualitative content analysis (QCA) of all transcripts of the interviews[8], following the guidelines of Erlingsson and Brysiewicz (2017), while using NVivo Release 1.4. A list of all codes generated through the QCA can be found in Appendix 4.

3.3 Ethical consideration

The global pandemic of the virus Covid-19 has impacted the lives of many people extensively, Covid-19 related deaths or the fear to get infected, has put immense pressure on the mental health of many individuals, which makes the research an emotionally sensitive topic. I am aware that my research topic requires sensitive communication, to prepare participants I was as open as possible about the content of the survey and interviews which I conducted as part of the research.

Furthermore, I must point out my positionality. Living most of my life in the City of Hamburg makes it impossible for me to call myself a neutral observer. My experiences and political involvement in the city might have impacted the selection of stakeholders, which I decided to interview. However, by asking the interviewed experts for suggestions for possible interview partners, I tried to overcome my biases.

[8] The transcripts were created using the online tool 'Amberscript'.

4 Theoretical frameworks

For this thesis, I use the academic understanding of Neoliberal Urbanism to critique the current practices of the city of Hamburg and to define a desirable future state, I draw from the RTTC theory. Through A. Sen's capabilities approach, I evaluate the changes that occurred during Covid-19 and suggest how decisions can be made to react to these changes to achieve a pathway towards a RTTC.

4.1 Theoretical approach

4.1.1 Neoliberal Urbanism

As earlier established, Hamburg has been following neoliberal urban planning policies for many years. Neoliberalism describes a political ideology that encourages privatization of former social resources and follows free-market values while aiming for low state intervention (Vives Miró, 2011). There are different ideas of what neoliberal urbanism means, but essentially it follows the belief that market mechanisms are best suited for organizing urban land use (Baeten, 2012), following an institutional framework that ensures property rights, privatization, free market and free trade (Kelly & MacLaran, 2014). Neoliberal urban policies aim to attract investments and people (Baeten, 2012; Brenner & Theodore, 2005), to generate a surplus that allows investments in urban spaces (Vives Miró, 2011). Following this idea, competitiveness between cities is a core element, cities are aiming to become the centre of financial flows to successfully attract businesses by scaling their "positions in the global urban hierarchy" (Vives Miró, 2011, p. 1). However, neoliberal governance has been challenged by many scholars because of the entailed neglect of social issues (Baeten, 2012; Vives Miró, 2011). The global rise of neoliberal urban planning and the connected social issues has led to the development of counter theories such as The Just City planning theory by Susan Fainstein (2010) and recent adaptations of the Right to the City theory by Lefebvre (1996).

4.1.2 Right to the City

To problematize the current stage of mobility in the urban setting and be able to guide the design of a Post-Covid-19 future of the City of Hamburg, I adapt the RTTC theory. The RTTC is a narrative that was first developed by Henri Lefebvre in 1968, who described the RTTC as a "cry and demand" (Lefebvre, 1996, p. 122): the cry of citizens to be included in urban life and to have access to the city's amenities and the demand to have "control over the production of urban space" (Coggin & Pieterse, 2015, p. 298).

Lefebvre talks about the right to inhabit the city and create urban life in our everyday life (Lefebvre, 1996; Lefebvre et al., 1996), meaning that city dwellers can use services, find ways to fulfil their goals and needs and in doing so shape the city (Coggin & Pieterse, 2015). Lefebvre recognizes that some groups already have access and rights to the city while others do not (Lefebvre, 1996). The RTTC, therefore, calls for the empowerment of marginalized groups to create a city where everyone can enjoy resources and services equally (Verlinghieri & Venturini, 2018). Marcuse (2009) identifies the "financial powers, the real estate owners and speculators, the key political hierarchy in state power, the owners of the media" (p. 191) as the societal groups that are currently the ones who have a right to the city, which means that other more marginalized social groups should be the key focus. Harvey (2008) elaborates further on Lefebvre's understanding of citizens shaping the city when he talks about the idea of citizens seeking the "right to change ourselves by changing the city more after our heart's desire" (p. 1) and stresses the importance of collective action when doing so.

A unique characteristic of the RTTC theory is that it brings different rights together (Sorensen & Sagaris, 2010). The term 'Right' is seen as a moral claim and:

> "not meant as a legal claim enforceable through a judicial process today …. Rather, it is multiple rights that are incorporated here: not just one, not just a right to public space, or a right to information and transparency in government, or a right to access to the centre, or a right to this service or that, but the right to a totality, a complexity, in which each of the parts is part of a single whole to which the right is demanded" (Marcuse, 2009, pp. 192-193)

Since the RTTC goes beyond simply being a visiting right, it requires an extensive transformation of the current urban life, to allow all social groups to fully participate and benefit from the city (Lefebvre, 1996). According to Lefebvre (1996) "it is impossible to envisage the reconstitution of the old city, only the construction of a new one on new foundations, on another scale and in other conditions, in another society" (p.110), the RTTC demands a right to a future city rather than the existing one.

Lefebvre (1996) emphasizes the need for creative activity outside of economic products and consumption within cities, while criticizing the increasing commodification of cities and the focus on capital over citizens (Coggin & Pieterse, 2015). The RTTC is therefore often presented as a counter-theory to neoliberal urbanism (Purcell, 2002) and capitalist social relations (Islar & Irgil, 2018). Although there are many publications by Lefebvre and scholars further developing it, the concept remains vague and unspecific (Purcell, 2003). This also applies in the discourse around mobility and the RTTC approach (Verlinghieri & Venturini, 2018). However, a few scholars are elaborating on the right to mobility, defining it as something that allows citizens to access the city spaces and participate in those (Coggin & Pieterse, 2015; Sheller & Urry, 2006; Verlinghieri & Venturini, 2018). Coggin and

Pieterse (2015) suggest that when applying the RTTC to mobility it goes beyond looking at how much of transport infrastructure is provided by the state, the focus rather lies on looking at who is and who is not using the provided infrastructure. Following the RTTC narrative, the right to mobility also entails a focus on marginalized groups and their right to transport (Attoh, 2012).

4.2 Analytical framework

4.2.1 Evaluation of results

4.2.1.1 Capabilities approach for understanding mobility behaviours

To develop the methodology and evaluate the results of this thesis, I apply Amartya Sen's capabilities approach, providing an alternative for evaluating wellbeing beyond economic indicators (Robeyns, 2005). The capabilities approach focuses on ensuring the freedom of individuals to choose between different capabilities. Sen and Nussbaum (1993) assess quality of life "in terms of the capability to achievable valuable functionings" (p.2). A capability describes the number of possible doings or activities that a person is theoretically able to do while the functioning describes the things that the person decides to do (Sen & Nussbaum, 1993). The freedom to choose between different doings is essential in Sen's approach since it allows a person "to lead the kind of lives they value – and have reason to value" (Sen, 2004, p. 79). Analysing behaviours from a capabilities approach allows one to look beyond behaviours and understand conditions that allow certain behaviours to be carried out. For this research, this means when looking at behaviours adopted during Covid-19, I analyse not only the change in functioning but also the underlying change in means, agency, and capabilities. The definition and relation between these four different factors are adapted from Yerkes et al. (2020) and illustrated in Figure 3.

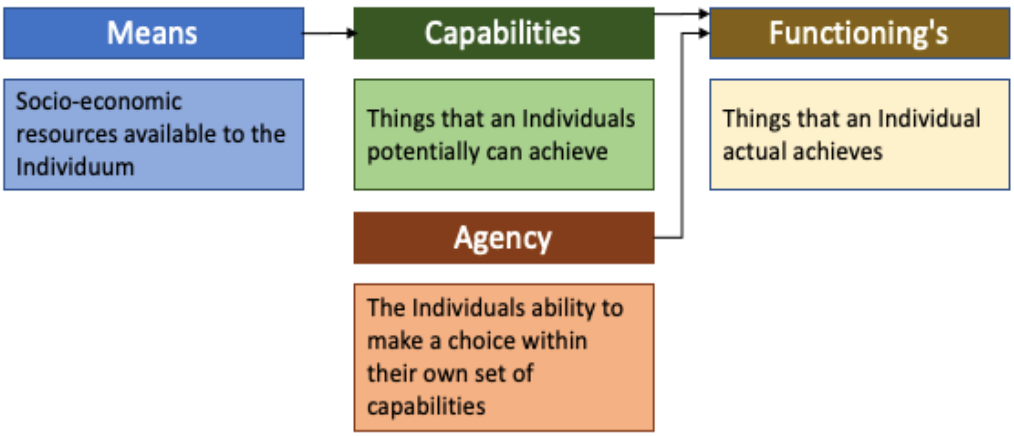

Figure 3. Interrelations and definitions of the capabilities approach based on the work by Yerkes et al. (2020)

4.2.1.2 Sen's theory of Social choice for decision making in the Post-Covid-19 future

To define changes for the Post-Covid-19 future while building on the changes during Covid-19, Sen's theory of social choice is applied. While the first RQ is focused on individual behaviours, the second part is focused on societal changes accompanying behaviours of individuals. Social choice theory "addresses a wide range of decisional and judgmental problems" (Sen, 2011, p. 29) and the essential question on how to make a decision that might affect societal groups differently.

Part of neoliberal decision making is often to conduct cost-benefit analyses (Hamann, 2009); Sen disagrees with making decisions that are supposed to result in a greater good for society by applying a calculation, he claims that "no such magic formula does … exist, since the issue of weighting is one of valuation and judgement, and not one of some impersonal technology" (Sen, 2001, p. 79). He argues that because individuals have different needs, measurable indicators will not be sufficient to represent the plurality of individual preferences (Sen, 2001). Still, Sen understands that there is a need for decision-making since "there is the underlying issue of how much weight should be placed on the capabilities, compared with any other relevant consideration" (Sen, 2001, p. 77). As an alternative to making decisions based on monetary calculations, Sen proposes social choice practices that use "public discussion and a democratic understanding" (Sen, 2001, p. 79). The public involvement in decision-making is also represented in Lefebvre's idea of the RTTC, and while Sen argues for a necessity of public involvement in decision-making, Lefebvre's theory argues that there is a demand of citizens to have "control over the production of urban space" (Coggin & Pieterse, 2015, p. 298). This means to achieve greater wellbeing of society and to be able to decide which capabilities and resulting functionings to prioritize in decision-making, Sen's idea of freedom should guide the discussion while choosing "open public discussion and critical scrutiny" as the source for making decisions about societal wellbeing (Sen, 2001, p. 81).

4.2.2 Definition of sustainable behaviours

For the purpose of this thesis, a sustainable behaviour is a behaviour that both benefits the wellbeing of a person and is characterized by low carbon emissions. Furthermore, a sustainable behaviour is defined as a behaviour where the individual is not forced to carry out one behaviour. In this case, the different forms of mobility must be accessible in a way that the individual does not have to compromise their wellbeing to choose a certain type and degree of mobility. The connection between the capability approach and a low-carbon approach is based on the understanding that different individuals have needs for different forms of transport and/or different length of travels which might not necessarily be characterized by low-carbon emissions. The chosen theoretical approach for this research says that

changes that are part of sustainable development should primarily benefit individuals with a limited set of capabilities.

4.2.3 Definition of Post-Covid-19 state

The second part of the research aims to answer the question of what kind of changes have to be made to preserve the 'sustainable behaviours' after the withdrawal of the Covid-19 related regulations and the end of the pandemic. To investigate the changes, the conditions of the future state must be defined. When talking about the Post-Covid-19 future in this research, I assume that the pandemic has ended, meaning that there are close to no cases in the City of Hamburg and Germany. It means that individuals do not face a risk of containing or spreading the virus following their day-to-day activities. In this future state, the way how Covid-19 is impacting the lives of citizens is limited to the memories of it and possible hesitations connected to it.

5 Results of the conducted survey

The following section answers the first RQ on how inner-city mobility changed during the time of Covid-19. This thesis focuses on inner-city mobility changes during Covid-19 as opposed to other behaviour changes, because of the high average changes and the clear connection to carbon emissions. The following section will therefore only present the results of the survey related specifically to mobility.

5.1 RQ1: How did inner-city mobility in the City of Hamburg change during Covid-19?

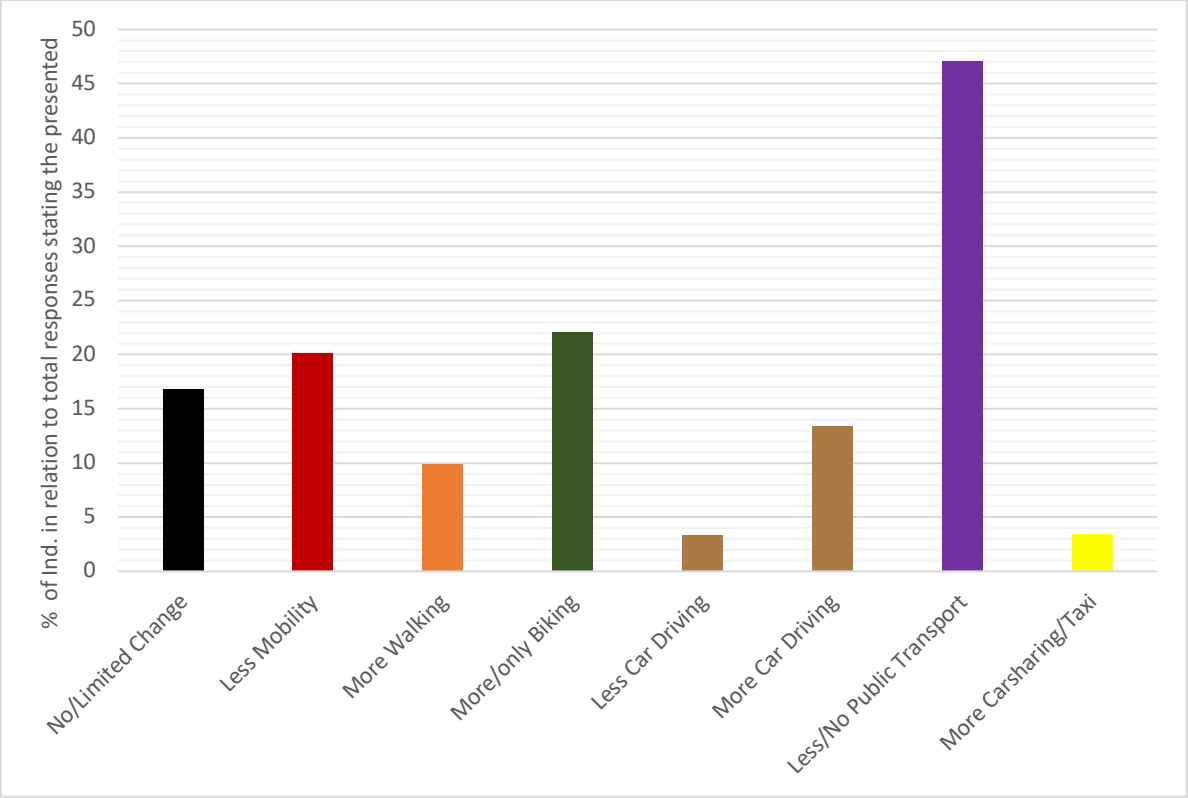

Figure 4. Change of mobility behaviours during Covid-19. Own Figure.
The column shows the percentage of the Individuals who indicated the changes in relation to the total number of responses. The terminology is referring to no, less, more, and only in comparison to the Pre-Corona times.

When asking the open-ended question on how the mobility of individuals changed during Covid-19 it was possible to identify recurring themes in the responses. 20% of the responses indicate that they are less mobile, possibly because of the closing of public spaces, restaurants and bars and the recommendation to study and work from home. Meanwhile, 17% of the individuals indicate no or limited change in their mobility behaviours. Reasons for individuals not changing their mobility are either, them being essential workers without the possibility of working from home or that they already before the pandemic used to drive their car to reach certain destinations and remain to do so, resulting in no change in their mobility. The pandemic and the resulting regulations did not only influence the number and length of respondents' travels in the city, but it also changed the mean of transportation

used for undertaking travels (see Figure 4). The most often reported change in mobility is the move away from public transport (47%). This is closely connected to the understanding that trains and buses are a place of infection risk where it is difficult to keep distance.

Looking from a capabilities perspective, the virus Covid-19 can be seen as an influencer of the agency of an individual to choose between different forms of mobility. Theoretically, during the whole lockdown period, individuals who were using public transport before Covid-19 had the opportunity to access and use public transport, however, the capability to access safe means of mobility was limited, even though the services were still running.

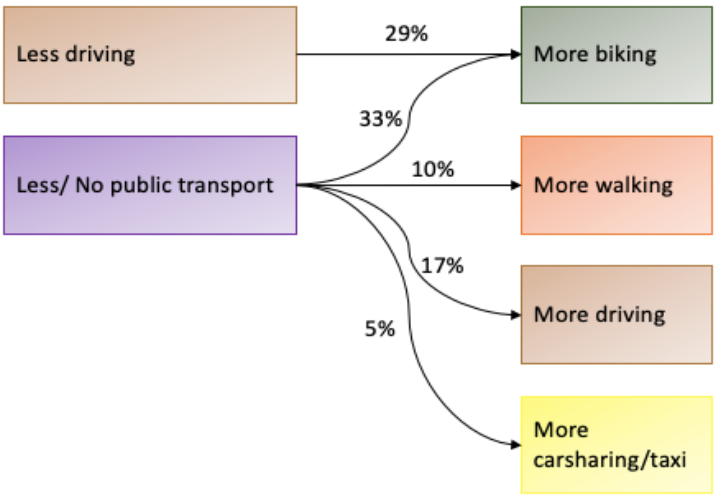

Figure 5. Overview of which modes of transport substitute for the abandonment of certain forms of transport during Covid-19. Own Figure.

Because of this, individuals chose to fall back on other forms of mobility if available (see Figure 5). Individuals transitioned from using public transport to biking, walking, driving, or using carsharing or taxi services. A phenomenon that was indicated by several respondents (13.4%) is that individuals drive more by car to get from one place to another. 60% of these respondents explained that they drive more to avoid public transport.

5.2 What allowed individuals to adapt those behaviours?

To answer the question of what allowed individuals to adopt certain forms of mobility behaviour the two open questions addressing the motivation and the enabling conditions for certain behaviours (Question 8 & 9, see Appendix 1) were analysed. Important to note is that the questions were asked concerning all the different behavioural changes during Covid-19 and not specifically mobility. I group the conditions allowing different behaviours into enabling and restricting conditions. Enabling means that through the changes during Covid-19 individuals had a wider range of capabilities to choose from and therefore change their behaviours. Restricting conditions describe the change of behaviour where individuals were restricted in their capabilities and therefore were drawn to a certain behaviour rather than choosing one behaviour over another. Table 1 presents an overview of the enabling and restricting factors identified through the analysis.

The responses show that the behaviour of some individuals can be explained through restricted capabilities. This indicates that the behaviours carried out during the time of restrictions are motivated by a restriction in the access to capabilities and not because of the freedom to choose between different forms of mobility. Behavioural change through restricting capabilities goes against Amartya Sen's idea of freedom and it compromises the wellbeing of individuals (see chapter 4.2.1).

Table 1. Responses indicating restricting or enabling factors.

Response classified as **enabling** factors	Percentage of Individuals indicating the presented
Increase in time availability	
fewer appointments	7%
less work	4%
less time spent commuting	6%
more free time	12%
Ability to organize your own time	
the flexibility of working hours	5%
ownership of time	1%
Home office	18%
Response classified as **restricting** factors	Percentage of Individuals indicating the presented
lack of alternatives	12%
balancing out other activities	10%
Regulations & restrictions	21%

However, not all respondents claim restricting forces to be the reasons for them to change their behaviours. Some respondents explain that the changes in the pandemic enabled change, which is often related to an increase of available time and the ownership of how to use the time.

Even though the concept of enabling factors rather than restricting factors aligns more with Sen's idea of wellbeing, it is still difficult to evaluate the true creation of capabilities based on the survey conducted, because it does not provide sufficient information to understand what an individual truly values doing and how much this is a result of the freedom to choose between different capabilities.

5.3 What differences between mobility-related behavioural change can be observed?

The changes in mobility behaviour differ between social groups, indicating that different circumstances allow individuals to adopt different behaviours. In the following section, the difference in mobility behaviour is presented according to income, place of living and age. This section is providing the basis to identify the different pathways for a Post-Covid-19 future that are inclusive and closer to being carbon-neutral.

5.3.1 Income

Looking at the income of individuals is crucial when analysing the behaviours of individuals through a capabilities approach. The household income of an individual is significant since it defines the socio-economic means that an individual has which partly determines among other things the set of capabilities one has access to (Sen, 1997).

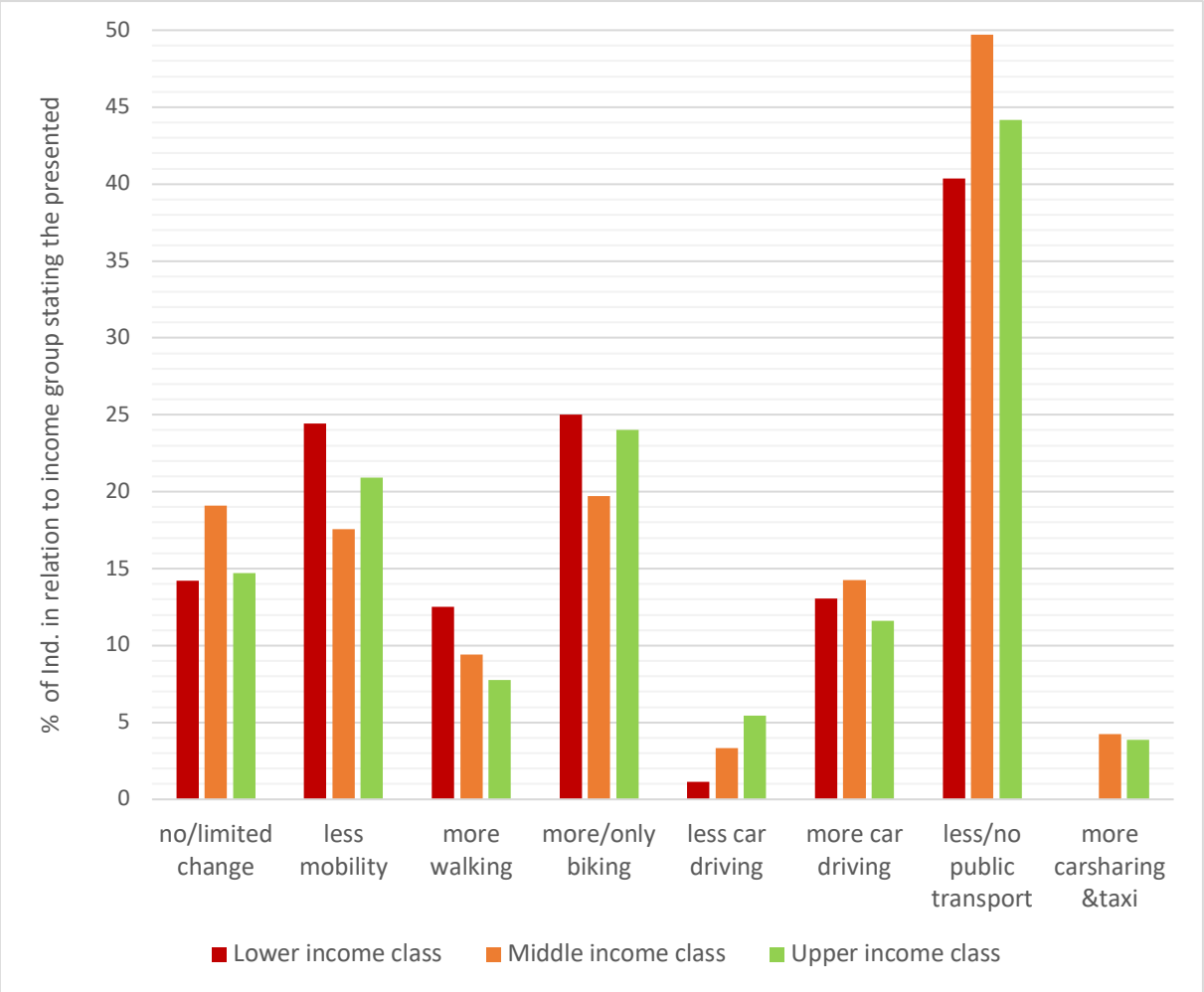

Figure 6. % of Ind. per income group stating the described changes in mobility. Own Figure.
The category of Lower-income class refers to individuals with a yearly household income of up to 29.000€. Individuals with a yearly household income between 30.000-82.999€ are categorized as a middle-income class. All individuals earning more than 83.000€ per household are part of the upper-income class.

The average mobility change (on a scale from 1-5) differs slightly between income groups. Individuals with a low income on average report a change of mobility behaviour of 3.4, individuals from the middle-income class are reporting slightly lower changes (3.3) and people of the upper-income class report the highest changes in mobility behaviour with an average change of 3.6. Figure 6 shows the differences in survey responses regarding mobility behaviour based on income. Aligning with the average mobility change is the higher percentage of the middle-income group reporting no or limited changes (+ ≈5% more).

Another interesting point is that people with low income seem to be more frequently reporting the adaptation of new behaviours such as walking, biking, and car driving. They are also the ones avoiding public transport the least, which could either mean that they continue using public transport regardless of the risk of the infection or did not use public transport before. However, a study conducted by the government of Germany indicates that in the City of Hamburg individuals with low income are the ones using public transport the most (Follmer et al., 2019), suggesting that individuals with low income were forced to continue using public transport regardless of the risk of infection. Another important point is that individuals of the low-income class report more often that because of the pandemic they are less mobile. This indicates that the individuals of the low-income class had a lower set of capabilities to choose from and therefore when Covid-19 restricts their agency to choose from different mobility forms the result is lower mobility. The lower frequency of individuals being less mobile during Covid-19 can be therefore explained because individuals of the upper-income class for example could afford carsharing and taxi services to replace other forms of mobility that were restricted during Covid-19.

5.3.2 Neighbourhood of residency

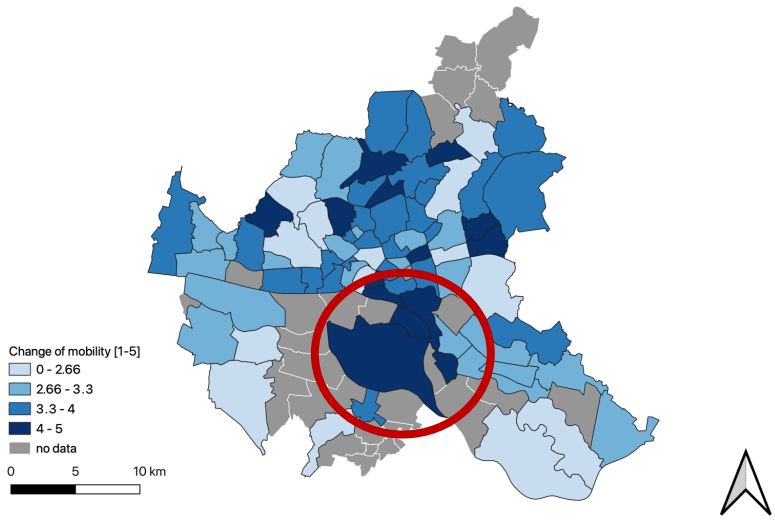

Figure 7. Average change of mobility on a scale from 1-5. Own Figure.

The City of Hamburg counts close to two million inhabitants and 104 neighbourhoods (Statistisches Amt für Hamburg und Schleswig-Holstein, 2020). The place of residency often determines the distance an individual has to undergo to reach the destination and

their access to different forms of mobility. Figure 7 shows that the highest changes in the average mobility can be observed in the south of Hamburg, the city centre, and the north of Hamburg. The high mobility changes of the south (circled in red) can be explained through geographical reasons. Hamburg is divided by the river 'Elbe' and its tributaries create an island which exactly matches the circled part in the map. The island is normally well connected through public transport, which during the pandemic was not seen as a safe form of transportation. This can explain why people in that area of Hamburg had a high change in mobility.

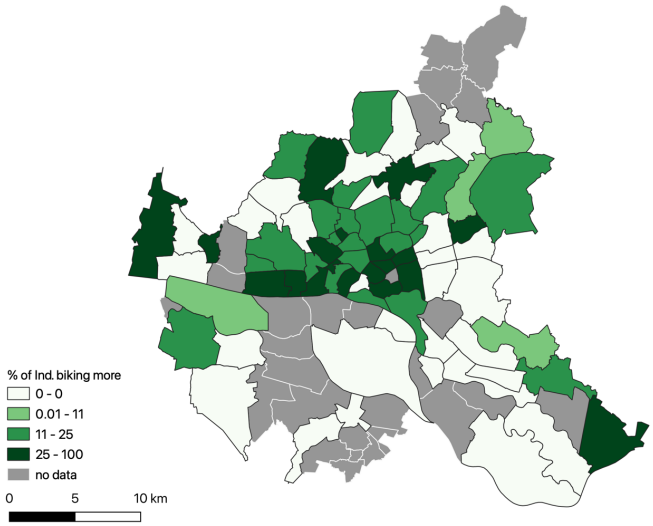

Figure 8. % of Ind. per neighborhood who indicate to bike more. Own Figure.

Another interesting point discovered in the analysis is the adaptation of biking as a form of mobility being concentrated in the city centre (see Figure 8). Reasons for that could be the fact that infrastructure is often concentrated in the city centre and that the biking infrastructure is more extensive within the city centre. This results in individuals living close to the city centre are afforded a different set of capabilities allowing biking as an easily accessible habit. A similar observation was made when looking at the adaptation of walking, which was more frequently reported by individuals living closer to the city centre (see Appendix 5).

5.3.3 Age

Differences in responses were also observed regarding the age of individuals. A general pattern is that younger individuals and older individuals have undergone higher changes in their mobility behaviour than the middle-aged group. Individuals that are between 25 and 34 years old and individuals who are 55-75 years old indicate a higher change of mobility than the overall average. In the categories of the behaviours being: biking more, walking more, using more carsharing and taxi services and driving more, especially young, and old people more frequently report those behaviours (see Appendix 6). Interesting to point out is that individuals who are 25-34 years old report 12.6% more often that they use no or less public transport. This possibly can be explained through the fact that these individuals were the ones using public transport the most before the pandemic. In contrast to that individuals who indicate no change in response to the open question of how their mobility has changed during Covid-19 are more often part of the age group 35-64 and older than 75 years old.

6 Analysis of survey in relation to the results of the QCA of interviews

6.1 RQ 2: Using Covid-19 as a departure point, what are possible pathways for ensuring inclusive and carbon-neutral forms of mobility in the Post-Covid-19 future?

Covid-19 is seen as a force of agency that affected and changed the set of capabilities accessible to individuals and their resulting behaviours. Sometimes but not always the changes in capabilities and functioning are associated with greater wellbeing and lower carbon emissions. However, simultaneously Covid-19 limited the capabilities of individuals which resulted in some using more carbon intensive modes of transport. This research aims to identify actions that ensure low-carbon and inclusive forms of mobility while learning from the behavioural changes during Covid-19. The following section presents pathways for a Post-Covid-19 future identified through the survey and connected potential actions based on the interviews conducted. Important to note is that the presented pathways and their implications are based on the current knowledge and understanding of the situation, which does not mean that unanticipated negative effects could arise in the implementation.

6.1.1 Enhancing biking and walking

As presented in chapter 5.1, during the time of strict regulations many people indicated that they started biking and walking more as a form of mobility. Since walking and biking is a behaviour, most frequently adopted by individuals with a low income and is a carbon free mode of transportation, enhancing biking and walking was identified as a desirable solution for the Post-Covid-19 future. However, biking and walking as a form of mobility is a limitation when it primarily benefits people living close to the city centre and less so people living in the outskirts of Hamburg. When it comes to mobility, changing your behaviour is seen as a difficult step to overcome and often once an individual changes their behaviour they continue to follow these behaviours as a habit (AU02; LO05; LO07[9]). However, other measures can help encourage individuals to continue to carry forward their newly adapted mobility behaviour.

Nearly all experts interviewed indicate that to keep people biking the infrastructure needs to be improved (PO01; PO03; PO09; AU02; AU11; LO04; LO07; LO08). Furthermore, the capability to bike and to feel safe needs to be created. While the infrastructure needs to be safe, individuals also need

[9] A list of all interviews and their code that is used for referencing can be found in Appendix 2. The two first letter of the code define the stakeholder group the interviewed person belongs to and the number indicates the order of the interview. The different stakeholder groups are: AU = Authorities; PO = Politicians, LO = Lobby group.

to feel safe while biking (LO08; AU02; LO05; LO07; PO01; PO09). Some of the interviewed experts point out that, in general, for further behaviour change towards biking the image of biking as a form of mobility needs to be improved and made desirable (LO08; LO05).

Like biking, there are ways to adapt to the behavioural change during Covid-19 by facilitating changes that increase walking capabilities and, therefore, the continuity or adaptation of walking as a mobility form. The infrastructure needs to be improved (PO01; PO03; LO04; LO05; LO06; LO07; LO08) and different pedestrian walkways need to be connected to provide a walkway network (LO04; PO01). Since walking is a slow form of mobility it is important to create a pleasurable environment for walking (LO06) which entails a greening of the surrounding environment (LO07) and not being close to busy car traffic (PO03; PO09; LO04). Along with that, the facilitation of shorter ways within a city is important since it decreases the frequency and length of pathways an individual must undergo to reach their destination (PO09; LO06). Even though there is a potential for improvements for pedestrians through small changes and investments (LO04), pedestrians and their demands have often not been included in policymaking. According to the non-governmental interest groups interviewed, the interest of pedestrians is often pushed out of the picture by the strong political emphasis on the development of biking (LO06; LO07). One reason for this is the weak lobby of pedestrians (LO04; LO08) and another is the low number of representatives for walking in the authorities (LO04).

6.1.2 Expanding public transport

Public transport is a form of mobility with the potential of low carbon emissions (Carroll et al., 2019). Before the pandemic, public transport was of major importance to the transportation system of the City of Hamburg. Part of a possible Post-Covid-19 future is to understand what changes need to be made to transition those individuals who started driving more as a response to the pandemic back to public transport. Some of the interviewed experts indicate that in the Post-Covid-19 future people will start using public transport again with no specific changes required (LO08; PO03; LO06; LO04). Additionally, the supply manager of the public transport federation indicates that the reduction of up to 50% of public transport users and the connected financial losses, together with the uncertainty of the future makes planning for the future and adapting to changes challenging (AU10). Furthermore, public transport expansion projects tend to be very time-consuming (LO04) and cost-intensive (LO08; LO07) which most likely means that a reversion of Covid-19 behaviours is not going to be achieved through the expansion of public transport.

6.1.3 Restricting car traffic

A common agreement among the experts interviewed is that the enhancement of walking, biking and public transport will only work together with the restriction of car driving (LO08; PO03; LO07; PO01; LO06; PO09). This goes back to the fact that space within the city is limited (PO03; LO04; AU02; AU11; PO09).

> There is actually a conflict of space in … every project. Because at some point you have to take something away. If you build better bike paths, then you may have to take away parking spaces or lanes. .... In the end, it's all about space. The way we manage it. And of course, there is always a lot of resistance. Persistence. (PO03, p. 3)

Restricting one's capabilities goes against Sen's idea that all freedoms and the connected capabilities can increase and benefit everyone over time (Sen, 2001). The following paragraphs, therefore, discusses how restricting car traffic to achieve greater wellbeing and especially the ones worst-off can be combined with Sen's idea of wellbeing.

Motorized private transport such as cars come with a wide set of negative social and environmental externalities. The noise and air pollution attributed to combustion engines affect the environment and the health of citizens (LO08; PO03; LO07; PO01) and especially citizens with low socioeconomic status (LO08; PO09; (Raddatz & Mennis, 2013). Adding to the pollution problem, the ownership of cars requires a large amount of space (LO08; LO07; LO06; PO09; AU10) which otherwise could for example be used for housing (PO01) or green spaces (LO08). Those individuals affected by the presented impacts of car-predominant transportation likely have lower capabilities to choose from. For example, individuals whose health is compromised because of pollution are not able to participate in daily life to the same extent as a healthy individual. To conclude, the freedom and capability to drive a car actually compromises someone else's capabilities and freedom due to negative externalities.

Research presented by the experts interviewed indicate that a city with limited car traffic will result in a lower cost for the greater society (PO01; PO09), which indicates that the freedoms society gains outweigh the costs of individuals compromising their freedom to drive and own a car. Another important point is that the ownership of cars is often correlated with a higher income and these high-income individuals usually have a wider range of mobility options (Follmer et al., 2019). We must ask: is it justifiable to place restrictions on people with an extreme wide range of capabilities? Sen does not have a direct solution to the issue of different freedoms compromising the freedom of others, other than to say that it should be settled through social choice. However, he acknowledges that in some situations it is necessary to redistribute material resources (Sen, 1999). Deciding on how material

resources must be distributed or more generally how different capabilities should be prioritized in decision making is desired to be done by applying Sen's ideas of a Social Choice (see Chapter 4.2.1.2).

While this research indicates that changes towards decreased motorized private transportation and enhancement of walking, biking and public transport will benefit affected citizens (LO08; PO01), users of those forms of mobility (PO03; LO05) and the greater public (PO03; AU02; LO05; LO07; PO01; LO06; LO04; PO09), it will most likely affect car drivers negatively (LO05; PO09). To avoid individuals compromising freedom and their access to mobility when restricting car traffic, an idea which is opposed to Sen's idea of development, we need to understand the freedoms that are connected to driving a car and how those freedoms can be ensured through the creation of other non-limiting capabilities. Furthermore, there is a risk of creating a mobility gap (AU02; LO04) if other forms of mobility and the connected capabilities are not expanded. It is therefore crucial that both transitions go hand in hand and are done in the right way (see discussion chapter 7.1).

6.1.4 Encouraging home office – less mobility

Less mobility throughout the pandemic has resulted in a reduction in carbon emissions from transportation (Friedlingstein et al., 2020). 5.5% of survey respondents who indicated that they are less mobile also indicated that they are driving less. An interview with the car lobby (ADAC) confirmed a decrease in road traffic during the pandemic (LO04). Less mobility within the city is closely connected to the fact that people during the pandemic were working from home. 116 respondents stated home office as an enabling factor for the newly adapted behaviours and 35 people indicated that not having to travel to work saved them time.

However, individuals of high- (19%) and middle- (20%) income groups describe home office as an enabling factor more frequently than individuals with a low income (14%). The chairwomen of the transport committee pointed out that it is also likely that home office is only a desirable state for individuals with large enough apartments and/or no families at home (PO01) since limited shared living space can restrict the capabilities of a person to work from home. Based on the presented analysis, encouraging home office in the Post-Covid-19 future is not identified as a desirable intervention since it may be of limited benefits for low-income groups.

However, there are potential benefits to enhancing home office. More people working from home can potentially result in less car usage and traffic jams (LO04; LO07), with fewer negative externalities connected to the usage of cars, such as noise and air pollution including CO_2 emissions (LO06; LO08). Another potential benefit is that through home office the necessity for office space could decrease

(PO01; LO07), which frees up space for living, and relieves pressure from the housing market. Even though home office comes with desirable co-benefits it might not be a form of working that everyone desires or can do. As the spokeswomen of the Green party puts it:

> I wouldn't say you have to work at home now so that we have less traffic, but rather in the other direction. If you like it, then it is also good for the traffic. .... There ... I think the questions are a bit bigger than mobility (PO09, p. 13)[10]

Based on this argumentation, this thesis does not further analyse encouraging home office as a pathway for the Post-Covid-19 future.

6.2 RQ 3: What are possible challenges and barriers in the implementation of the identified pathways?

6.2.1 Car-centric organization

Decreasing private motorized transport while enhancing biking, walking and public transport does not come without challenges. One common challenge identified through the interviews is the car affinity of individuals living in Germany and the connected car-centric organization of society. As established in the previous chapter (6.1.4), reducing car traffic is crucial to enhancing carbon-neutral forms of mobility, however, “there's an inertia among both the public and politicians not to tackle car traffic too much" (LO08, p.2). The interviewed experts explain that because the car is seen as a cheap (PO01) and comfortable (LO07; PO01; PO09; AU11) form of mobility and as a source of personal freedom (PO01), restrictions often lead to conflicts (LO05; LO07). In some cases, individuals are dependent on their car (LO05), and therefore their opposition to restricting measures, in reality goes back to their fundamental interest in staying mobile rather than being attached to the car as a specific form of mobility.

Another identified challenge is the dominant discourse of cars being a symbol of one’s social status. Driving a car has for many years been seen as the ultimate highest form of mobility which is only for ones who can afford it (LO04) while using public transport or biking is something for “losers” (PO01, p. 3). However, the policy spokesman of the German car lobby (ADAC) states that in their experiences the car affinity of the younger generation is decreasing: “So 60+ is which I call the most car affine ones ... but then … the young ones 18 to 35, who have a different mobility behaviour and no longer find the car as ... their standard of living” (LO04, p. 9).

[10] I translated the original quotes from the conducted Interviews from German to English with the intention to provide an as consistent meaning as possible. A list of all original quotes can be found in Appendix 7.

Even though there are indicators that the status of cars is decreasing in society there is a favourable environment for the development of cars hindering a transition towards carbon-neutral forms of mobility (PO09; LO07). As the executive director of the NGO BUND explains that taxes, authorities, and regulations are built upon years of car friendly politics and "40 years of car-friendly traffic policy in Hamburg are now taking their revenge" (LO08, p. 2). One example comes from the company cars that employees are often provided with being highly subsidized with low taxes (LO05; PO09).

According to the interviewed expert of the pedestrian lobby, the authorities in charge of transport planning are used to planning streets from the 'inside out', meaning that the priority is to ensure space for car traffic, then the remaining space of the road is divided between cyclists and pedestrians, while cyclists are often favoured over pedestrians (LO06). The spokeswoman of the bike lobby (ADFC) calls authorities responsible for hindering the transition: "it is authorities that in many cases hold on to the old situation"[11] (LO05, p. 7), arguing that that the lanes reserved for cars are not allowed to be decreased for reasons of road safety (LO05). Additionally, it was indicated, that the road traffic regulations (*Straßenverkehrsodnung*) of Germany which are strictly followed by the police and is cantered around car traffic needs to be reassessed and adapted to the mobility of the future (LO07; PO09).

6.2.2 Governmental structures as reinforcing powers

Many different factors are hindering the effectiveness and target-oriented actions of the governance of the mobility transition of the City of Hamburg. The first factor brought to my attention by the experts interviewed is the strong influence that lobby institutions have over mobility policies and politics. The German car lobby especially opposes the restriction of car traffic, requiring a strong political will and resilience (PO01; LO04).

In addition to the strong influence of the car lobby the experts interviewed identified the following weaknesses in the governance of the transition: the missing overall strategy, the past changes in government, the slow-moving decision making (LO07) and the political tension around the topic of restricting car traffic (LO07; PO09). As mentioned in the background section (chapter 2.1.3) Hamburg does not have an overarching sustainability strategy, which also hinders mobility changes (LO07). Furthermore, it is complicated by the changes in government, because with every parliamentary term, the future of mobility changes with the different goals of each party. However, mobility projects often

[11] The wording of this quote was configurated on request of the person interviewed. The content of the quote remains the same.

are time-intensive and require up to ten years of political commitment, which goes beyond the election period making the successful completion of mobility projects challenging (LO04). Many of the stakeholders interviewed criticize that the government of Hamburg is moving too slow (LO05; LO07; PO01): "Politicians are taking very small steps. With the Jungfernstieg, an important street in Hamburg is becoming car-free, but that is far too little. Actually, much larger areas should be boldly made car-free"[12] (LO05, p. 2). The problem with a slow-moving government is not only that the changes are not drastic enough to combat climate change but also that the infrastructure changes do not fit the transition of the mobility behaviour of society, which can create new problems. According to the representative of the initiative 'Course bicycle city'[13], already today the newly built biking lanes do not fit the development of cargo bikes because they are built too small making overtaking difficult (LO07).

6.2.3 Conflicting mobility needs

Beyond the government there is also conflict in society, there are disagreements and conflicts between the different users of different mobility forms and their interest. Especially, car drivers and cyclists are often in conflict (LO07). On the one side, in daily traffic situations, drivers and cyclists are fighting over their own space on the road (LO04), on the other hand, when it comes to infrastructure projects citizens who drive and citizens who do not drive are often in conflict. The lack of consensus is not only hindering the development of projects as part of the transition but also leads to a division of society. "I have the feeling, that in the mobility sector it can lead to a division of society. I will put it bluntly: the radical car drivers and the radical cyclists." (LO04, p. 14). The mobility development during the Covid-19 pandemic could have intensified the gap between cyclists and drivers since many people using public transport before had to choose the side of either being a car driver or being a cyclist.

Another conflict created through space scarcity is the conflict between pedestrians and cyclists. This conflict again takes place on two levels: in daily traffic situations and on a governmental level. In the current road infrastructure cyclists and pedestrians often must share one road lane, which hinders cyclists and endangers pedestrians (LO07). On a governmental level, pedestrians and their weak representation of interest are often threatened to lose attention to their needs because of the focus on biking (LO06), even though both interest groups aim to reduce car traffic and not oppose each other (LO05; PO09).

[12] The wording of this quote was configurated on request of the person interviewed. The content of the quote remains the same.
[13] 'Course Bicycle City'= Kurs Fahrradstadt

7 Discussion

7.1 Discussion of results and suggestions for the Post-Covid-19 future

7.1.1 Governmental organization as the source of failure to represent societal needs

The pandemic has shown that governments indeed have the power to carry out drastic changes and regulations to secure societies wellbeing (Bouman et al., 2020). However, when looking at the governance of mobility quite the opposite is the case. For the past 40 years, the governance of Hamburg has been car-centric, space-intensive, polluting, environmentally damaging and costly, which disproportionally damages social groups of low socioeconomic status and favours high-income groups through mechanisms such as tax reduction for company cars and free parking spaces within the city.

Walks (2015) suggests that there is a connection between neoliberal governance, such as in the City of Hamburg (see Chapter 2.1.1), and car-centric policies. According to Walks (2015) “neoliberalism has played a key role in justifying the kinds of labour, tax, and trade practices that capitalists profiting from global expansion of the system of automobility have demanded” (p. 406). Even though there was a change in government and nearly all stakeholders interviewed agreed that a reduction of motorized private transport is necessary for a sustainable future, the government is not able of acting quickly enough, while inadequately addressing social and political conflicts at the same time (see Chapter 6.2.2 and 6.2.3).

While enhanced biking and walking infrastructure and improved public transport are labelled in both this thesis and the political landscape as sustainable, there is a risk of unintended consequences depending on the implementation. Ibsen and Olesen (2018) suggest that in a competitive city, the enhancement of biking infrastructure can lead to issues such as gentrification. In the case of Hamburg, Wiesemann (2014) suggests that the sustainability practices of the City of Hamburg are connected to issues such as gentrification, which in turn leads to the current housing crisis. These examples suggest that a transformation of how the City of Hamburg is governed is required to be able to reach the goals of a carbon-neutral and inclusive future. While one could conclude this thesis by calling the neoliberal governmental structures an insurmountable challenge, this thesis aimed to not only criticize but also identify actions on how to overcome the identified challenges and barriers. The following chapter aims to suggest practical actions that should follow this research.

7.1.2 Restructuring decision making to ensure a Right to the City and mobility for all

The practices suggested by this research are divided into two main parts, the first one being to create guiding sustainability and mobility strategy which adapts Sen's idea and measurement of wellbeing (see Chapter 4.2.1.1), and the second which proposes participation practices inspired by the RTTC theory.

7.1.2.1 Rethinking goals and indicators

While the City of Hamburg is currently following a Green Economy approach in their sustainability narrative where most of the indicators are measurable, this research shows that purely focusing on emission rates, road traffic and public transport occupation is not enough. I suggest that the governance of sustainable mobility should focus on providing rights and capabilities to the ones with low access to mobility, using the capabilities approach to understand the true access of individuals to transportation. In order to be able to identify new indicators connected to the values and wellbeing of individuals, participation according to Amartya Sen's social choice theory is needed. Through public discussion there is the potential to create a mutual understanding of what individuals value, which allows decisions on which capabilities should be prioritized (Sen, 2001).

7.1.2.2 Enhancing participation

Similar to Sen's understanding the results suggest a necessity for participation when it comes to the development of mobility infrastructure and practices. The RTTC "opens the door to a new politics in which capital and the state are displaced and the voice and agenda of urban inhabitants occupy centre stage" (Purcell, 2003, p. 583). There is an opportunity by adapting the RTTC and its participatory practices to break with the neoliberal governance paradigm (Purcell, 2003) and respond to the need of the oppressed people (Mitchell, 2003).

I suggest that participation makes it possible to dissolve current power dynamics that are hindering the development of sustainable mobility and misrepresenting society's needs. Generally, there is a need for social compromises to move forward with the mobility transition (LO04), a way of achieving the inclusion of citizens through participation. As established in Chapter 6.2.3, often a few loud citizens are responsible for the failure of mobility projects. Sorensen and Sagaris (2010) put forward that "local participation may build active support among residents that is crucial to success" (p. 299), and in infrastructural projects, public participation has proven to be crucial to prevent conflicts among citizens (Zenker & Seigis, 2012). Hodgson and Turner (2003) suggest that social exclusion in transportation is connected to a lack of participation of the excluded ones, making participation very

important to overcome the influence of biased interest groups. Furthermore, the car lobby and its extensive impact influences policymaking (see Chapter 6.2.2), which fits with the perception of the RTTC understanding of the state of the current city, which is “not so much a site of participation as one of the expropriations by a dominant class (and set of economic interests) that is not really interested in making the city a site for cohabitation of differences ” (Mitchell, 2003, p. 18).

Participation comes with the opportunity to “strengthen a sense of shared interest” (Sorensen & Sagaris, 2010, p. 299), meaning that there is a possibility for car drivers and cyclists to find a common ground and successfully establish consensus. As presented in Chapter 6.2.3 there is a growing division in society which possibly intensified during Covid-19. It is not uncommon that cyclists and car drivers are situated on opposing sides (Hoekstra et al., 2018) and participation can be a possible way to find solutions to it. Part of participation following the RTTC narrative is to include local knowledge and experiences when recreating cities (Sorensen & Sagaris, 2010). Mayers and Glover (2020) established positive outcomes between participation and increasing the safety for cyclists. Currently, the Police of Hamburg and the connected authorities are designing a safe infrastructure based on research and statistics rather than the experiences and feelings of individuals (AU11). However, it was indicated by several people interviewed that there is a need for considering the subjective safety feelings of the users of the infrastructure (PO09; LO07). There are bike lanes that have been built previously which are not used by the wider public because of the lack of feeling safe. To prevent this from happening an engagement with citizens regarding their safety needs and perception is needed (LO07). Participation practices among all sectors have the potential to create the capability of feeling safe when biking and walking and therefore enhance those carbon neutral behaviours.

Even though it seems like participation can be a solution to many of the observed problems, it also comes with challenges and risks. One of the major challenges is the difficulty of how to create bottom-up participation practices which are independent of the state. There are no specific ideas in the RTTC narrative on how participation should emerge and which role the government takes in it (Wright et al., 2006). One risk that is often observed in participatory practices is the risk of nonparticipation (Sorensen & Sagaris, 2010) and that group dynamics are favouring those most powerful (Cooke & Kothari, 2001). Something that was already indicated in the interviews is that the public discussion surrounding transportation is often dominated by the white middle class or people who are already engaged in the topic (PO01). It is clear that participation does not automatically lead to success, and Bickerstaff et al. (2002) suggest putting special attention on inclusion to avoid representing only a minority group in participation practices.

7.1.3 Limitations of suggested transformation

As presented in Chapter 2.1.1 the City of Hamburg is a federal state that gives it a share of political power to change and adapt to bring its sustainability goals forward. However, there are still some policy changes that the government of Hamburg does not have the power to do, and which can only be changed on the national level. While the City of Hamburg can make infrastructural changes, it has limited power to change car favouring taxes or the national road traffic regulations (PO09). However, many of the experts interviewed indicate that those changes on a national level are necessary to secure a transition towards sustainable mobility in the City of Hamburg (PO09; LO7).

7.2 Contribution to Sustainability Science

This thesis is contributing to SS by responding to emerging societal changes, bringing together different fields of studies, and working towards closing the knowledge-action gap. SS focuses "on the dynamic interactions between nature and society, with equal attention to how social change shapes the environment" (Clark & Dickson, 2003, p. 8059). Covid-19 has changed our society by defining those changes and their impact is of importance to the sustainability field. By contributing to the emerging discussion on how Covid-19 influences a sustainable transition (see Introduction) this research can support the sense-making process of the new situation.

Furthermore, SS is characterized by its interdisciplinarity, including the communication of "knowledge from diverse scientific disciplines" (Spangenberg, 2011, p. 276). By bringing together viewpoints from urban, justice, sustainable development and transportation disciplines this research sets an example of how a transdisciplinary approach can bring new insights to the debate on urban mobility. Furthermore, this research exemplifies how merging Amartya Sen's theory situated in welfare economics and the philosophical theory of the RTTC can strengthen the analytical capacity of research. Additionally, by shining light on issues of justice in the discourse of urban sustainability, this research follows the research strategy for SS designed by Jerneck et al. (2011) by merging "old social problems" such as inequality within cities and "new sustainability issues" such as the climate-relevant carbon emissions associated with inner-city mobility (p. 71). SS is focused on finding solutions and encourage action (Kates et al., 2001) by "bridging the gap between science and practice" (Polk, 2014, p. 440). As stated in the Introduction, this research aims to not only analyse societal change but also aims to identify actions for governmental institutions to overcome the discussed challenges. Following the finalization of this thesis, a policy brief condensing the main findings relevant to policymakers will be designed and shared with those in power.

7.3 Limitations and Future Research

I conducted this research at a time when the pandemic of Covid-19 and its impacts had not come to an end yet. The fast-changing situation results in adapted behaviours, which limits the findings of this research. Therefore, I suggest future research to reassess the situation and conduct reflective research when the pandemic is over. Social movements such as the RTTC movement play an important role in the City of Hamburg. However, I failed to schedule interviews with representatives of the movements. Bringing their voices into future research can give answers on how social movements can help to change urban governance and enhance participation. Additionally, to that, this research revealed interesting knowledge gaps. As mentioned in Chapter 7.1.2 there are possible unintended consequences connected to the enhancement of biking, walking and public transport infrastructure. Examining if there is a connection between those infrastructural changes and cases of inequalities and the role that neoliberal governance plays, can help prevent unintended consequences of mobility infrastructure improvement. When it comes to mobility it was well established that the car plays an important role. To not compromise the freedoms of individuals through restrictions it is crucial to further examine the capabilities that are attached to owning a car in the City of Hamburg and how those capabilities can be secured elsewhere. Finally, the RTTC opens a new interesting field in urban studies; however, it is vague, and the exact execution of its deliberative actions needs more research and application. Continuing this research by defining more precisely how participation practices could look like in the case of mobility in the City of Hamburg, could result in more precise recommendations for policymakers and movement activists.

8 Conclusion

As established in the results section Covid-19 has restricted individuals which made changes to their mobility. Not feeling safe while moving through the city has resulted in extensive changes and a loss of "the right to urban life, … enabling the full and complete usage of … moment and places" (Mitchell, 2003, p. 19). Restricting measures increased carbon-neutral forms of mobility (walking and biking) but also carbon-heavy behaviours (driving). Based on the conducted research, restrictions during Covid-19 influence social groups differently. While high-income groups had the opportunity to fall back to driving their car, low-income groups had if biking and walking was not accessible, no other option than to risk infection by continuing to use public transport or being less mobile. The fact that different social groups were impacted differently reemphasizes Sen's understanding that we must look beyond the mobility behaviours/functionings of individuals while focusing on the ones with the most limited set of capabilities on hand.

It is likely that with the end of the pandemic and the removal of restrictions the lost capabilities will be restored. Individuals will transition back to former mobility forms, before the pandemic "they found other means of transportation more relaxing to get around in" (PO09, p. 3). This means that to keep the sustainable behaviours (see Chapter 4.2.2), the enabling capabilities for the sustainable behaviours need to be expanded to make the newly adapted behaviours more accessible and desirable. However, enhancing those desirable behaviours requires a restructuring of the city, aligning with Lefebvre's demand for a future city instead of improving the current city (see Chapter 4.1.2). In the case of the City of Hamburg, this means a restriction of car traffic to be able to develop biking and walking infrastructure further. Even though there is clear evidence that the restriction of car traffic will release the pressure on societies wellbeing and help to secure the mobility of the citizens least fortune, the government has failed to do so. I, therefore, call the government to revaluate their sustainability goals, while putting forward participatory practices to move the focus towards ensuring greater access to mobility for all in the Post-Covid-19 future.

9 References

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10 Appendices

Appendix 1 – Survey design

No	Question	Type of Question
01	To which gender do you most identify?	Multiple Choice
02	How old are you?	Multiple Choice
03	What is your yearly household income?	Multiple Choice
04	In which area were you mostly living during the last year?	Multiple Choice
05	Did your activities change during the times of high restrictions?	Yes/No Answer
06	If yes, on a scale of 1-5 how much did your activities change in relation to the following categories?	
06a	My activities and behaviours concerning food (including diet & supply) have changed …	Rating scale
	How did your activities change?	Open-ended
06b	My activities and behaviours surrounding transport and mobility have changed ...	Rating scale
	How did your activities change?	Open-ended
06c	My activities and behaviours surrounding consumption of goods and services (nonfood) have changed ...	Rating scale
	How did your activities change?	Open-ended
06d	My activities and behaviours surrounding free time have changed …	Rating scale
	How did your activities change?	Open-ended
07	Think back and reflect on what kind of activities you picked up or started to do more during the times of high restriction?	Open-ended

08	Why did you start doing the listed activities? What were your motivations?	Open-ended
09	What conditions (regulations, changes in your schedule, availability of certain resources etc.) enabled you to adopt those activities?	Open-ended
10	Were there activities that you would have liked to carry out but because of lack of certain resources (time, money, space, etc.) you were not able to?	Open-ended
11	If yes, what were the constraints?	Open-ended
12	Today, do you still continue to do those activities? Why or why not?	Open-ended
13	What conditions would allow you to continue carrying out those activities in the future?	Open-ended
14	Would you say that those activities are embedded in a deeper change in your lifestyle? In what sense is it/ isn't it a deeper change of lifestyle?	Open-ended
X	Would you be interested in participating in an interview as part of this study?	Yes/ No Answer
X	Hereby I confirm that I understand that my responses to this survey will be used for a research carried out as part of a Master Thesis at the Centre for Sustainability Science at Lund University in Sweden. My shared data is confidentially and stored safely, anonymity is guaranteed. The shared data will be used only for academic (not commercial purposes). I agree that the end result of the study will be published as a thesis on a public website managed by Lund University Library.	Yes/ No Answer

Appendix 2 – List of people interviewed

Reference code	Interview No	Responsibility	Institution
PO01	1	Chairperson of the transport committee of Hamburg	Representative of the left-wing party '**Die Linke'**
PO03	3	Mobility Spokesman and member of the transport committee of Hamburg	Representative of the party social democratic party '**SPD**'
AU02	2	Responsible for Mobility in the Project 'Environmental Partnerships' ('Umweltpartnerschaften')	Representative of the authority for the environment, climate, energy and agriculture (**BUKEA**)
LO04	4	Head of Department & Transport, Transport Policy Spokesman	Representative of Europe's largest motoring association **ADAC**
LO05	5	Spokeswoman ADFC district group Hamburg-Nord	Representative of the biking association of Germany **ADFC**
LO06	6	Team member of the NGO Fuss e.V.	**Fuss e.V**. is a group working on increasing the walkability of cities
LO07	7	Team member of the initiative 'Course bicycle city' ('**Kurs Fahrradstadt'**)	'Course bicycle city' is a group organizing a petition for better biking in Hamburg
LO08	8	Executive Director of BUND	**BUND** a national NGO working towards environmental protection & natural conservation

PO09	9	Mobility Spokeswomen and member of the transport committee of Hamburg	Representative of the Green party '**Bündnis 90/ Die Grünen'**
AU10	10	Division Manager Bus Transport / Supply Planning	**HVV Hamburg**
AU11	11	Head of Situation and Operations Center Traffic	**Police Hamburg**

Appendix 3 – Interview guide

The following interview guide is an example of one interview conducted. The order of the question and the number of questions asked per interview differed. The interview specific questions can be traced back by looking up the transcripts of the interviews.

No	General questions
1	From your point of view, how has inner-city mobility changed in the times of Corona?
2	Do you and the *(name of organization)* have more specific plans to respond to these changes?
3	What is the vision of *(name of organization*) for the future of transport and mobility?
4	What problems do you want to solve with your vision/changes?
5	What challenges do you face when you implement it?
Questions related to the survey	
Many citizens tell in the survey that they have started to ride a bike or ride a bike more. Especially citizens living in the inner city and people with low and high income tell this (less in the middle class). Based on this, a possible way for a just and co2 free post-Corona future is to make changes that allow these people to keep the habit of biking.	
6	What changes do you think need to be made to ensure that people continue to ride bicycles?
7	What role does *(name of organization)* play in this development?
8	How can bicycle traffic be made inclusive?
9	What do you think are the reasons why people don't switch to bicycles?

10	How can these reasons be counteracted?
11	What do you think are the limits of bicycle traffic? To what degree can bicycle traffic replace other forms of transport?
Many of the people who say they bike or walk more explain that they do so to avoid public transportation. The fact that public transport became a mode of transport with high infection risks also led people to drive more and use more car-sharing and cab services.	
12	Where do you see the future of public transport in the city of Hamburg?
13	What role does public transport play for cycling and walking?
Another common phenomenon reported in the survey is that people walk more often to get around. This is a phenomenon that is most commonly adopted by low- and moderate-income groups. For the post-Covid 19 future, the creation of walkable cities/walkable cities could be a change that benefits low-income groups and is a low-carbon form of mobility.	
14	What changes do you think need to be made to keep people walking to get from A to B?
15	Do they see competition between walking and cycling?
Closing questions	
16	Which institution do you think is responsible for making the changes you propose?
17	Who benefits from the changes you propose?
18	Who will bear the cost of the changes?
19	What negative impacts might result from the changes?
Additional questions	
20	In general, the times of high restrictions led to less mobility because people stayed at home and places were closed. Do you expect a less mobile future? Why or why not? What are the costs and what are the benefits of this?
21	Hamburg is still aiming for population growth and with that comes an increase in traffic. What is *(name of organization)* position on this issue?

Appendix 4 – List of codes used in qualitative content analysis

Name	Number of Files	Number of References

Adapting to mobility changes	6	12
Biking	3	7
Behavior change	5	7
Commercial Bike systems	4	5
Image change	4	4
Infrastructure	9	47
Safety	8	20
Car traffic	2	5
Infrastructure	3	4
Restricting car traffic	8	24
Less Mobility	6	9
Home office	6	6
Less traffic	6	9
More space	3	3
Who benefits from it	3	3
Public transport	4	8
Access & Expansion P.T	8	18
Connection of Outskirts	1	1
Connection to other mobility forms	6	11
Ensuring low infection risk	4	6
No Covid-19 specific changes	7	10
Safety	1	3
Ticket & Prices	7	15
Walking	4	6
Facilitating short ways	4	5
Infrastructure	9	28
Quality of stay	7	14
Spokespeople Lobby	5	8
Status symbol	2	2
Agent of Change	0	0
Authorities	9	13
Bottom-up organizations	2	3
Citizens	4	8
City government	9	19
Companies	3	6
Lobby	1	1
National government	3	3
Benefits of Vision	1	1
Cost Redistribution	3	3
Healthy form of living	4	4
Less Noise &Pollution	3	3
Livable cities	2	2
More space for green spaces	2	2
Who	1	1
Already affected citizens	3	4
Car drivers	3	3
Citizens	10	13
Small Businesses	2	2
Tourists	1	1

Users of carbon low mobility forms	3	3
Challenges	1	1
Biking bad weather	4	4
Car affinity	9	39
Car Lobby	2	4
Conflict Competition between mobility users	8	18
Creating consciousness	6	8
Financial Costs	2	3
Governance	2	2
Overall strategy missing	2	2
Political tension	2	3
Slow moving government	5	7
Inclusion and Participation	7	15
Increasing mobility demand	1	1
Missing cooperation	2	2
Not enough space	7	8
Not in my backyard Mindset	3	3
Outskirts	2	5
Pub. Tr. Costs	5	5
Pub. Tr. Time Intense	1	1
Redefining Rules	2	5
Unclear Covid-19 conditions	1	1
Change of mobility during Covid-19	2	2
Biking	11	20
Car Traffic	10	16
Less accidents	1	1
More car registrations	1	3
Difference between First and Second Lockdown	4	4
Less Mobility	7	9
More pedestrians	2	4
Public transport	3	3
Obligated to still use PT	2	2
P.T. infection risk	5	7
P.T. less busy	8	13
P.T. still busy	1	2
Ticket Refund	1	3
Costs for Transition	1	1
Affordability	1	1
Companies	1	1
Government	2	2
National Government	1	1
Taxpayer	5	6
General Mobility Problems	1	1
Co2 Climate Change	7	8
Housing	2	2
Pollution - Health	5	7
Space scarcity	6	10
Traffic Jams	4	5
Traffic Safety	2	2

Negative Impact Vision	4	5
Ensuring Mobility	3	4
Mobility Gab	3	3
People moving in	1	1
Transition of jobs	2	2
Vision for Mobility Future	2	2
Biking & Walking	5	7
Comfortable mobility	3	4
E-Cars Transport	3	4
Environmental compatibility	4	6
Hamburg - an Example City	2	2
Inclusion of companies	1	1
Less Car Traffic	8	14
Livable city	3	5
Mix of mobility forms	5	9
No traffic accidents	1	2
Ownership of city	2	3
Population Growth	6	9
Public Transport	8	10
Save ways	4	6
Saving space	7	10
Traffic jams	2	2

Appendix 5 – Map of neighborhoods

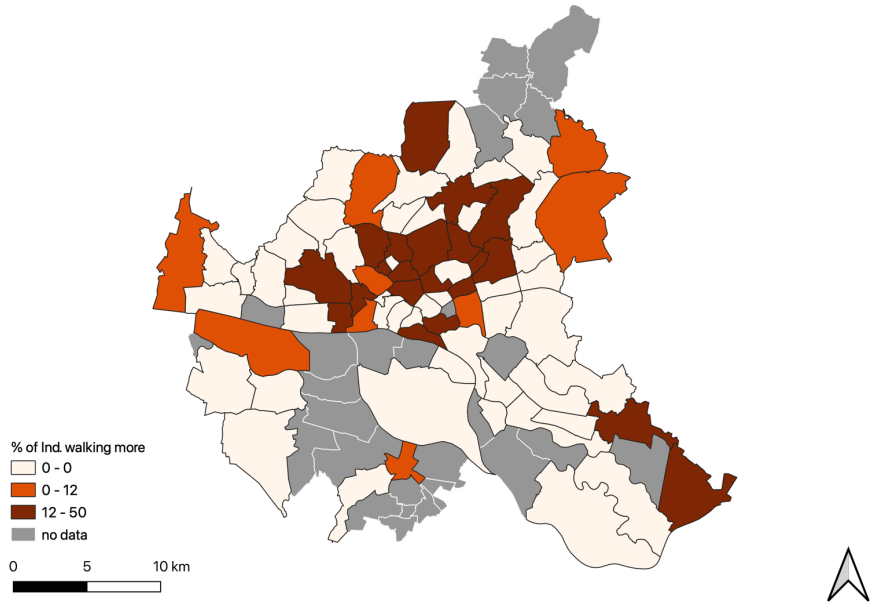

Figure 9. % of Individuals per neighborhood indicating that they walk more.

Appendix 6 – Mobility behavioral change per age group

	16-24	25-34	35-54	55-64	65-74	75+	Everyone
more walking	15.7%	13.5%	9%	4.6%	15%	0%	9.9%
more/only biking	31.4%	28.4%	19.6%	16.5%	25%	0%	22%
more car driving	21.6%	9.9%	12.5%	17.4%	10%	0%	13.4%
more carsharing &taxi	0%	6.4%	3.2%	0.9%	5%	0%	3.3%
less car driving	21.6%	9.9%	12.5%	17.4%	10%	0%	13.4%
less/no public transport	43.1%	58.9%	45.7%	36.7%	25%	0%	46%
less mobility	21.6%	17.7%	21.5%	22%	0%	33.3%	20.2%
no change	9.8%	12.8%	15.8%	19.3%	10%	66.7%	15.3%

Appendix 7 – List of original quotes of the transcribed interviews conducted in German

Original quote in German	Translated quote in English
“da würde ich nicht sagen ihr müsst jetzt zuhause arbeiten, damit wir weniger Verkehr haben, sondern eher in die andere Richtung. Wenn es euch gut gefällt, dann ist das auch gut für den Verkehr.... Da … sind die Fragen glaub ich ein bisschen größer als die Mobilität” (PO09, p.13)	“I wouldn't say you have to work at home now so that we have less traffic, but rather in the other direction. If you like it, then it is also good for the traffic.... There ... I think the questions are a bit bigger than mobility” (PO09, p. 13)
”Es gibt eigentlich bei jedem Konflikt oder bei jedem Projekt den Flächenkonflikt. Weil irgendwann muss man was wegnehmen. Wenn man bessere Radwege baut, dann fallen vielleicht Stellplätze weg oder Fahrspuren. Es geht am Ende immer ganz viel um Fläche. So wie wir das hinkriegen. Und da gibt es natürlich auch immer große Widerstände. Beharrlichkeit.“ (PO03, p. 3)	“There is actually a conflict of space in … every project. Because at some point you have to take something away. If you build better bike paths, then you may have to take away parking spaces or lanes. …. In the end, it's all about space. The way we manage it. And of course, there is always a lot of resistance. Persistence.” (PO03, p. 3)
“Das heißt, es gibt ein Beharrungsvermögen sowohl in der Bevölkerung als auch in der Politik nicht zu sehr den Autoverkehr anzugehen“ (LO08, p.2)	“there's an inertia among both the public and politicians not to tackle auto traffic too much" (LO08, p.2)

“Also 60 plus nenne ich mal die höchst Auto Affin sind … sondern das kommt von den Jungen 18 bis 35, die ein anderes Mobilitätsverhalten haben und das Auto nicht mehr als … den Lebensstandard finden.“ (LO04, p. 9)	“So 60+ is which I call the most car affine ones ... but then (…) the young ones 18 to 35, who have a different mobility behavior and no longer find the car as ... their standard of living” (LO04, p. 9)
”40 Jahre Auto freundliche Verkehrspolitik in Hamburg rächen sich jetzt.” (LO08, p. 2)	“40 years of car-friendly traffic policy in Hamburg are now taking their revenge” (LO08, p. 2)
„Es sind Behörden, die vielfach an der alten Situation festhalten.“ (LO05, p. 7)	“it is authorities that in many cases hold on to the old situation” (LO05, p. 7)
„Die Politik macht sehr kleine Schritte. Mit dem Jungfernstieg wird zwar eine wichtige Straße in Hamburg autofrei, aber das ist viel zu wenig. Eigentlich müsste man viel größere Bereiche mal mutig autofrei machen.“ (LO05, p. 2)	“Politicians are taking very small steps. With the Jungfernstieg, an important street in Hamburg is becoming car-free, but that is far too little. Actually, much larger areas should be boldly made car-free. ” (LO05, p. 2)
„Ich hab so ein Gefühl, dass es dann auch im Bereich der Mobilität durchaus zu einer Spaltung der Gesellschaft kommen kann. Ich sage es mal ganz hart die radikalen Autofahrer und die radikalen Radfahrer.“ (LO04, p. 14	“I have the feeling, that in the mobility sector it can lead to a division of society. I will put it bluntly: the radical car drivers and the radical cyclists.” (LO04, p. 14)
„offensichtlich fanden sie andere Verkehrsmittel entspannter zum Vorankommen.“ (PO09, p.3)	“obviously they found other means of transportation more relaxing to get around in” (PO09, p. 3)