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# TOWARDS SUSTAINABLE MOBILITY IN TALLINN: VIEWS AND EXPERIENCES OF YOUNG CONSUMERS REGARDING SHARED MOBILITY SERVICES

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# ABSTRACT

The current transportation system is causing various problems, such as congestion, climate change, and pollution. Hence, there is a need to make mobility more sustainable. Shared mobility services are seen as a solution, as they have been found to, for example, reduce greenhouse gas emissions and private car usage. This thesis aims to explore the sustainability potential of these services in Tallinn by studying how consumers interpret their experiences regarding shared mobility services. Therefore, the usage, impact, and future potential of car-sharing and shared micromobility are studied with a focus on the views and experiences of young consumers. For that, 14 semistructured interviews were conducted with young consumers who had used these services in Tallinn. The gathered data was analysed using thematic analysis. The findings suggest that shared mobility has the potential to make mobility in Tallinn more sustainable. The analysis shows that young consumers use shared mobility because the services help them make sustainable choices. Additionally, the study demonstrates that using shared mobility services impacts the mobility of young consumers, and some of those changes steer mobility in a more sustainable direction, such as reduced private car usage. The analysis also reveals the aspects that need to be improved to increase the sustainability potential of shared mobility in Tallinn, including micromobility infrastructure and shared vehicle availability in car-dependent areas.

Keywords: sustainability transitions, sustainable mobility, shared mobility services, car-sharing, shared micromobility

# INTRODUCTION

The current transportation system is unsustainable as it causes various problems, including climate change, congestion, and air pollution (Black, 2010, pp. 5–12). In the European Union, transportation is the only sector where greenhouse gas emissions increased between 1990 and 2019 (European Environment Agency, 2021, p. 17). The same problems apply to mobility in Estonia, as it is characterised by one of the highest motorisation rates in the European Union (Statistics Explained, 2024) and the majority of the transportation sector's greenhouse gas emissions come from passenger cars (Rohetiiger, 2024, pp. 4–5). The issues are also relevant in the city of Tallinn, where personal cars are the most popular mode of transportation for commuting, and their usage has significantly increased in the last decades (Estonian Transport Administration, 2023c). Due to these issues, the need to lower car dependency and the transportation sector's environmental impact has been brought out in both national and local strategies (Tallinn, 2020; Ministry of Economic…, 2021, pp. 27, 35; Tallinna Jätkusuutliku ..., 2023). Overall, several authors have argued that because of the various problems the current transportation system causes, it needs a sustainability transition (Hoogma et al., 2002; Black, 2010; Kemp et al., 2012).

One of the solutions that could steer mobility to a more sustainable path is shared mobility (Ruhrort, 2020; Lee et al., 2022), which includes services such as shared micromobility, car-sharing, and ride-sourcing (Machado et al., 2018; Shaheen & Cohen, 2019). Previous research has shown that shared mobility services can contribute to sustainability in various ways: they can reduce congestion in urban areas (Mouratidis et al., 2021), improve access to public transportation (*Ibid.*; Nienhaus et al., 2023), reduce private car use and ownership (Shaheen & Cohen, 2018; Mouratidis et al., 2021), and lower greenhouse gas emissions (ITF, 2015; Nienhaus et al., 2023). Additionally, shared mobility has been shown to have a positive impact on sustainability in other European cities, such as Helsinki (ITF, 2017), Oslo (Mouratidis, 2022), and Amsterdam (Arbeláez & Plepys, 2021). The city government of Tallinn has set a goal to lower the environmental impact of the transportation sector and sees shared mobility as one of the solutions for achieving the target (Tallinna Jätkusuutliku ..., 2023). At the same time, the city

government has stated that it doesn't plan to invest in shared mobility before its positive impact has been proven (*Ibid.*). Therefore, there is a need to explore the impact and sustainability potential of shared mobility in Tallinn.

Previous studies regarding shared mobility in Estonia have mostly used quantitative research methods and focused on one shared mobility service at a time. However, this thesis uses qualitative research methods to explore the potential of three services: shared e-scooters, car-sharing, and shared e-bikes. To the author's knowledge, the potential of these shared mobility services regarding sustainability transition in Tallinn hasn't been studied before. Furthermore, it hasn't been researched how these services have impacted users' mobility in Tallinn, how the services could be improved, and how these impacts and improvements relate to sustainability.

Even though shared mobility is seen as a possible solution for making mobility more sustainable, the services' impact is unknown in Tallinn. Hence, this paper aims to explore the potential of shared mobility services in making mobility in Tallinn more sustainable by focusing on the views and experiences of young consumers. To understand the services' potential, it is necessary to learn more about their usage, impact, and future potential. Therefore, this thesis focuses on the following three research questions:

1. Why do young consumers use shared mobility services in Tallinn?
2. How have shared mobility services changed young consumers' mobility?
3. How could shared mobility services be improved in Tallinn?

To explore the potential of shared mobility services in Tallinn, qualitative research methods were used in this thesis. The capital of Estonia was chosen as the study area mainly because it has the potential for a more sustainable mobility regime: it is the biggest urban area in the country where cars are the most popular mode of transportation (Estonian Transport Administration, 2023c), but there are also several shared mobility services available in the city. Young consumers were chosen for the sample because when compared to older generations, they care more about environmental and climate issues (Arenguseire Keskus, 2021, p. 19; Pew Research Center, 2021) and use shared mobility more likely (Dias et al., 2017; Circella et al., 2018; Mouratidis, 2022).

Data was gathered using semistructured in-depth interviews with young consumers who had used shared mobility services in Tallinn. Altogether 14 interviews were conducted during February and March 2024. For data analysis, the thematic analysis method was used.

The thesis is organised into four chapters. The first chapter begins with outlining the theoretical background for how transitions happen within socio-technical systems, followed by explaining the need for a sustainability transition in mobility. Then it moves over to shared mobility, focusing on car-sharing and shared micromobility, and gives an overview of the users, benefits, challenges, and future potential of these services. The next part of the chapter focuses on mobility in Estonia and Tallinn by bringing out the challenges the sector faces, the presence of shared mobility services in Tallinn, and previous research conducted in Estonia focusing on shared mobility. The chapter ends with presenting the research gap and explaining the need for this study.

The second chapter explains the study's methodological choices. First, it justifies the usage of qualitative research methods and then explains why young consumers were chosen as the sample and Tallinn as the site to study. The next subchapter outlines the reasons for using semistructured interviews to gather data and then describes the process of data gathering. The final subchapter focuses on data analysis, explaining why thematic analysis was chosen and how the analysis was conducted.

The third chapter presents the results of the study and is divided into three subchapters, each of them dealing with findings related to one of the research questions. The subchapters present the results of the thematic analysis, with examples from the interviews to illustrate the findings. The fourth and final chapter is dedicated to the discussion, and it analyses the findings presented in the third chapter. It also presents the limitations of this study together with recommendations for further studies.

# 1. THEORETICAL BACKGROUND

## 1.1. Transition towards sustainable mobility

Mobility, an essential part of any modern society, can be identified as a socio-technical system in transition. According to Geels (2004, p. 900), socio-technical systems fulfill societal functions such as transport and consist of elements – e.g. technologies, regulations, and infrastructure – needed to carry out these services. When such a system faces fundamental and drastic long-term changes in the technical and social dimensions, it can be seen as a transition (Elzen & Wieczorek, 2005, p. 651), and when these changes lead to production and consumption being more sustainable, it can be called a sustainability transition (Markard et al., 2012, p. 956). To be sustainable means to meet "the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on ..., 1987).

One of the theories used to explain the process of transitions within a socio-technical system is the multi-level perspective. It argues that transitions happen in a system when a socio-technical regime experiences pressure from the socio-technical landscape and radical innovations generated by niches (Loorbach et al., 2017). A socio-technical regime is a system made up of elements like infrastructure and technologies that are affected by numerous actors, such as policymakers, users, and manufacturers (Geels, 2002, pp. 1260–1262; Kemp et al., 2012, pp. 54–55). Because of different lock-in mechanisms – e.g. supportive legislation, deep-rooted investments, and consumer behavior – mostly incremental innovation occurs in regimes (Kemp et al., 2012, p. 58). The prevailing socio-technical regime in the transportation sector is automobility, which was developed during the last century and is dominated by privately owned cars powered by fossil fuels (Kemp et al., 2012, p. 4; Wells, 2023).

Niches, on the other hand, are protected environments for experimenting with new technologies that are not ready to enter the market yet (Schot, 1998). Although the context of the regimes and landscapes affects the novelties generated in niches (Geels, 2002, p. 1261), they can be seen as

incubators for novelties, where the rules of the regime do not apply and normal market conditions do not dominate (Hoogma et al., 2002, p. 17; Geels, 2004, p. 912). In that space, experiments are conducted, which leads to learning about expectations, problems, and preferences (Hoogma et al., 2002, pp. 17–19; Geels, 2004, p. 912). The success of the novelties depends on both the experiments and broader changes in the regimes and landscapes (Hoogma et al., 2002, p. 19). Geels et al. (2015, pp. 6–7) explain that novelties from niches can contribute to a transition when they become gradually stronger, but at the same time, changes in the landscape level must be putting pressure on the dominating regime and the regime needs to be unstable for the novelties to break through. The stronger novelties get, the more likely they might eventually lead to changes in the socio-technical system (*Ibid.*).

Numerous authors have argued that the current mobility regime needs a sustainability transition because of the various problems it causes, such as climate change, oil dependency, congestion, noise, and air pollution (Hoogma et al., 2002; Black, 2010; Kemp et al., 2012). For example, the greenhouse gas emissions of the transportation sector in the European Union rose 33.5% between 1990 and 2019, making transport the only sector where emissions have increased in that timeframe (European Environment Agency, 2021, p. 17). Mobility also faces the problem of inefficient use of cars and space (Elzen & Wieczorek, 2005, p. 654) as a typical car isn't actively used about 95% of the time (Bates & Leibling, 2012) and in the European Union occupies 1,6 people on average (European Environment Agency, 2021). Additionally, it has been recognised that incremental innovation happening within the current mobility regime won't lead to sustainability, which is why radical innovation is needed (Elzen & Wieczorek, 2005, pp. 653–654). This master's thesis focuses on urban mobility and passenger transport, which are facing the same challenges as mentioned above. Additionally, passenger cars are the biggest polluters of the transport sector in the European Union, as they account for 61% of greenhouse gas emissions emitted by road transport, which in turn makes up 71% of the transportation sector's emissions (European Environment Agency, 2021, p. 18).

## 1.2. Shared mobility

Shared mobility is considered to be one of the solutions with the potential to make mobility more sustainable (Hoogma et al., 2002; Ruhrort, 2020; Lee et al., 2022). It is a feature of the sharing economy, an economic model based on renting goods and services, that has been affected by the

Internet, location-based services, and mobile technologies (Shaheen et al., 2016, p. 1). Shared mobility aims to use transport resources more efficiently and uncouple them from ownership by giving consumers access to shared vehicles for a short time when needed (Shaheen et al., 2016, pp. 2–4; Machado et al., 2018; OECD & ITF, 2016, p. 11). It is common in urban areas and includes services like car-sharing, shared micromobility, and on-demand ride services such as ride-sourcing (Shaheen et al., 2016; Machado et al., 2018; Shaheen & Cohen, 2019). Also, widely used smartphones and mobile apps have made these services more accessible to consumers (Nienhaus et al., 2023). In the context of the multi-level perspective framework, shared mobility services are seen as the new technologies that emerged from niches that can contribute to changing the current mobility regime (Svennevik et al., 2020; Social Studies Institute of ..., n.d.; Medina-Molina et al., 2022; Pangbourne et al., 2020; Marini, 2017). Various Estonian experts have considered shared vehicles – e.g. cars and bicycles – to be radical innovations that can help speed up the sustainability transition of mobility in Estonia within five years (Social Studies Institute of ..., n.d).

In this master's thesis, the focus is on the usage of two different shared mobility services present in Tallinn: car-sharing and shared micromobility. Car-sharing is a service that gives consumers short-term access to shared cars, with the service operator usually providing things like maintenance and insurance (Shaheen et al., 2016, p. 5). The operator can be a business, a cooperative, or an individual, meaning the sharing is peer-to-peer (Münzel et al., 2018). This study focuses on car-sharing services operated by businesses. Car-sharing service can be free-floating, meaning the usage of shared cars can start and end anywhere within a predetermined area, or station-based, meaning the user must return the car to a specific location (Shaheen et al., 2016, pp. 11–12). Additionally, there are two different types of station-based services: roundtrip sharing, which means the car must be returned to the same station it was collected from, and one-way sharing, meaning the car can be dropped off at multiple locations (*Ibid.*). Shared micromobility means allowing consumers to use shared e-scooters, e-bikes, and other small, low-speed vehicles for a short period when needed (Shaheen & Cohen, 2019, p. 3). These services can either be station-based or dockless, the difference being that with the first option, the vehicles are taken and returned to a specific site, but rides with dockless vehicles can start and end in any location within a permitted area (*Ibid.*). The users of shared cars and e-scooters typically pay a fee each time they use the vehicle, but bike-sharing users may also have the option of paying on a daily or monthly basis (Shaheen et al., 2016, p. 5).

As for the users of shared mobility, Machado et al. (2018) concluded that there isn't one distinct group of people who use these services, but all of them seem to be familiar with technology and are concerned about the environment. Mouratidis (2022) found that in the city of Oslo, different shared mobility services are mainly used by young people living close to the city center with low access to private cars. Regarding different types of shared mobility, car-sharing is mostly used by well-educated young people in their 20s and 30s (Amirnazmiafshar & Diana, 2022), the most active users of shared e-scooters seem to be young men (Bozzi & Aguilera, 2021) and bike-sharing users also tend to be male and compared to the rest of the population, younger and more educated (Ricci, 2015). Schaefers (2013, pp. 73–75) has identified four main reasons why consumers use shared mobility services: convenience, lifestyle, sustainability, and financial reasons. Convenience as a motive means the services are easy to access and use, sustainability indicates that the consumers are concerned for the environment (*Ibid*.). Financial reasons include services being cheaper for users than private vehicles, and lifestyle motive means feeling a part of a community when using shared cars (*Ibid.*).

### 1.2.1. The benefits, challenges, and potential of shared mobility

Shared mobility can provide various benefits, for example, reduce the use and ownership of vehicles, widen the usage of public transit, and reduce transportation costs (Shaheen et al., 2016). It has also been found that shared mobility can help people access destinations they couldn't access with public transportation or active travel (Ferrero et al., 2017; ITF, 2017) and the services can help change the meaning of private car commuting (Sopjani et al., 2020, p. 9). Shared micromobility can improve access to public transportation, as it can be used as a first- or last-mile mobility solution (ITF, 2017, p. 83; Nienhaus et al., 2023; Mouratidis et al., 2021). E-scooters could replace car travel when used in car-oriented areas, and bike-sharing could replace car use and help reduce congestion in urban areas (Mouratidis et al., 2021). As for car-sharing, it could lead to reduced private car ownership and use, fewer kilometers traveled, and less space needed for driving and parking cars (*Ibid.*). One roundtrip car-sharing vehicle has been found to replace 9-13 private cars, and one-way car-sharing vehicle 7-11 personal cars (Shaheen & Cohen, 2018, pp. 4–5). Car-sharing users are also likely to use public transit more than non-users (Clewlow, 2016, p. 163). On a wider scale, car-sharing could bring about the need to build more infrastructure for walking, cycling, and public transport, as less infrastructure is needed for cars (Mouratidis et al., 2021). ITF (2015) researchers have studied the possible potential of shared mobility services in the city of Lisbon when all private cars would be removed and replaced with

shared vehicles like autonomous vehicles, taxis, and taxi-buses. The study showed that if a city has such shared vehicles, altogether 90% fewer vehicles were needed, CO2 emissions decreased by 30%, and congestion and the need for on-street parking disappeared (*Ibid*.).

There are also various challenges related to shared mobility services. For example, shared e-scooters are associated with blocked sidewalks and safety concerns, both for e-scooter users and pedestrians (Sikka et al., 2019; Gössling, 2020; Bozzi & Aguilera, 2021). Several studies have found that e-scooters mainly replace public transport, walking, and cycling (Laa & Leth, 2020; Bozzi & Aguilera, 2021), especially in compact urban areas that aren't car-oriented (Mouratidis, et al., 2021). Shared micromobility users also face problems such as not having access to vehicles when needed or finding broken vehicles (Roig-Costa et al., 2024, p. 117). The impact of shared mobility on greenhouse gas emissions is also mixed. For instance, Arbeláez Vélez & Plepys (2021) found that when car-dependent users shift to car-sharing, emissions are reduced, but when users without a personal car start using car-sharing, emissions increase. However, it is also possible that when car-free consumers use car-sharing, it might lead to them not buying a personal car (*Ibid.*).

Researchers have also outlined the changes needed to enhance shared mobility's impact on the sustainability transition. Nienhaus et al. (2023) have brought out four aspects that could help unlock shared mobility's full potential when it comes to reducing greenhouse gas emissions. First of all, integrating shared mobility services with walking, cycling and public transport increases their potential to reduce emissions (*Ibid.*). Secondly, investing in micromobility infrastructure, such as adding bike lanes, parking areas, and charging stations (*Ibid*.). The aspects also include decarbonising the electric grid to power electric vehicles with clean energy and creating regulations that help to prioritise sustainable mobility options, such as lanes dedicated to shared vehicles (*Ibid*.). Luo et al. (2023) concluded that for shared mobility to have a sustainable impact, it must be smoothly combined with the existing public transportation network, or it has to replace journeys taken with private cars. For shared mobility to replace journeys taken with private cars, they need to be made competitive with private cars (Sopjani et al., 2020) and they need to be accessible to current private car users who have poor access to public transportation (ITF, 2017, p. 9). It has also been found that users would like shared mobility services to be accessible outside the city, in the entire metropolitan area, particularly in regions with poor public transportation (*Ibid*., p. 8).

## 1.3. Mobility in Estonia and Tallinn

The focus of this study is on urban mobility in the capital city of Estonia – Tallinn. Estonia has one of the highest motorisation rates among the countries of the European Union: in 2022, it had 637 cars per thousand inhabitants (Statistics Explained, 2024). The most popular mode of mobility among Estonians is a personal car, and in urban areas it's the main mode of mobility for almost half of the citizens (Estonian Transport Administration, 2023b). Other modes like taxis, car-sharing, and micromobility are the main way of transportation for 1% of Estonians (*Ibid.*). Cars are also the most popular type of transport for commuting, for example in 2022, 58% of all working-age people in Estonia used a personal car to commute (Estonian Transport Administration, 2023c). Similarly to the European Union, passenger cars in Estonia are the biggest emitters of greenhouse gas emissions in the sector, as road transportation makes up over 90% of Estonia's transportation emissions, out of which 65% is emitted by cars (Rohetiiger, 2024, pp. 4–5).

In Tallinn, personal cars are also the most popular type of transport, as 49% of all working-age people in the city use cars to commute (Estonian Transport Administration, 2023c). The same indicator was 34% in the year 2000 (*Ibid.*), which indicates that using personal cars for commuting in Tallinn has significantly increased in the 22 years. On the other hand, using public transit for commuting has decreased significantly, from 50% of all working-age people using it in 2000 to 29% in 2022 (*Ibid.*). One of the reasons for these changes in commuting practices is that in the last few decades, Tallinn and its surrounding county have experienced urban sprawl which has led to citizens needing personal cars for commuting (Tuvikene et al., 2020).

Several Estonian strategies and reports suggest that the country needs to lower the environmental impact of the transportation sector and the high motorisation rate (Ministry of Economic…, 2021, pp. 27, 35; Government Office, 2022, pp. 26–28; Rohetiiger, 2024, p. 3). Sustainable mobility goals are also linked with climate mitigation targets, for example, to achieve climate neutrality in Estonia by 2050, greenhouse gas emissions from the transport sector need to be cut by 90% by 2050, with the focus being on making cities less polluting (Ministry of Economic…, 2021, p. 3). The city government of Tallinn has also set several objectives related to sustainable mobility. First, they have set the goal of achieving climate neutrality by 2050 (Tallinn Climate Plan, 2021). In 2023, the city government published its Sustainable Urban Mobility Plan for 2035, which included targets to increase the share of sustainable mobility and decrease

dependence on privately owned cars (Tallinna Jätkusuutliku ..., 2023). Shared mobility is seen as a possible way to reduce reliance on private cars and lower the environmental impact of transportation, but the city government has said that it will invest in these services once their positive impact has been proven (*Ibid.*). Also, in the Tallinn 2035 Development strategy the city government set a goal that by 2050, most citizens in Tallinn can travel conveniently without a car due to having access to public transport and shared mobility services (Tallinn, 2020).

### 1.3.1. Shared mobility in Estonia and Tallinn

There are altogether five companies providing shared mobility services in Tallinn. Two of them offer shared micromobility services – Comodule provides shared e-scooters and Bolt offers both e-bikes and e-scooters. Car-sharing service is supplied by four companies: Bolt, Citybee, Elmo Rent, and Mobire. Bolt and Citybee offer a free-floating car-sharing service, Elmo Rent provides a one-way station-based service with only electric vehicles, and Mobire a roundtrip station-based service. Shared e-scooters have been available in Tallinn since 2019 when Bolt started to offer the service (Pahv & Liiva, 2019), and Comodule entered the market in 2020 (Härma, 2020). Bolt's e-bikes became available in Tallinn in 2021 (Pau, 2021). As for car-sharing, Elmo Rent entered the market in 2013 (Inselberg, 2013), Citybee in 2019, Bolt in 2021 (Aaspõllu, 2021) and Mobire in 2023 (Täker, 2023).

Statistics on the usage of shared mobility services in Estonia are only available regarding shared e-scooters. According to a questionnaire carried out by the Estonian Transport Administration (2023a) in 2022, 27% of adults in the population used e-scooters in the previous 12 months, and two-thirds of those e-scooters were shared ones, the rest were personal vehicles. Compared to 2021, there were 62,000 new e-scooter users in 2022, meaning a five percent increase from the previous year (*Ibid*.). The study also found that e-scooters were mainly used by young people up to the age of 34, male users, and the citizens of Tallinn (*Ibid*.).

### 1.3.2. Previous studies on shared mobility in Estonia

Shared mobility has been previously studied in Estonia mostly by using quantitative research. These studies include research on Tartu's bike-sharing network (Tutu-Brempong, 2023), the usage of electric scooters in Tallinn (Miller, 2020), electric scooters as a possible way to reduce car traffic in Kuressaare (Lillepärg, 2023), consumer's attitudes towards car-sharing (Renn, 2021; Bažulina, 2023) and ride-sharing applications (Teder, 2018). Qualitative research has been

used to study car-sharing, what affects its development, and how car-sharing influences people's perception of private cars (Monastyrskyy, 2021). To the author's knowledge, qualitative research hasn't been used in Estonia to study different shared mobility services jointly with a focus on the city of Tallinn. Although Monastyrskyy (*Ibid.*) used qualitative methods to study car-sharing, he interviewed experts representing mostly the automotive industry and didn't focus on studying car-sharing in one specific location. Overall, previous works have mostly studied how users perceive shared mobility services, or their attitudes towards these services, however, this thesis focuses on the experiences of users and how the services have impacted their mobility. Also, the reasons for using shared mobility services in Tallinn have not been previously studied, nor have previous studies explored how the usage of these services has affected consumers' other mobility choices. Another novel aspect includes users' views on how these services could be improved, based on their own experiences.

Concerning car-sharing in Estonia, Bažulina (2023) discovered that car-sharing was considered as a main mode of transportation for some young people aged 18-30, who lived in Tallinn and didn't own a car. The author also concluded that although most of the participants recognised the environmental and financial advantages of car-sharing, the freedom and comfort associated with a private car outweighed the advantages of car-sharing, as most participants said they weren't prepared to plan their journeys according to car-sharing services (*Ibid.*). Renn (2021) found that car-sharing was used more by male respondents than by female ones and the younger the pollees were, the more likely they were to use car-sharing. Monastyrskyy (2021) discovered that five main factors influence the development of car-sharing services: infrastructure, parking, policy, regulations, and autonomous driving. For example, half of the interviewees said that parking spaces meant for shared cars would influence the development of car-sharing services positively (*Ibid.*). Also, five out of eight respondents in the study thought that car-sharing can reduce traffic and parking demand, and thus have a positive impact on the urban environment (*Ibid.*).

Regarding micromobility usage in Estonia, Lillepärg (2023) found that in the town of Kuressaare, electric scooters were not considered a viable alternative to cars due to unsuitable infrastructure, and were instead seen as a possible substitute for walking. It was also discovered that to improve the traffic culture associated with electric scooters, the current infrastructure should be redesigned so it would be more suitable for micromobility (*Ibid.*). The study on Tartu's bike-sharing service found that it was mainly used for short trips by people from ages 14 to 24 (Tutu-Brempong, 2023).

## 1.4. Research gap

The theoretical background explains how sustainability transitions happen and previous literature shows that there is a need for a sustainability transition in mobility, with Tallinn being no exception. As shared mobility is seen as a solution for making mobility more sustainable, it should also be considered as a solution in Tallinn. When looked at through the lens of the multi-level perspective framework, shared mobility services are the new technologies that have emerged from niches and now have the potential to change the current mobility regime (Svennevik et al., 2020; Pangbourne et al., 2020; Marini, 2017). As the new technologies grow stronger, so does their potential to change the regime and the socio-technical system itself (Geels et al., 2015). This potential is the aspect that hasn't been researched in Estonia, in the context of Tallinn – in other words, it is the research gap. Although shared mobility services have been studied in Estonia before, their potential in the sustainability transition of Tallinn's mobility hasn't been researched.

To grasp the services' potential, the experiences and views of shared mobility users in the context of Tallinn's urban area must be explored. Thus, it is important to use qualitative research, which takes into account the context and allows to investigate how users interpret their experiences (Ravitch & Mittenfelner Carl, 2021). To understand the potential, it is necessary to explore the reasons why these new technologies are being used and how sustainability fits into the motives because this helps to understand how the new technologies fit into users' overall mobility. Additionally, it is important to research how the services impact users' mobility, because this gives crucial insight into the potential of the new technologies to change the current unsustainable regime dominated by personal cars. Finally, it is necessary to explore the aspects that would improve the usage of shared mobility services, as it helps to understand how the new technologies can grow stronger and thus increase their potential to change the current regime. Therefore, this master's thesis uses qualitative research to better understand the motives behind using shared mobility, the impact shared mobility's usage has on consumers and how the services could be improved, so that they could contribute to the sustainability transition of mobility in Tallinn.

# 2. METHODOLOGY

The goal of this master's thesis is to explore the potential of shared mobility services in making mobility more sustainable, focusing on the city of Tallinn and the views and experiences of young consumers. To achieve that goal, this paper investigates why young consumers use shared mobility services in Tallinn, how the services have impacted consumers' mobility and how could the services be improved.

## 2.1. Research design

In this master's thesis, qualitative research methods are used to gather and analyse data. Initially, the aim was to use both quantitative and qualitative methods, but as the companies providing shared mobility services in Tallinn weren't able to share their data, only qualitative methods are used. Qualitative research aims to understand how individuals interpret their own experiences and a certain phenomenon in a specific context (Mason, 2002; Denzin & Lincoln, 2008; Ravitch & Mittenfelner Carl, 2021). Contrary to quantitative research, which can be described as objective and focusing on numbers, qualitative research is subjective, interpretative, and is more interested in non-numerical data (Ravitch & Mittenfelner Carl, 2021, pp. 2–10; Hesse-Biber & Leavy, 2003, pp. 1–4). Qualitative research acknowledges the existence of different subjective realities and sees knowledge as something developed by the subjective experiences of individuals (Ravitch & Mittenfelner Carl, 2021, pp. 5–10). Furthermore, samples in qualitative studies are usually small, purposeful, and chosen for their relevance, compared to quantitative research, which aims to have samples that represent the population (Crabtree & Miller, 2022, p. 19; Kara, 2022, p. 6). As this thesis does not aim to make broad conclusions about shared mobility services but rather explore how individuals interpret their experiences when using them in a specific context, qualitative research seemed a better fit than quantitative.

## 2.2. Participant and site selection

In this thesis, purposeful sampling was used because it allowed to include participants who have experienced a particular phenomenon in a specific context and are thus rich in information (Ravitch & Mittenfelner Carl, 2021, p. 83). The participants selected for the sample had to meet the following criteria: have prior experience using one or more shared mobility services in Tallinn, and be between the ages of 18 and 40. In this study, young consumers are considered to be in this specific age range because they represent the younger generations, as they belong to Generation Y or Z (Pew Research Center, 2021; Paramita et al., 2024).

Young consumers were selected as participants for several reasons. Firstly, compared to older generations, young people use technology more frequently to make sustainable mobility choices (Zipcar, 2014) and they are more likely to use smartphones for planning journeys (Jamal & Habib, 2020, p. 4). Secondly, they prioritise protecting the environment (Arenguseire Keskus, 2021, p. 19) and they care more about climate issues (Pew Research Center, 2021, p. 6). These factors seem to build a foundation for their mobility views and habits as they are more likely to use shared mobility services (Dias et al., 2017, p. 1318; Circella et al., 2018; Mouratidis, 2022, p. 10) and give up personal cars (Europ Assistance, 2023) than older generations. In Estonia, younger generations agree significantly more that the number of cars is a problem and see both e-scooters and shared cars as attractive alternatives to personal cars (Bolt, 2023). Furthermore, the users of ride-sharing, car-sharing, and shared micromobility tend to be young adults in their 20s and 30s (Schmöller et al., 2015; Dias et al., 2017; Becker et al., 2017; Fitt & Curl, 2019; Laa & Leth, 2020; Amirnazmiafshar & Diana, 2022).

Tallinn, the capital of Estonia, was chosen as the study area for numerous reasons. As shared mobility services are mainly used in urban areas and Tallinn is the biggest urban area in Estonia, it has the most possible users of shared mobility services. The region also has a lot of potential in terms of making journeys more sustainable, as almost 50% of all journeys in Estonia are made in the city of Tallinn and Harjumaa, the county surrounding Tallinn (Ministry of Economic ..., 2021, p. 6), and because cars have become the most popular transportation mode for commuting in Tallinn over the last few decades (Estonian Transport Administration, 2023c). Furthermore, the city government of Tallinn has set a goal to achieve a more sustainable mobility system and recognises that shared mobility services might help achieve this, but has also stated that there is

no plan to invest in the services before their positive impact has been proven (Tallinna Jätkusuutliku ..., 2023).

## 2.3. Data collection

In this study, qualitative interviews were used to gather data. According to Ravitch & Mittenfelner Carl (2021, p. 126), when a researcher aims to study the experiences of individuals and how they make sense of the subject under study, qualitative interviews are suitable. As the aim of this study is to explore how individuals interpret their experiences of using shared mobility services, qualitative interviews are the most suitable method to gather information for answering the research questions. To be more precise, data was gathered using semistructured in-depth interviews. In-depth interviews mean that one person is interviewed at a time (Leavy, 2017, p. 139). Semistructured interviews were chosen because they allow the researcher to tailor the conversations according to each participant, as a set of questions is prepared for all interviewees, but the wording and order of questions can vary depending on the respondent and there is the possibility to ask follow-up questions (Ravitch & Mittenfelner Carl, 2021, p. 134). In-depth semistructured interviews were chosen as the data-gathering method because each consumer's mobility habits are different, which is why it was important to interview respondents one by one and have the opportunity to tailor the interview questions and their order based on the interviewee.

As the first step of data gathering, a thorough interview guide was created, as it is advised for inexperienced researchers to compose a detailed guide (Leavy, 2017, p. 140). An interview guide can be understood as a set of questions to be used in the interview, to make sure the same information will be gathered from all interviewees (Patton, 1980, p. 200). The created interview guide has four different sections. The first part focuses on determining the overall mobility habits of the participant. The second section was designed to understand the reasons why participants use shared mobility, and the third one to explore how shared mobility has affected the mobility of the participants. The final part of the guide focuses on the views of the participants regarding improving the usage of shared mobility services in Tallinn. The first version of the guide was used in a mock interview, which brought out its errors. The final version of the guide has altogether 24 questions, most of them experience questions, which Patton (1980, p. 207) has described as questions aimed at obtaining descriptions of behaviors and experiences.

Additionally, the guide contains opinion questions, which are meant to help understand the respondent's interpretation of a subject (Patton, 1980, p. 207). The interview guide is presented in Appendix 1.

The participants of the study were recruited through universities in Tallinn because it allowed to reach a wide range of young consumers. First of all, all higher education institutions in Tallinn were contacted and asked if it would be possible to inform their students of the opportunity to participate in the study if they meet the criteria. Students from three different universities responded – Tallinn University of Technology, Estonian Academy of Arts, and Estonian Business School. As all the participants were Estonians, the interviews were carried out in Estonian. Altogether 14 interviews were conducted in the period of 27.02-14.03.2024. This sample size was chosen because of data saturation, meaning data was collected until no new significant insights appeared (Hennink & Kaiser, 2022). The youngest participant was 19 years old, and the oldest interviewees were 38 years old. The average age of the participants was 29 years. The full list of participants, including their gender and age, is presented in Appendix 2. All interviews were audio recorded and verbal consent to do so was obtained from all participants. Based on the recording, all 14 interviews were transcribed in Estonian in Microsoft Word.

## 2.4. Data analysis

After the data was gathered, it was analysed using thematic analysis, a qualitative data analysis approach. Thematic analysis is a method for analysing a qualitative dataset by identifying, analysing, and reporting themes in the data (Braun & Clarke, 2006, p. 79; Braun & Clarke, 2022, p. 4). Themes can be understood as patterns (Braun & Clarke, 2006, p. 79), for example, similarities or differences in the data (Racitvh & Mittenfelner Carl, 2021, p. 239). According to Braun & Clarke (2022, p. 35), thematic analysis has six phases: (1) familiarising with the dataset; (2) coding; (3) creating initial themes; (4) developing themes; (5) refining and naming themes; (6) and writing up. The method of thematic analysis was chosen for data analysis because it offers a systematic way to look at the data gathered, and the many steps of the analysis help to make sense of the data and to find patterns in the dataset that help to answer the research questions.

The first step of the analysis was to get familiar with the data, as Braun & Clarke (2022) have suggested. Racitvh & Mittenfelner Carl (2021, p. 260) have also called this step precoding, a process done before coding to get acquainted with the data. To get familiar with the dataset, all the interviews were read through once, and then, keeping in mind the research question, first notes were taken. The next step was coding, which is an analytical process that involves applying code labels to certain parts of the dataset that carry a meaning relevant to the research questions (Braun & Clarke, 2022, pp. 52–53). In this case, inductive coding was used, which means to derive the codes from the data, either by using the words of the participants or the researcher creating the code (Racitvh & Mittenfelner Carl, 2021, p. 265). Inductive coding was used because answering the research questions required understanding and showing the experiences and views of the young consumers who were interviewed.

After all the interviews were coded, the next step was to look for patterns and shared meaning within the codes, which gave the basis for creating themes. At first, the focus was on finding and writing down patterns, which was then followed by developing the first set of themes. Then it was important to understand if the themes make sense in the context of the whole dataset (Braun & Clarke, 2022, p. 35), which is why some of them were eliminated, and the remaining ones were refined and named. Altogether 23 themes were created as a result of the analysis, and the full list of themes with code examples is presented in Appendix 3. As there are three research questions to answer, the themes were developed in three different sections, with each of the sections helping to answer one research question. The analysis was done manually, without using any data analysis programmes, and the codes and themes were managed in Microsoft Word and Excel programmes. All the codes and themes were created in English, and the interview parts used to illustrate the themes were translated from Estonian to English.

# 3. RESULTS

## 3.1. Shared mobility usage

In this chapter, the themes created to answer the first research question are presented. There are altogether nine themes that were created to answer the question of why young consumers use shared mobility services in Tallinn: (1) shared mobility services help to save time; (2) shared mobility services are available and accessible; (3) shared mobility services are convenient; (4) shared mobility services are faster and more convenient than public transport; (5) shared mobility services can be combined with public transport; (6) shared mobility services entail fewer responsibilities; (7) shared mobility services help to avoid car ownership; (8) shared mobility services help to save money; (9) shared mobility services are good for urban space, resource use and the environment.

All the interviewees explained that they use shared mobility because the services help to save time, with many of them pointing out that they use the services when they are in a hurry, for example when they miss the bus. Other explanations included shared cars and e-scooters being faster than public transportation and shared e-scooters helping to reach public transport faster, avoid congestion, and cover short distances faster. One participant (02M24) illustrated the time-saving aspect with the following example: "*Usually when I need to get somewhere fast, for example, the train station, which is a 10-minute walk from my home, but if I take the shared e-scooter, I can be at the train station in four minutes*".

The majority of the interviewees described that they use car-sharing and shared e-scooters because of the availability and accessibility of the services. Many explained that e-scooters in particular are very available in the city, as they have no problem finding a shared e-scooter to use. On the other hand, several participants said that shared e-bikes are not very available in Tallinn, which is one of the reasons why they prefer e-scooters to e-bikes. This is how the matter

was explained by one of the interviewees (03F32): *"E-scooters are on every corner, seriously on every corner, but there are very few e-bikes, only in a handful of places."*

Another aspect that every participant pointed out was convenience, they use shared mobility services because the services are convenient. They explained that the services are easy to use and make their life easier, and parking shared cars is convenient. Regarding e-scooters, participants expressed how the vehicles are convenient like a personal car, easy to maneuver, and more convenient than public transport.

The aspects of saving time and convenience were brought together in another pattern, which is what ten interviewees pointed out: they use shared mobility because the services are either faster or more convenient than public transportation. They gave examples of how using an e-scooter to cover shorter distances is much faster than using public transport, or how reaching a destination using public transportation would require switching buses two times, which is why shared cars are a more convenient way to reach the destination.

On the other hand, five respondents expressed that one of the reasons they use shared mobility is because it can be combined with public transport. One of the interviewees (03F38) explained the aspect with the following example: *"Shared mobility services allow me to improve my public transportation usage, either when the station isn't near, I'm in a hurry, or I don't have the energy to walk, then I can still use public transportation".* Others explained that they use shared e-scooters because they can travel one part of a journey with public transit, and for the other part that isn't covered by public transportation, they can use shared e-scooters.

Participants pointed out one more reason that is related to convenience: with shared mobility services, the users have fewer responsibilities. Several interviewees described that they use shared mobility because they don't have to drive back with the same vehicle if they don't want to. In other words, they don't depend on one personal vehicle, but can rather be a user of many vehicles without having responsibilities. Another aspect that participants mentioned is that using a shared car allows them to avoid the responsibilities of owning a car, for example, insurance and maintenance. Additionally, a few interviewees who own a car said that they use car-sharing because then their personal car remains at home, available to use later when they need it.

Four interviewees expressed that they use shared mobility services because by doing so they can avoid buying a personal car. Three of them do not own a personal car and described that being able to access shared mobility services allows them to avoid car ownership. The fourth person (02M34) explained that using car-sharing has helped him avoid buying a second personal car that he would only use a few times a week, on days when his private car is not available.

More than half of the respondents described that they use shared mobility because it helps them to save money. The main explanation given by interviewees was that the services are affordable compared to using a personal car. One participant (02M36) gave the following explanation: "*In my opinion, in terms of costs and other circumstances, it is currently more rational for me to pay the renting fee than pay for all of the expenses that come with a personal car*". Other reasons included car-sharing being more affordable than buying a second personal car and using taxis, avoiding parking fees when using car-sharing instead of a personal car, and shared cars being more affordable for covering longer distances than shared e-scooters.

Almost half of the interviewees pointed out that they use shared mobility due to its positive impact on the environment, urban space, and resource usage. Many of them referred to shared mobility services as environmentally friendly transportation. Respondents also saw a positive impact on urban space, for example, they used car-sharing because it means there are fewer cars in the city and shared e-scooters because they don't take up much space. One participant (03F29) explained how sustainability plays a part in why she uses shared mobility: "*I benefit from using them without hurting others too much,"* and by others, she meant the environment and urban space. Regarding resource usage, one interviewee described that she uses shared mobility because it's better to use resources as shared ones and for cars to be in active use.

To conclude this chapter, young consumers use shared mobility in Tallinn because the services are available, accessible, sustainable, convenient, and compared to public transportation both faster and more convenient. They also help consumers save time and money, access public transportation better, prevent car ownership, and avoid the responsibilities of owning a vehicle.

Out of these nine reasons why young consumers use shared mobility services, seven of them have been identified by previous research. Firstly, Schaefers (2013) has also identified convenience and accessibility, affordability, and environmental concerns to be among the

reasons for consumers to use shared mobility. The financial aspect was also pointed out by Shaheen et al. (2016), who described the reduction in transportation costs to be one of the benefits of shared mobility. Both Ferrero et al. (2017) and ITF (2017) found that shared mobility allows users to access places they couldn't by using public transport, which is similar to the theme that young consumers in Tallinn use shared mobility because it's faster and more convenient than public transit. On top of the financial aspect, Shaheen et al. (2016) brought out two other aspects that also emerged from this study: the benefits of shared mobility are reduced ownership of vehicles and widened usage of public transport. Both of these aspects are present in the findings of this study, as participants described using shared vehicles to avoid buying a personal car and to combine the services with public transportation. The reasons that haven't been mentioned in previous research were the following: shared mobility helps consumers save time and entails fewer responsibilities than personal vehicles.

## 3.2. The impact of shared mobility usage

This chapter presents the eight themes that help to answer the second research question, which is how shared mobility services have changed young consumers' mobility. The themes are the following: (1) shared e-scooters replace walking; (2) shared mobility replaces public transportation; (3) changed commuting; (4) increased overall mobility; (5) increased multimodal transport; (6) reduced personal car usage; (7) reduced car ownership; (8) possible reduced car ownership.

The majority of the interviewees expressed that in some situations, shared e-scooters have replaced walking, and since they started using the service, they have been walking less. Many of them explained that they use e-scooters to cover short distances faster than they could by walking, for example, to reach public transit faster, or to reach their destination faster after using public transport. Other aspects pointed out by several participants were that they replace walking with e-scooters when they are in a hurry or with unsuitable weather conditions, either when it is too warm or cold to walk. None of the interviewees said that shared mobility has replaced all walking, rather only in certain situations. One of the participants (03M23) illustrated this change with the following example: *"Those shorter distances between work or school and home, that would take 15–20 minutes if I walked, but with an e-scooter, it only takes five minutes."*

Half of the participants pointed out that shared mobility services have been replacing some public transport usage. Most of them explained that they use shared mobility instead of public transit either when they are in a hurry, for example, when they miss the bus, or when public transport is very inconvenient and slow, especially for longer journeys. They also pointed out that shared cars usually replace longer or multiple public transport rides, and e-scooters replace shorter rides. A few interviewees mentioned that because they can replace public transit with shared mobility, they are now less dependent on public transport and its schedule. None of them expressed that shared mobility has replaced all public transit usage. One participant explained why she has used shared mobility for driving to school instead of public transport (02F31): *"On a few occasions, when I'm starting to be late, for example, I missed the bus and I know the next one doesn't come for ten minutes, but the situation is already getting critical."*

Another change that half of the interviewees described is shared mobility affecting their commuting. They explained how the services have replaced public transit or their private car for driving to work or school. For some, it was a few times a week, for example when their personal car isn't available, while others used the services almost every day. One of the interviewees (02F29) explained that when e-scooters are available, she always uses them to commute to work, because the distance isn't very long, so she sees no reason to use her personal car. A few of them also said that they now combine shared e-scooters with public transport for commuting.

Participants also reported two changes that involve increased mobility: they have noticed an overall increase in their mobility and an increase in their usage of multimodal transportation. Regarding overall mobility, four interviewees described that after they started using shared mobility services, they have been taking more journeys. They explained that this is due to the availability and convenience of the services, which makes them use the services more. As for the other change, an increase in multimodal transportation means that the participants are now more actively using more than one transportation mode to reach their destination. Several of them described how they combine e-scooters with public transit, for example with trains or night buses. One of them (03F31) illustrated this with the following example: *"We had an event at a co-worker's place and it ended after midnight, so I thought I could use the night bus to get closer to home, but there were still about two kilometres to go, so I used an e-scooter for that."*

Regarding personal cars, interviewees pointed out three different aspects that have changed since they started using shared mobility services. The first one, which was described by five of them, is reduced use of their personal car. The participants explained that in some situations, they prefer shared mobility to their private car, which is why they have started to use their personal car less. For example, they prefer shared cars when they can't drive back with the car, or they prefer e-scooters to their private cars for covering short distances. One of them (02F29) explained this change: *"I used to drive everywhere with my personal car. Now by default I rather use shared e-scooters. There needs to be some specific reason for me to consider using my personal car. Using an e-scooter makes more sense, it is small, and I'm also one small human."*

Another impact shared mobility has had on young consumers' mobility is that because of the services, they can avoid car ownership. Three participants said that because they have access to the services, they feel that they can steer clear of buying a personal car. One interviewee (02M34), who already owns a personal car, described how he can avoid buying a second car because he has access to the car-sharing service. Another participant (03F32) explained how shared mobility has kept her from buying a car: *"At some point we thought about buying a car, but we don't actually need it every day. Now we don't think about buying a car at all."* She also described how she sees car-sharing: *"It was invented so that people wouldn't have to buy a car when they do not actually need one."*

The third change related to personal cars is what four interviewees pointed out: because of shared mobility services, they are considering or planning to give up their personal cars. They explained that because they have been using the services and have started to use their private cars less, they don't see the point of paying for their personal vehicle and have considered giving it up. One of them (02F38) described that she plans to sell her car because shared cars are available to her when she needs them. Another participant (03F29) explained that she is considering giving up her personal car, but there is one barrier: shared mobility doesn't cover all of her mobility needs, such as intercity journeys, for what she needs her personal vehicle.

To summarise, shared mobility has changed young consumers' mobility in the following ways: the services have replaced walking and public transportation in some situations, they have increased consumers' overall mobility and multimodal transportation usage, they have changed their commuting habits, reduced their private car usage, and reduced or possibly reduced car ownership.

Out of these eight changes that young consumers described, seven have been mentioned in previous studies. First of all, both Laa & Leth (2020) and Bozzi & Aguilera (2021) have found that shared e-scooters replace walking, which was also mentioned by the majority of the participants in this thesis. Furthermore, this trend has been slightly identified in Estonia by Lillepärg (2023) who found that consumers in the town of Kuressaare saw electric scooters as a potential substitute for walking. Laa & Leth (2020) and Bozzi & Aguilera (2021) have also discovered that e-scooters replace public transportation, an aspect that was mentioned by many interviewees in this study. Changes regarding commuting have been identified by previous research as well, as Sopjani et al. (2020) have found shared mobility to help change the meaning of private car commuting, which is similar to participants of this study bringing out that shared mobility has replaced public transportation or their personal car for commuting.

There are three changes regarding private cars that the participants of this study described that have been previously discovered: reduced usage, reduced ownership, and possibly reduced ownership. Mouratidis et al. (2021) have found that car-sharing and shared e-scooter can reduce private car use, and that shared mobility can reduce private car ownership. The second aspect of shared mobility reducing ownership has also been pointed out by Shaheen et al. (2016), and the third one by Arbeláez Vélez & Plepys (2021), who found that when consumers without personal cars use car-sharing it might keep them from buying a car. Finally, multimodal transportation such as combining public transit with shared mobility has also been mentioned before, but not regarding increased usage, but in the context of increased sustainability, for example by Nienhaus et al. (2023) and Luo et al. (2023). The only change that hasn't been mentioned in previous research is that shared mobility has increased the overall mobility of consumers.

## 3.3. Improvements regarding shared mobility

Here are presented the six themes that were created to answer the third research question, which was how could shared mobility services be improved in Tallinn. The themes are the following: (1) if micromobility infrastructure was improved; (2) if the amount and availability of shared vehicles was improved; (3) if intercity usage of shared cars was improved; (4) if parking shared cars was improved; (5) city government and service providers have different obligations regarding changes; (6) changes should be made in cooperation of the city government and the service providers.

Almost all interviewees expressed that using shared mobility services in Tallinn could be improved by having better infrastructure for micromobility. Many of them described how the current infrastructure isn't safe or convenient to use, which is why they pointed out the need to separate micromobility users from pedestrians by having isolated cycling lanes. They also expressed the need to have a comprehensive network of cycling lanes. Furthermore, several participants emphasised that using the services would be greatly improved if there were no steep curbstones, which make using shared micromobility unsafe and inconvenient. One participant (03F32) described her perspective on the matter: *"I understand that some things are slowly getting better, but when you look at the red cycling paths, where you have a high possibility to die, then I don't know if they count as an improvement or not. We could start moving towards making it considerably more convenient for people to walk and cycle in the city."*

More than half of the participants said that the services could be improved by having more shared vehicles available to consumers. Many of them expressed that currently, it is difficult to use shared e-bikes even if they wanted to because there are very few of them available. Regarding shared cars and e-scooters, interviewees pointed out that there could be more vehicles in residential areas and suburbs, where people are more dependent on their private cars. Some participants also expressed that using car-sharing would be improved if there were overall more shared cars to use in the city. One interviewee (02M24) described how car-sharing could be improved and personal car usage reduced at the same time: *"Maybe in the suburbs around Tallinn, where more people use personal cars daily, like Tabasalu, Saku and Saue, the car-sharing service should be more accessible and affordable so that people would be more motivated to use it and not depend on their personal cars so much."*

There were two aspects concerning car-sharing that emerged from the interviews: participants expressed that both intercity car-sharing and parking shared cars could be improved. Five interviewees explained that using shared cars for intercity transportation in Estonia could be improved because currently, it is not possible to leave a shared car in another city, for example in Viljandi or Haapsalu. They described that this makes the service too costly to use, especially when compared to a personal car. A few of them said that if car-sharing could be used for intercity transportation, they could give up their private cars. One interviewee (03F21) who would like to use car-sharing to drive to Viljandi explained why intercity usage of shared cars should be improved: *"I need a personal car because of long-distance journeys and being away*

*from Tallinn. If this problem could be solved then I wouldn't need to have a personal car anymore."*

Regarding the other aspect, five participants pointed out that car-sharing could be a better service and using the service would be better if the parking of shared cars was improved. They described how there could be more parking options for shared cars, both more areas to park them and more designated parking spots for shared cars. A few interviewees also expressed concern about parking areas being unclear and unstable, meaning that some areas where users can park shared cars are frequently changed.

Since there also needs to be someone in charge of implementing the changes, all interviewees were asked who it should be in their opinion. There were two types of answers. Some participants thought that the changes should be made by the city government of Tallinn and service providers, with the authorities being responsible for changes to the city's infrastructure and companies for improving their services. The other opinion was that the city government and service providers should cooperate to carry out the changes. One of the interviewees (02F38) explained why she thinks cooperation is needed: *"We have people who have information, and we have people who have the ambition, need, and money to do something, so the two of them should be brought together."*

To conclude, young consumers pointed out the following aspects to improve regarding shared mobility: micromobility infrastructure, the amount and availability of shared vehicles, intercity usage of shared cars, and parking of shared cars. As for implementing the changes, young consumers mentioned two possible scenarios: firstly, the city government should be in charge of improving infrastructure, and service providers should be responsible for improving their services, and secondly, the two parties should cooperate to make the changes happen.

Out of these four improvements that participants mentioned, three have been brought out by previous research. Firstly, the need to improve micromobility infrastructure is something Nienhaus et al. (2023) have also pointed out, as one of the aspects needed to unlock shared mobility's potential to reduce greenhouse gas emissions. Furthermore, it has been brought out in the context of Estonia, as Lillepärg (2023) discovered that the current infrastructure should be redesigned so it would be more suitable for micromobility, or the traffic culture associated with

electric scooters can’t be improved. The second improvement concerns the availability of shared vehicles, as ITF (2017) found that users in Helsinki would like to access shared mobility services in the whole metropolitan area, including in areas outside the city. This is similar to the aspect brought out by participants of this study, that there should be more shared vehicles in residential areas and suburbs. Finally, improving the parking of shared cars was also brought out by Monastyrskyy (2021), who found that having designated parking spaces for shared cars would have a positive effect on the development of car-sharing. The improvement that hasn’t been mentioned in previous research is the intercity usage of shared cars.

# 4. DISCUSSION

The aim of this master's thesis was to explore the sustainability potential of shared mobility in Tallinn. Therefore, the usage, impact, and possible improvements of shared mobility services were studied, with the focus on the views and experiences of young consumers.

The first research question explored why young consumers use shared mobility in Tallinn. The results show that consumers use the services due to their characteristics – available, accessible, sustainable, and convenient – and because of the benefits they receive from using the services. The benefits include saving time and money, avoiding private car ownership and the responsibilities of vehicle ownership, and having better access to public transportation.

These findings demonstrate that young consumers have diverse reasons for using shared mobility in Tallinn, and some of those reasons are directly connected to the services' sustainability potential. Firstly, the results show that the services' sustainability is acknowledged by the consumers, as they consider shared mobility to be environmentally friendly, and they use the services because of this characteristic. Secondly, two benefits are connected to shared mobility's sustainability potential: using the services because they can be combined with public transport and because they allow to avoid private car ownership. Combining the services with public transit has been found to influence sustainability as Nienhaus et al. (2023) have demonstrated that integrating shared mobility with public transport can increase the services' potential to reduce emissions. As for using shared mobility to avoid car ownership, its sustainability impact is connected to passenger cars being the biggest emitters of greenhouse gas emissions in Estonia's transportation sector (Rohetiiger, 2024, pp. 4–5). Thus, by helping consumers avoid car ownership, shared mobility services help to prevent further emissions from passenger cars.

There were two findings concerning the first research question that haven't been addressed in previous research explicitly: consumers using shared mobility services because they help to save time and entail fewer responsibilities than personal vehicles. Both findings can be connected to the broader reasons for using the services – convenience –, as both reasons contribute to making

the services convenient to use. Furthermore, it can be said that because these reasons contribute to consumers using shared mobility in the first place, they are therefore also helping to enhance the sustainability impact of the services.

To conclude, these findings give new insight into the reasons why shared mobility services are used in Tallinn, and about the sustainability potential of the services. It is now known that young consumers consider the services to be sustainable and use them because of this. Another new finding is that consumers use shared mobility services because it allows them to make more sustainable mobility choices, such as shared mobility helping to avoid car ownership. As a result, shared mobility services contribute to mobility's sustainability transition in Tallinn.

The second research question was how shared mobility services have affected the mobility of young consumers. The analysis reveals that the services have changed their commuting habits, reduced their private car usage and ownership, replaced walking and public transportation, and increased their usage of multimodal transportation and overall mobility.

These discoveries can be divided into two sections: changes that, according to previous research, impact mobility's sustainability and changes that don't. To start with the ones that don't, shared mobility replacing walking and public transportation doesn't increase the services' potential to reduce emissions. This has been pointed out by Nienhaus et al. (2023), who found that for shared mobility services to influence emissions and sustainability, they need to be integrated with walking and public transit.

On the other hand, several changes reported in this study have a positive impact on sustainability. One of them is consumers using their private cars less, both in general and for commuting. Its positive impact has been brought out by Arbeláez Vélez & Plepys (2021) who found that emissions are reduced when car-dependent users shift to car-sharing, and Luo et al. (2023), who found that shared mobility has an impact on sustainability when it replaces journeys taken with a private car. Furthermore, it impacts the usage of space and resources because private cars are associated with inefficient use of cars and space (Elzen & Wieczorek, 2005, p. 654), as a typical car is actively used about 5% of the time (Bates & Leibling, 2012). Another change reported in this study that has a positive impact on sustainability is the increased usage of multimodal transport, such as combining shared mobility with public transport. Previous

research has shown that integrating shared mobility with public transit increases the services' potential to reduce emissions (Nienhaus et al., 2023), and shared mobility has an impact on sustainability when it is combined with the existing network of public transit (Luo et al., 2023).

There was one change among the discoveries that hasn't been specifically brought out in previous studies: shared mobility increasing the overall mobility of consumers, meaning that they take more journeys than they used to. Participants explained that the increase is connected to shared vehicles being very available and convenient to use, which indicates a connection with two reasons why young consumers use shared mobility: availability and convenience.

To summarise, these results provide new information that shared mobility can help steer consumers' mobility towards a more sustainable path – the findings of this study demonstrate that the services have impacted young consumers' mobility, and some of the changes have been shown to reduce emissions. However, new insight that shared mobility can replace other sustainable transport modes like walking and public transportation also emerged from this paper, meaning that the impact of the services isn't sustainable in every aspect. Hence, the impact of shared mobility should be analysed collectively, because, for example, in some situations shared e-scooters replace walking, but they can at the same time also increase the usage of public transportation. Furthermore, although car-sharing may replace public transit in some circumstances, the service can also help young consumers avoid buying a personal car.

The third research question explored the ways shared mobility services could be improved in Tallinn. The results show that according to young consumers, the services could be improved by having more shared vehicles and better micromobility infrastructure in Tallinn, and by improving the intercity usage and parking of shared cars. The study also shows that young consumers see two possible ways for carrying out the changes: either the city government is in charge of improving the infrastructure and service providers of improving the services, or the two should cooperate to make the changes happen.

These findings demonstrate what needs to be improved regarding shared mobility services for their impact on changing the current mobility regime and making mobility more sustainable could be enhanced. First, improving micromobility infrastructure to make using shared e-scooters and e-bikes safer and more convenient is something young consumers wish to see, and

it could also influence the sustainability transition. This is because to enhance shared mobility's impact on reducing emissions, Nienhaus et al. (2023) have found that it's important to invest in micromobility infrastructure, such as building bike lanes. Young consumers also pointed out that there should be more shared vehicles, especially in areas where people are dependent on private cars. This could have an impact on sustainability, as Arbeláez Vélez & Plepys (2021) have previously found that emissions are reduced when car-dependent users shift to car-sharing. The same goes for improving the parking of shared cars, which could help replace private car usage with car-sharing, and again contribute to reducing emissions.

The only suggested improvement that hasn't been mentioned in previous studies is improving the intercity usage of shared cars, meaning that young consumers would like to use shared cars instead of private ones to drive from one city to another. This also shows that improving intercity usage of shared cars could help reduce the usage and ownership of private cars, which could in turn positively impact sustainability. As it hasn't been mentioned in previous research, the finding could be specific to Estonia, a small country where the distances between cities aren't very long. Or it could be a characteristic of the study's participants, who were university students who had moved to Tallinn from other cities in Estonia.

To conclude, these results provide new knowledge about what needs to be improved to increase the sustainability potential of shared mobility in Tallinn. These improvements brought out by consumers show what would help the new technologies to grow stronger and start affecting the current mobility regime more strongly. These insights are also practical, as they give both the city government and the service providers new information about aspects that the users think need to be improved regarding shared mobility. Furthermore, the results provide the two parties with suggestions about who should be in charge of specific changes and that consumers consider cooperation between them to be an important part of implementing the changes.

Based on the findings of this study, shared mobility services have the potential to make mobility in Tallinn more sustainable, the most important factors being that they can increase the usage of public transportation and reduce private car usage and ownership. However, the sample size of this study was rather small and narrowed down to a specific age range, which means the generalisability of the results is limited, and it's not possible to make broad conclusions about shared mobility's potential in Tallinn. The results only demonstrate the experiences and views of

consumers between the ages of 19-38 and although previous research has shown that people in this age range use shared mobility most actively in other countries, it doesn't mean the same applies in Estonia. Therefore, the first recommendation for further studies is to gain insight into how many shared mobility users there are in Tallinn and who are the most active users. These aspects haven't been explored before, but such information would be valuable for further studying mobility's sustainability transition in Tallinn. Moreover, this information would help the city government of Tallinn to move towards its goals to reduce car dependence and lower the environmental impact of the transportation sector (Tallinna Jätkusuutliku ..., 2023).

Another recommendation is to study shared mobility's usage and impact on mobility among consumers from different age groups and socio-economical backgrounds, which would give a more comprehensive understanding of the services' sustainability potential. For example, this study shows that shared mobility has the potential to reduce car usage and ownership in Tallinn, but its full potential cannot be seen based on a handful of young consumers. Furthermore, when studying these different aspects, it is also important to look at the impact of shared mobility as a whole, because as this thesis demonstrated, the services can at the same time impact sustainability positively and negatively, such as reduce walking but also reduce private car usage. Conducting further research to discover the full impact of shared mobility would also help the city government of Tallinn with its sustainable mobility goals, but furthermore, it would show the city government the impact of shared mobility and thus help decide whether to further invest in the services or not.

Additionally, this thesis offers practical information for the city government of Tallinn and companies providing shared mobility services. Regarding the city government, this study shows that their priority should be micromobility's infrastructure, as consumers feel it is currently unsafe and inconvenient. There are also some practical takeaways for service providers, for example, that they could bring more shared vehicles to areas where people are currently dependent on private cars, and provide more areas to park shared cars. This could in turn help the city government to reduce car dependency in Tallinn.

# CONCLUSION

Shared mobility services are seen as a possible solution for making mobility more sustainable, but their impact in Tallinn hasn't been previously researched. Hence, this paper aimed to explore the potential of these services in making mobility in Tallinn more sustainable, with the focus on the views and experiences of young consumers. Therefore, the following research questions were developed to study the usage, impact, and future potential of shared mobility:

1. Why do young consumers use shared mobility services in Tallinn?
2. How have shared mobility services changed young consumers' mobility?
3. How could shared mobility services be improved in Tallinn?

To answer the research questions, a qualitative study was carried out. Altogether 14 semistructured interviews were conducted with young consumers, who were between the ages of 19-38 and had used shared mobility services in Tallinn. After the data was gathered, thematic analysis was used to analyse it and answer the research question.

The findings of the study showed that young consumers use shared mobility because the services are available, accessible, sustainable, and convenient, and due to the benefits they receive from using the services, include having better access to public transportation, saving time and money, and avoiding buying a private car and the responsibilities of vehicle ownership. Regarding shared mobility's influence, the results demonstrated that the services have impacted young consumers' mobility by changing their commuting habits, replacing walking and public transportation, reducing their private car usage and ownership, and increasing their overall mobility and usage of multimodal transportation. The findings also showed that in the opinion of young consumers, there are several ways to improve shared mobility services: in Tallinn, there could be more shared vehicles, better parking options for shared cars, and better micromobility infrastructure, and overall, the intercity usage of shared cars could be improved.

Based on the analysis, this paper provides new knowledge that young consumers choose shared mobility in Tallinn because the services are sustainable and help them to make sustainable

choices, for example, use more public transportation and avoid car ownership. However, to get the full picture, other users of shared mobility should also be researched, who are from different age groups and socio-economic backgrounds. Furthermore, to understand the services' sustainability potential even better, the overall presence of shared mobility in Tallinn should be researched, as the amount of users and the most active group of users is currently unknown. This information would also come in handy to the city government of Tallinn, which has set goals to make mobility more sustainable and reduce car dependency.

Another new aspect that was found from this study is that using shared mobility services in Tallinn can make the mobility of young consumers more sustainable. For example, it was found that the services have reduced consumers' private car usage. However, it was also found that the effect can be the opposite, such as shared mobility reducing walking. Therefore, as the findings are inconsistent, additional research to comprehensively understand the different impacts of shared mobility is needed. Additionally, by further studying the sustainable impacts found in this study, like reduced car usage, the city government of Tallinn would be a step closer to achieving its goals to reduce car dependency and mobility's environmental impact.

This study also provided new knowledge about the aspects that need to be improved regarding shared mobility in Tallinn, which could in turn increase the services' sustainability potential. Those aspects included improving infrastructure for micromobility and making shared vehicles more available in areas where users are car-dependent. These findings give practical takeaways that can be implemented by both the city government and the service providers. Furthermore, the recommended improvement for companies to increase the number of shared vehicles in car-dependent areas could help the city government achieve its goal of lowering car dependency.

Overall, the findings of this study suggest that shared mobility has the potential to make mobility in Tallinn more sustainable. Nevertheless, to make broader conclusions, a bigger sample with different user groups would be needed, as this study focused solely on young consumers. Having a broader understanding of the sustainability potential of shared mobility in Tallinn would give the city government valuable information for deciding whether to invest in the services or not, and on a larger scale, help Tallinn reach its mobility goals. Therefore, it would also lead to a more sustainable mobility system in Estonia.

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# APPENDICIES

## Appendix 1. Interview guide

**General questions:**

- Please list the different modes of transport that you use to make your journeys, both on weekdays and weekends.
- What are the proportions of the different modes of transport that you use, what do you use the most, and what the least?
- Why do you use these modes of transport?

**Questions to answer the first research question:**

- Please list the shared mobility services that you use in Tallinn.
- What are the proportions of different shared mobility services, which service do you use the most, and which do you use the least? Why?
- Are there any shared mobility services that you do not use at all? Why?
- How often do you use each service, for example, several times in a day, week, or month?
- For what purpose do you use shared mobility services, and for what types of trips?
- When you think about all the modes of mobility you use in Tallinn, what is the proportion of shared mobility services?
    a) (low proportion) Why do you not prefer shared mobility services to other modes of transport?
    b) (high proportion) Why do you prefer shared mobility services over other modes of transport?
- What benefits do you receive from using shared mobility services, and what positive aspects do you perceive about them?
- Can you please summarise why do you use shared mobility services?

**Questions to answer the second research question:**

- Have your mobility habits changed since you started using shared mobility services in Tallinn? How?

- Are you less likely to use another mode of transport or have you replaced some of the previous modes of transport with shared mobility services? If so, which one and why?
- (Uses a personal car) Have you considered giving up your personal car due to the use of shared mobility services? Why?
- (Doesn't use a personal car) Have you postponed the purchase of a personal car because of using shared mobility services? Why?

**Questions to answer the third research question:**

- Have you had any negative experiences using shared mobility services in Tallinn? Can you please describe them?
- In your opinion, are there aspects that could be improved about the services, or are the services lacking something when you are using them in Tallinn?
- In your opinion, what could be changed in the urban environment of Tallinn so it would be better to use the services?
- (Uses a personal car) Should anything change about the services so that you would use them more and your personal car less?
- (Doesn't use a personal car) Should anything change about the services so that you would not have to buy a personal car in the future?
- Who do you think should implement the changes you outlined? Why?
- Finally, please describe your ideal future of urban mobility and the role shared solutions play there.

## Appendix 2. List of interviewees

List of the interviewees of this study, featuring the date of the interview, interviewees' age and gender, interview length, and interviewees' codes.

| Date | Age | Gender | Interview length | Code |
|---|---|---|---|---|
| 27.02.2024 | 34 | Male | 00:33:33 | 02M34 |
| 27.02.2024 | 38 | Female | 00:26:24 | 02F38 |
| 27.02.2024 | 24 | Male | 00:38:16 | 02M24 |
| 28.02.2024 | 29 | Female | 00:24:54 | 02F29 |
| 28.02.2024 | 36 | Male | 00:40:35 | 02M36 |
| 29.02.2024 | 19 | Male | 00:22:08 | 02M19 |
| 29.02.2024 | 31 | Female | 00:38:41 | 02F31 |
| 01.03.2024 | 21 | Female | 00:32:02 | 03F21 |
| 01.03.2024 | 31 | Male | 00:20:53 | 03M31 |
| 01.03.2024 | 32 | Female | 00:46:07 | 03F32 |
| 07.03.2024 | 38 | Female | 00:40:12 | 03F38 |
| 07.03.2024 | 31 | Female | 00:42:21 | 03F31 |
| 07.03.2024 | 29 | Female | 01:14:52 | 03F29 |
| 14.03.2024 | 23 | Male | 00:30:19 | 03M23 |

Source: data gathering by author

## Appendix 3. Results of the thematic analysis

The results of the thematic analysis, categorised by the research question they help to answer.

| **Themes for the first research question "why do young consumers use shared mobility services in Tallinn" with code examples and the number of interviews the codes appear in** | | |
|---|---|---|
| **Themes** | **Code examples** | **No. of interviews** |
| Shared mobility services help to save time | Shared mobility usage: faster than walking or public transport | 9 |
| | Shared mobility usage: when in a hurry | 8 |
| | Shared e-scooter usage: faster than a car or public transport | 7 |
| | Shared mobility usage: the services help to save time | 5 |
| | Shared e-scooter usage: to travel short distances faster | 2 |
| Shared mobility services help to save money | Shared car usage: affordable compared to personal car | 4 |
| | Shared mobility usage: affordable | 3 |
| | Shared car usage: more affordable than e-scooters for longer distances | 1 |
| | Shared e-scooter usage: affordable compared to taxis | 1 |
| Shared mobility services are convenient | Shared mobility usage: convenience | 11 |
| | Shared mobility usage: easy to use | 4 |
| | Shared mobility usage: makes life easier when needed | 1 |
| | Shared e-scooter usage: convenient like a personal car | 1 |
| | Shared e-scooter usage: easy to manoeuvre | 1 |
| Shared mobility services are faster and more convenient than public transportation | Shared car usage: faster and more convenient than public transport | 6 |
| | Shared e-scooter usage: faster than public transport | 4 |
| | Shared e-scooter usage: more convenient than public transport | 1 |

Source: thematic analysis by author

## Appendix 3 continued

| **Themes for the first research question "why do young consumers use shared mobility services in Tallinn" with code examples and the number of interviews the codes appear in** | | |
|---|---|---|
| **Themes** | **Code examples** | **No. of interviews** |
| Shared mobility services are available and accessible | Shared mobility usage: available and accessible | 10 |
| | E-scooter usage: most available | 2 |
| | Shared e-scooter usage: very available compared to e-bikes | 1 |
| Shared mobility services are good for the urban space, resource use, and the environment | Shared mobility usage: environmentally friendly | 6 |
| | Shared mobility usage: resources are in active use | 2 |
| | Shared car usage: less personal cars in the city | 1 |
| | Shared e-scooter usage: takes less space in the city | 1 |
| | Shared e-scooter usage: one less car in the traffic | 1 |
| Shared mobility services help to avoid car ownership | Shared car usage: can avoid buying a personal car when it's not needed | 2 |
| | Shared car usage: substitutes a second personal car | 1 |
| | Shared e-scooter usage: convenient like a personal car | 1 |
| Shared mobility services entail fewer responsibilities | Shared car usage: doesn't have to drive back with the car | 5 |
| | Shared car usage: can avoid responsibilities related to owning a car | 3 |
| | Shared mobility usage: personal car remains available | 1 |
| | Shared mobility usage: can avoid responsibilities related to owning vehicles | 1 |
| Shared mobility services can be combined with public transport | Shared e-scooter usage: combines with public transport | 4 |
| | Shared mobility usage: combines with public transport | 1 |

Source: thematic analysis by author

## Appendix 3 continued

| **Themes for the second research question "how have shared mobility services changed young consumers' mobility" with code examples and the number of interviews the codes appear in** | | |
|---|---|---|
| **Themes** | **Code examples** | **No. of interviews** |
| Reduced personal car usage | Shared mobility usage: environmentally friendly | 6 |
| | Shared mobility usage: resources are in active use | 2 |
| | Shared car usage: less personal cars in the city | 1 |
| | Shared e-scooter usage: takes less space in the city | 1 |
| Reduced car ownership | Change: doesn't need to own a car | 2 |
| | Shared cars prevented buying a personal car | 2 |
| | Change: can avoid buying a second car | 1 |
| Possible reduced car ownership | Change: would be ready to give up personal car | 2 |
| | Change: plans to sell personal car | 1 |
| | Change: has considered giving up personal car | 1 |
| Increased multimodal transport | Change: combines e-scooters with public transportation | 5 |
| | Change: combines different modes more | 2 |
| | Change: combines e-scooter with nighttime buses | 1 |
| Increased overall mobility | Change: increased mobility | 3 |
| | Change: takes more journeys | 1 |
| | Change: uses transportation more | 1 |
| Shared e-scooters replace walking | Change: uses micromobility instead of walking for some trips | 8 |
| | Change: e-scooter replaces walking on short distances | 3 |
| Shared mobility replaces public transportation | Change: depends less on public transportation | 3 |
| | Change: e-scooters replace some public transportation rides | 3 |
| | Change: shared car replaces public transportation | 2 |
| Changed commuting | Change: uses e-scooters to commute to work | 3 |
| | Change: uses shared cars to commute to work | 2 |

Source: thematic analysis by author

## Appendix 3 continued

| **Themes for the third research question „how could shared mobility services be improved in Tallinn" with code examples and the number of interviews the codes appear in** | | |
|---|---|---|
| **Themes** | **Code examples** | **No. of interviews** |
| If micromobility infrastructure was improved | To improve: micromobility infrastructure overall | 8 |
| | To improve: safe infrastructure to use micromobility | 5 |
| | To improve: separate micromobility users from pedestrians | 2 |
| | To improve: comprehensive cycle lane network | 2 |
| If the amount and availability of shared vehicles was improved | To improve: shared cars more available | 4 |
| | To improve: expand car-sharing service to suburbs | 3 |
| | To improve: more shared vehicles | 2 |
| | To improve: more shared e-bikes | 1 |
| If parking shared cars was improved | To improve: more parking options for shared cars | 4 |
| | To improve: parking areas more clear | 2 |
| If intercity usage of shared cars was improved | To improve: intercity shared car usage | 5 |
| | To improve: shared cars network for intercity transportation | 1 |
| City government and service providers have different obligations regarding changes | Service provider should improve the service | 8 |
| | City government should improve cycling infrastructure | 6 |
| | Intercity usage of cars improved by service provider | 1 |
| Changes should be made in cooperation of the city government and the service providers. | Changes should be made in cooperation of the service providers and the city government | 3 |
| | Urban planning needs cooperation between service providers and city government | 1 |
| | Service providers and city government should cooperate more to favour shared mobility | 1 |

Source: thematic analysis by author

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