CHALMERS
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Car-sharing in Gothenburg

An Evaluation of its Current Role, Implementation Challenges, and Potential within Sustainable Mobility

Master's thesis in Management and Economics of Innovation

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Gothenburg, Sweden 2025
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SUMMARY
This thesis provides a comprehensive evaluation of car-sharing in Gothenburg, with the aim of mapping its current state, identifying key stakeholders, and assessing how the service is distributed and integrated into the city's urban mobility system. Drawing on theoretical perspectives from sustainability transitions and innovation systems, and combining these with empirical findings from interviews and spatial mapping, the study examines both the practical implementation of car-sharing and its potential for further development. Particular attention is given to challenges faced by various actors, such as municipalities, service providers, and real estate developers, and how these can be addressed to enhance adoption and long-term viability.

Findings show that while Gothenburg has a relatively well-developed ecosystem of local actors supporting car-sharing, significant challenges persist at the national level. The most prominent barriers are regulatory in nature, including the lack of a formal legal definition for car-sharing, its current classification under a high VAT rate, and limitations on the use of public parking spaces for shared vehicles. These obstacles limit the ability of local actors to fully integrate car-sharing into urban planning and mobility strategies. Moreover, behavioral and cultural attachment to private car ownership remains a major barrier, underscoring the need for both supportive measures and policies that gradually discourage car dependency.

The study concludes that car-sharing is currently positioned between a niche and acceleration phase, with growing legitimacy but still constrained by structural and institutional factors. A policy mix that includes both creative support and controlled destabilization of the private car regime is essential to advance its diffusion. The thesis highlights the importance of aligning car-sharing with public transport and urban planning, and emphasizes the need for national recognition of its role in a multimodal and sustainable transport system.

Keywords: Car-sharing, sustainable transitions, shared mobility, socio-technical systems, technological innovation systems, behavioral change, policy mix

Acknowledgements

In the spring of 2025, we wrote our master thesis on the topic of car-sharing as a socio-technical system in the city of Gothenburg. In the wake of this thesis project, we would like to send our gratitude towards Devon McAslan, our supervisor, and Frances Sprei, the examiner of the project both from the Department of Space, Earth, and Environment at Chalmers University of Technology. They remained steady resources in generating and discussing ideas throughout the project.

We also want to thank all participants that made this study possible. This includes respondents from the interviews and members of the Gothenburg car-sharing forum, who all helped with their useful insights on the car-sharing industry in general and in Gothenburg specifically. Without your participation we would not have been able to fulfill this research.

Andreas Quist & Joel Johansson

Gothenburg, June 2025

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1. Introduction

With increasing urban densification, stricter environmental regulations, and shifting mobility needs, the way we move through cities must be reconsidered. How people travel from point A to point B, the services they rely on, and how these modes interact are all critical factors in creating an efficient and sustainable transportation system for the future. Ensuring that different mobility solutions work together seamlessly will be essential in addressing congestion, emissions, and accessibility challenges in urban environments.

1.1 Car-sharing Background

In recent years, increasing environmental concerns and stringent CO_2 emission regulations have reshaped the transportation sector. The European Union has implemented ambitious policies aimed at reducing the carbon footprint of personal vehicles (European Commission, 2021; Regulation (EU) 2019/631, 2019). As personal vehicle technology advances, electrification and alternative fuels have emerged as primary solutions to these stringent emissions regulations. However, with ongoing urbanization (Ritchie et al., 2024) new challenges arise, including overcrowded roads, reduced mobility efficiency, and increased strain on infrastructure.

Public transportation plays a crucial role in addressing many of these challenges by providing an efficient and sustainable alternative to private car use. Well-developed transit networks help reduce traffic density, lower greenhouse gas (GHG) emissions, and improve accessibility in dense urban areas. However, public transport is not a one-size-fits-all solution. It often lacks the flexibility and carrying capacity required for certain travel needs, leading individuals to rely on personal vehicles to fill the gaps. Traditional car ownership, while offering personal convenience, contributes significantly to these previously mentioned challenges of emissions and traffic congestion. Privately owned vehicles remain idle for approximately 95% of their lifetime (Bricka et al., 2024), leading to inefficient space utilization in cities. Moreover, as parking shortages and traffic congestion worsen, cities must explore alternative mobility solutions to enhance efficiency while reducing environmental impact.

Among these solutions, car-sharing has emerged as a potential approach to increase vehicle utilization and decrease traffic congestion. Importantly, car-sharing is not intended as a one-to-one replacement for private car ownership, but rather functions as a complementary component

within a broader multimodal transport system, alongside public transport, cycling, and other shared mobility services. The rise of access-based consumption, where consumers prefer temporary access to goods over ownership, has contributed to this shift (Bardhi & Eckhardt, 2012). Instead of buying and owning vehicles, individuals increasingly opt to borrow or rent cars only when needed, a trend facilitated by technological advancements and changing consumer preferences.

However, there remains a disconnect between academic literature and business development, as described by Ferrero et al. (2018). This gap is evident in the fact that while car-sharing services promise efficiency and sustainability, their revenues remain marginal compared to the capital invested (Ferrero et al., 2018). Understanding the barriers to widespread adoption and how car-sharing can be effectively scaled within urban mobility systems is therefore crucial.

In Gothenburg, Sweden, the development of car-sharing has faced significant challenges. Although demonstrating several characteristics that are favorable to car-sharing, including a well-developed public transport system, a strong sustainability profile (Global Destination Sustainability Movement, 2024), and low car ownership (Trafikanalys, 2025), car-sharing has remained a niche and relatively underutilized solution. A notable example is the shutdown of Volvo On Demand, a car-sharing service provided, and fully owned, by Volvo. Despite the company's deep-rooted presence in Gothenburg, the service evidently struggled to achieve long-term viability. The challenges facing car-sharing in Sweden become even more apparent when compared to neighboring countries with similar cultural and socio-economic characteristics. Both Norway and Denmark, despite having smaller populations than Sweden, report higher total revenues in B2C car-sharing (Statista, 2025). Given the similarities among the Nordic countries, this discrepancy suggests that Sweden may be facing context-specific barriers that hinder the growth of car-sharing relative to its neighbors.

1.2 Purpose and Research Questions

This thesis aims to provide a comprehensive evaluation of car-sharing in Gothenburg, mapping its current state, key stakeholders, and distribution, while analyzing its implementation and potential for future development. By combining theoretical insights from existing research with empirical findings from mapping and interviews, the study seeks to critically assess how car-sharing is integrated into Gothenburg's urban mobility system.

The research will identify strengths, challenges, and gaps in the approach to car-sharing within the city and explore how different stakeholders such as government, service providers, and property owners can collaborate to enhance adoption and effectiveness. Ultimately, the goal is to offer a clear picture of what is currently being done, what it helps to achieve, and where improvements could be made to support greater market penetration and the development of car-sharing as a sustainable mobility solution.

RQ1: What is the current state of car-sharing in Gothenburg, and who are the key stakeholders?

- How does car-sharing operate in Gothenburg, and where are services physically distributed?
- Who are the key actors, and what roles do they play?
- How does the geographic distribution of car-sharing relate to the characteristics of current users?

RQ2: How can stakeholders collaboratively enhance the effectiveness and adoption of car-sharing in Gothenburg?

- What factors influence the adoption of car-sharing as a mobility solution?
- How can governments, service providers, and municipal companies collaborate and align efforts to promote the growth of car sharing?

1.3 Delimitations

To ensure a focused and feasible scope, limitations are imposed within certain areas of the study. While some contextual references may be made for comparison, the study remains centered on mapping the current state of car-sharing in Gothenburg and examining its key challenges and opportunities.

1.3.1 Geographical Scope

This study focuses on car-sharing in Gothenburg, Sweden, analyzing its current state, key stakeholders, and potential for future development. While the research is centered on Gothenburg, comparisons with other cities may be included to provide context or highlight differences in car-sharing adoption and implementation. However, such comparisons will serve as supporting references rather than the primary focus of the study. Furthermore, given that this

study focuses on Gothenburg, car-sharing will be analyzed in the context of its role within an urban environment. Thus, car-sharing as a mobility solution for rural areas or small municipalities, will not be analyzed.

1.3.2 Types of Car-sharing Models

There exists a variety of different business models and service configurations within car-sharing. This study focuses on business-to-consumer (B2C) car-sharing services. Business-to-business (B2B) services are also brought in for some perspective, but are not at the focal point of this study. Thereby peer-to-peer (P2P) models and actors are excluded from the analysis. This delimitation is motivated by several factors. First, B2C services are generally more visible, standardized, and centrally managed, making them easier to map and evaluate consistently across an urban context. In contrast, P2P car-sharing is highly decentralized, with vehicles dispersed across private locations and often lacking dedicated parking infrastructure or publicly available usage data. Moreover, the operational logic and stakeholder dynamics in B2C and P2P models differ substantially. B2C services typically involve clear institutional actors, such as municipalities and professional operators, whose roles are central to this study's focus on governance, infrastructure, and service integration. By narrowing the scope to B2C services, the study ensures a more coherent and comparable analysis of how car-sharing is developing within Gothenburg's formal mobility landscape.

1.3.3 Open and Closed Car-sharing Stations

In the mapping of car-sharing infrastructure, this study focuses exclusively on open stations, which are publicly accessible and visible through service provider platforms or city mobility tools. Closed stations, such as those located within private residential areas or workplaces with restricted access, are excluded due to limited publicly available data. Identifying and verifying the existence and location of closed stations would require extensive manual investigation, which falls outside the available time and resource constraints of this study. As a result, the mapping reflects only the public-facing car-sharing infrastructure in Gothenburg.

1.3.4 Timeframe

This study focuses on the current state of car-sharing in Gothenburg, with a particular emphasis on present challenges, opportunities, and near-term developments. Historical details and context will only be included to provide background on key developments. The study will

include near-term future developments but will not extend to long-term projections beyond the next few years. The focus remains on providing insights that are directly applicable to the current and evolving urban mobility landscape.

1.3.5 Regulatory and Policy Scope

Relevant regulations and policies will be considered to the extent that they influence the industry and its key actors. The research will provide a surface-level examination of how regulations, subsidies, and policy decisions affect car-sharing companies, users, and municipal strategies, as well as the reasoning behind certain governmental interventions. However, this study will not conduct a detailed legal analysis or in-depth examination of legislative frameworks.

2. Theory

2.1 Car-sharing Business Models

There are several distinct models of car-sharing services currently being explored and implemented. A key differentiating factor lies in the type of service provider facilitating the offering, which significantly influences how the service operates. Broadly, car-sharing models can be categorized into business-to-consumer (B2C), business-to-business (B2B), and peer-to-peer (P2P) formats.

2.1.1 Business to Consumer Model

In the B2C format, which is the focus of this study, a company owns and manages the vehicle fleet while providing users with access to cars, as well as the necessary infrastructure and support services. Within this format, several service configurations exist, the most common being station-based systems (two-way and one way), but also free-floating systems.

In the two-way station based setup, vehicles must be picked up and returned to the same designated parking location. These stations are predefined by either the service provider or the local authority and function as fixed access points for users. Two-way systems are typically suited for round-trips, where users plan to return to their original location after completing their journey (Nourinejad & Roorda, 2015).

In contrast, one-way station based systems allow users to pick up a vehicle at one station and return it to a different location. This model offers greater flexibility and is particularly useful for point-to-point travel needs, such as errands that do not involve a return trip. By accommodating more spontaneous or non-repetitive travel behavior, one-way systems broaden the appeal of car-sharing services to a wider range of users (Nourinejad & Roorda, 2015).

Free-floating car-sharing systems represent a flexible form of shared mobility that allows users to pick up and return vehicles at any location within a defined service area, without the need for predefined stations. Unlike station-based models, these services enable discretionary, more flexible one-way trips (Firnkorn & Müller, 2011). Vehicles are typically located and accessed

via smartphone apps using real-time GPS tracking, and rentals often operate on a minute-based pricing model, without the need for advance booking or fixed costs.

2.1.2 Business to Business model

B2B car-sharing operates similarly to B2C models, with the key distinction that access to the vehicles is arranged through an organization or employer. In this model, companies provide their employees with access to shared vehicles for work-related travel instead of using traditionally leased or company-owned cars. This model enables organizations to utilize existing car-sharing infrastructure without the need to manage a dedicated vehicle fleet or take on the administrative responsibilities associated with ownership or leasing.

2.1.3 Peer to Peer Model

In contrast, the P2P car-sharing model allows private individuals to rent out their personal vehicles to other users, typically facilitated through a digital platform operated by a third-party company. In this arrangement, the platform provider does not own the vehicles but instead supplies the technological and administrative infrastructure (booking apps, insurance services, and customer support) that enables vehicle sharing between individuals. However, as previously noted, the P2P model falls outside the scope of this study and will therefore not be examined in relation to actors, infrastructure, or collaborative frameworks.

2.2 Advantages of Car-sharing

In response to the emerging challenges outlined in the background chapter, research indicates that car-sharing offers a promising solution to several of these issues. One of the most notable outcomes indicates a significant decrease of private vehicle ownership among car-sharing users (Katzev, 2003; Nijland & van Meerkerk, 2017). Since private cars are heavily underutilized, remaining idle for 95% of their lifetime (Bricka et al., 2024), car-sharing allows multiple individuals to meet their mobility needs using a shared fleet, significantly reducing the number of vehicles required per user (Katzev, 2003). Several studies have shown that each shared vehicle introduced into a car-sharing fleet can replace a significant number of privately owned cars. Estimates vary across the literature, with some studies suggesting a reduction of approximately 5 to 15 private vehicles per shared car (Transport & Environment, 2017), while others report a narrower range of 9 to 13 (Martin et al., 2010). These figures, however, are highly context dependent. Factors such as geographic location, urban density, public transport

accessibility, and the characteristics of the local population all influence the extent to which car-sharing substitutes for private vehicle ownership. As a result, while the potential for impact is substantial, outcomes must be assessed within the specific dynamics of each city or region.

Additionally, car-sharing has been linked to a modal shift toward more sustainable transport alternatives, with a majority of members reporting increased use of public transit, walking, and cycling (Katzev, 2003). Research has also shown that car-sharing effectively addresses gaps left by public transport, helps prevent car purchases that might otherwise lead to a complete shift away from public transport, and results in high levels of user satisfaction, demonstrating that the two mobility solutions can have a synergistic effects on each other (Huwer, 2004).

Furthermore, by separating access from ownership, car-sharing encourages more mindful and efficient mobility behavior. Members become more aware of the actual costs of travel, which promotes advanced trip planning, bundling of errands, and reduced spur-of-the-moment driving (Katzev, 2003). However, findings on the impact of car-sharing on driving distance and vehicle emissions are inconclusive. While some studies and industry reports indicate a reduction in both car usage and emissions (Capgemini Invent, 2020; Nijland & van Meerkerk, 2017), others suggest that the environmental benefits are minimal or comparable to those of private car ownership, and that the driving distance actually increases since more car-less individuals have easier access to shared vehicles (Jung & Koo, 2018; Katzev, 2003).

However, one of the main reasons for car-sharing's limited impact on reducing GHG emissions is the potential additional mileage generated from substituting public transport with car-sharing, which can offset the environmental benefits gained from avoided vehicle purchases and production (Jung & Koo, 2018). However, when car-sharing is used as intended, i.e., as part of a well-integrated multimodal transport system supported by efficient public transport, these negative effects can be significantly reduced, thereby enhancing the overall environmental benefits of car-sharing.

2.3 Sustainability Transitions and Diffusion of Innovation

Within the scientific literature, sustainable transitions refer to fundamental changes in socio-technical systems, one of which being transportation. These transitions are inherently complex, as they involve a diverse set of actors with differing roles, goals, and interests, all of which influence the direction and pace of change (Markard et al., 2012). Furthermore, as innovations move beyond the emergence phase and enter the acceleration phase, they encounter five main systemic challenges. Markard et al. (2020) identify these as the need for whole system change, interactions between multiple socio-technical systems, resistance from incumbent structures, role of consumers and social practices, and governance complexity.

First, Markard et al. (2020) argues that whole systems change is necessary to achieve meaningful and lasting sustainability transitions. The two main contingencies involve the need for complementary interactions between innovations and changes in system architecture. If complementary interactions are limited, transitions risk stalling due to the emergence of bottlenecks or declining system performance. Similarly, a lack of architectural change can hinder innovation from scaling, even when the technology itself is viable. As a result, Markard et al. (2020) emphasize the need for policy to support broader system transformation, rather than focusing solely on individual innovations at this stage.

Second, interactions between multiple socio-technical systems refers to the intersections with adjacent systems that have their own structures, norms, and governance arrangements (Markard, 2020). As innovations scale, tensions may emerge due to overlapping demands for shared resources, differences in planning horizons, or conflicting institutional logics. For instance, increasing the electrification of transport can place added pressure on energy systems.

Third, resistance from incumbent structures can impede the scaling of sustainable innovations (Markard et al., 2020). Actors with vested interests in the dominant regime may actively or passively resist change. This resistance can manifest through lobbying, regulatory capture, or path-dependent investments that favor the status quo. In transitions that challenge core business models or asset valuations, such resistance is often particularly strong.

Fourth, Markard et al. (2020) describes how the role of consumers and social practices presents a critical challenge in sustainability transitions. Changing individual behavior is particularly

difficult when it involves a perceived loss of freedom or a reduction in consumption. While relatively simple actions such as recycling or purchasing energy-efficient appliances are broadly accepted, more substantial shifts, including giving up private cars or avoiding air travel, remain culturally and politically sensitive, according to a study conducted by Dubois et al. (2019). This resistance is rooted in the strong connection between consumption and deeply embedded social norms related to freedom, identity, and everyday routines. Therefore, efforts to scale innovations must also address the social dimensions of change, including the need to build awareness, foster trust, and ensure that new practices are perceived as accessible and manageable.

Connected to this specific challenge of behavior change and adoption, Rogers (2003) provides a foundational framework for understanding how new ideas, technologies, and practices spread within a social system over time, called the diffusion of innovation. The theory describes diffusion as a process involving communication through specific channels over time among members of a social system. One of its key contributions is the identification of five adopter categories: innovators, early adopters, early majority, late majority, and laggards. Each of these categories are characterized by distinct attitudes toward risk, novelty, and social influence. Which in turn, are based on socio-economical aspects such as income and educational level. Furthermore, a significant gap often exists between early adopters and the early majority, making this transition one of the most critical and challenging stages in the diffusion process (Moore, 2014). This phase is commonly referred to as “crossing the chasm”, i.e., reaching the early stages of the mainstream market.

Fifth and finally, governance complexity refers to the challenges of coordinating and aligning policies across sectors and levels of government (Markard et al., 2020). Horizontal alignment is needed to ensure that policies in areas such as transport, energy, taxation, and land use support each other. Without this, conflicting goals and unclear responsibilities can slow progress. However, cooperation between ministries is often difficult due to institutional separation and political competition. Vertical alignment involves coordination between international, national, and local levels. While international actors may set strong goals, they often lack the resources or power to carry them out. National governments have more influence and funding but can be affected by pressure from established industries. Local authorities may lack the support or tools to act on their own. These gaps between levels can delay action and reduce the overall impact of sustainability policies.

2.4 Multi-level Perspective and Niches

To understand how large-scale changes in technology and society unfold, the Multi-Level Perspective (MLP) (Geels, 2002) offers a valuable framework. The MLP conceptualizes transitions as interactions between three analytical levels: niches (protected spaces where radical innovations can develop), socio-technical regimes (established practices and structures), and socio-technical landscape (broader trends and pressures, such as climate change or urbanization).

Niches can be understood as protected spaces where more experimental and radical innovations are developed, while regimes function as the structures that filter, stabilize, and reinforce existing practices and technologies (Geels, 2002). Stability within a regime arises from the way technologies, regulations, infrastructures, user practices, and cultural norms are tightly interlinked and continuously reinforced within it. The landscape level is the most difficult to influence directly, as it is typically understood as consisting of exogenous factors beyond the control of individual actors. These include long term societal trends, political developments, cultural norms, and environmental conditions. The socio-technical landscape can place pressure on existing regimes, potentially creating windows of opportunity for niche innovations to grow and gain legitimacy. In doing so, the landscape shapes the broader context in which transitions unfold, either reinforcing the stability of current regimes or contributing to their gradual destabilization.

The framework, and the levels within it, examines how transitions unfold not only through the adoption of individual innovations, but through the long-term, structural transformation of entire socio-technical systems. Such a perspective is particularly relevant in the context of urban mobility, where the shift toward sustainable transport solutions, such as car-sharing, from the previous norm of privately owned vehicles, requires coordinated changes across technologies, user practices, infrastructure, and institutions.

Smith and Raven (2012) further elaborations on the theory of niches, where protective spaces are formed that perform three interrelated functions: shielding, nurturing, and empowering of an innovation. Shielding refers to the process of temporarily protecting emerging innovations from dominant selection pressures within incumbent socio-technical regimes. This protection can be passive, where the innovation benefits from reduced external pressure due to

circumstances, or active, where deliberate efforts are made to create a supportive environment through policy, investment, or advocacy. Nurturing involves fostering its development through processes such as social learning, expectation formation, and network building. Finally, empowerment describes the process by which niche innovations begin to influence or compete with the mainstream regime.

Smith and Raven (2012) distinguish between two types of empowerment: fit-and-conform and stretch-and-transform. Fit-and-conform empowerment refers to the process by which a niche innovation becomes competitive within an existing socio-technical regime by aligning with its established norms, structures, and market expectations (Smith & Raven, 2012). While this can enhance the innovation's economic viability, it often reduces its transformative potential, as it adjusts to conventional criteria rather than challenging them. As a result, originally radical or sustainability-driven innovations may evolve into more incremental improvements, limiting their broader impact on systemic change. Stretch-and-transform empowerment refers to processes by which niche innovations seek not just to survive within existing regimes, but to actively reshape or replace dominant socio-technical structures (Smith & Raven, 2012). Rather than aligning with incumbent norms, these innovations promote institutional reform, often supported by broader societal movements and political advocacy. By addressing regime tensions and offering credible alternatives, stretch-and-transform niches aim to influence rules, standards, and expectations, ultimately reconfiguring the selection environment in favor of more sustainable practices.

2.5 Technological Innovation Systems and Policy-making

Car-sharing, as a part of the broader socio-technical transportation system, plays a crucial role in addressing the sustainability challenges outlined in the previous chapter. The development and diffusion of car-sharing services involve a wide range of actors operating across different levels of society. Critical insights often lie in the collaboration and interaction between these actors, as their coordination significantly shapes the trajectory of innovation. To better understand the factors that enable or hinder change in the context of car-sharing, the Technological Innovation Systems (TIS) framework offers valuable insight. TIS examines how technologies emerge, develop, and spread within a broader socio-technical context, emphasizing the systemic conditions and actor interactions that influence innovation dynamics within a particular technological field (Bergek et al., 2008; Hekkert et al., 2007). A TIS is

composed of actors, networks, and institutions, each playing a vital role in supporting the development, diffusion, and application of new technologies (Carlsson & Stankiewicz, 1995).

According to Bergek et al. (2008), a well-functioning innovation system supports several key functions, such as entrepreneurial experimentation, knowledge development and exchange, market formation, and the establishment of legitimacy. Analyzing these processes helps to identify both enabling conditions and systemic weaknesses that may hinder the scaling of an innovation. While this study does not evaluate each function in detail, the framework serves as a guiding perspective for understanding the broader dynamics affecting the development of car-sharing in Gothenburg.

Furthermore, to make the application of the TIS framework more practical, Bergek et al. (2008) propose a six-step analytical approach for evaluating the system, as illustrated in the figure below.

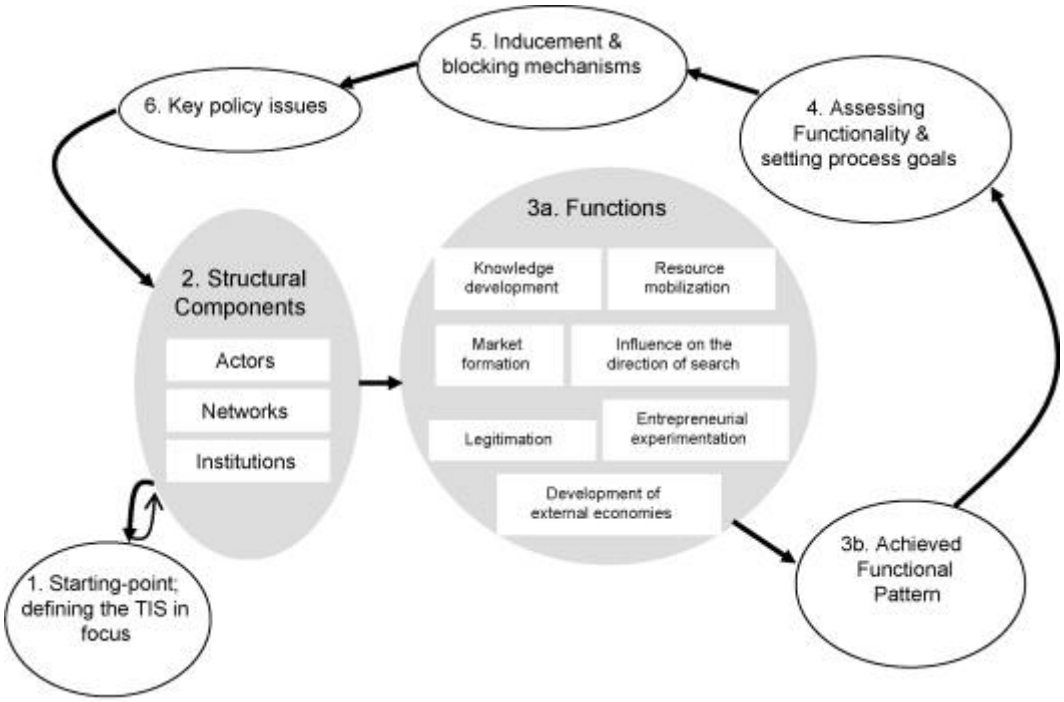

Figure 2.1: Six-step analytical approach of evaluating a TIS, adopted from Bergek et al. (2008).

This six-step analysis scheme, outlined by Bergek et al. (2008), is aimed at assessing its functionality and identifying key areas for policy intervention. The first step involves delineating the boundaries of the system in terms of its focal technology, product, or knowledge field. The TIS may be regional, national, or transnational and includes all actors, networks, and

institutions influencing the innovation process. Secondly, the structural components are identified. In the third step, the previously mentioned seven functions are evaluated. The fourth step, "Assessing Functionality & setting process goals" the current functional pattern is evaluated to determine how well the system is performing, based on its phase of development (e.g., formative vs. growth) or comparison to similar systems. This allows for the formulation of process goals, such as strengthening weak functions or expanding market formation. Sixth step uncovers factors that support or hinder the fulfillment of key functions. Inducement mechanisms and blocking mechanisms help explain the system's current dynamics. Finally, based on the identification of functional weaknesses and their underlying causes, this final step formulates policy recommendations aimed at removing blocking mechanisms and reinforcing inducement mechanisms. Policy interventions are targeted toward improving specific functions rather than changing structural components directly.

Furthermore, in connection to sustainable transitions and transforming socio-technical systems, Kivimaa and Kern (2016) argue that policy mixes should incorporate and address two dimensions: supporting innovations and the surrounding systems, as well as destabilizing the existing regime. They emphasize that the urgency of sustainability challenges requires not only stimulating processes, but also focus on active destabilization processes. Relying solely on the emergence and growth of alternative innovations is likely to result in transitions that are too slow to meet pressing environmental goals (Kivimaa & Kern, 2016). Therefore, policy mixes for sustainability transitions should not be limited to traditional innovation and technology policies, but should encompass all types of policies that can stimulate creation of sustainable alternatives (creative) and the deliberate weakening of established, unsustainable systems (destruction).

In the article, the functions influenced by stimulating policies correspond to the seven functions outlined in the TIS framework (Kivimaa & Kern, 2016). However, the authors also extend this by adding four regime destabilization functions: control policies (D1), major changes in regime rules (D2), reductions in support for dominant technologies (D3), changes in social networks and the replacement of key actors (D4). The authors demonstrate that policy mixes addressing both support for innovations and destabilization of incumbent regimes increase the likelihood of successful transitions, particularly in the context of sustainability transitions, which makes this perspective especially relevant for the case of car-sharing.

2.6 Summary of Key Theories and their Relevance to Car-sharing

This section provides an overview of relevant theoretical concepts, their key concepts and its applicability and relevance to car-sharing.

Table 2.1: Theoretical concepts and their application to car-sharing.

Theory	Key concepts	Relevance/Application to car-sharing
Sustainability transitions and diffusion of innovation	• Whole system change • Interactions between multiple socio-technical systems • Resistance from incumbent structures • Role of consumers and social practices • Governance complexity	Car-sharing is embedded within a broader socio-technical transport system, and its diffusion is dependent on change at the system level. Whole system change is central, as car-sharing must integrate with other mobility modes (e.g., public transport). Social practices and norms surrounding private car ownership present cultural resistance to adoption. Governance, especially horizontal and vertical policy alignment, is critical, as current regulatory frameworks can hinder the development of car-sharing services.
Multi-level perspective and niches	• Protection and nurturing of niche innovations • Transitioning from niche to regime (market penetration) • Landscape, regime, and niche levels	MLP provides a lens to understand how car-sharing, as a niche innovation, can transition into the mainstream. This involves understanding at which system level interventions are most needed (e.g., landscape trends supporting shared mobility, regime resistance, or niche development). Also draws attention to the protective role of niches, and how innovations such as car-sharing should be nurtured and empowered to enable wider adoption and diffusion within the socio-technical system.
Technological innovation systems and policy mix	• Systems perspective on innovation • Identification of key actors and networks • Functional dynamics of innovation systems • Policy mix with dual focus: niche stimulation (creative) and regime destabilization (destructive)	TIS enables mapping of the key actors, institutions, and networks involved in car-sharing, identifying both inducement and blocking mechanisms (e.g., legal definitions, VAT policy, parking regulations). The policy mix concept highlights the importance of not only supporting innovation through incentives and infrastructure but also destabilizing incumbent regimes, such as the dominance of private car ownership, to enable system-level transition. This dual approach aligns with sustainability goals by addressing both opportunity creation and structural resistance.

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3. Method

When determining how to address the research questions, we considered several other options for defining the study's boundaries. It was ultimately chosen to conduct a case study of car-sharing in Gothenburg, using the city's geographic limits to define our bounded system. Bell et al. (2019) identify geographic location as one of the most common ways to structure a case study.

We applied three criteria to assess Gothenburg's suitability for this study. The first criterion was the existence of a car-sharing market in the city. After conducting preliminary research, consisting of internet searches and conversations with individuals active in the local scene. It was confirmed that multiple car-sharing operators were present, thereby satisfying this most basic requirement.

The second criterion concerned sampling adequacy, in line with Bell et al. (2019). Specifically, it had to be ensured that Gothenburg's car-sharing market could yield sufficient data to address the research questions at hand. Multiple actors were among supply-side actors, there was also a relatively broad user base, and active municipal mobility initiatives from different local government departments. This diversity provided a sufficient context for meaningful analysis and informed conclusions related to the questions set out from the start.

The third criterion evaluated the feasibility of data collection, particularly our capacity to employ the chosen methods on site. Because both authors resided in Gothenburg, the initial knowledge of the area helped in getting the project off the ground. It also allowed for the authors to attend events such as the Gothenburg Car-sharing forum. Where, as an example, contacts with individuals who participated as interviewees in this study were initiated.

In summary, Gothenburg met all established criteria regarding market presence, data richness, and practical feasibility. Thus serving as an appropriate case for examining car-sharing dynamics.

3.1 Research Design

The study employed a mixed-methods approach, with a primary focus on qualitative data supplemented by selected quantitative measures of demographics, car usage and ownership, and density of car-sharing stations in areas of the city. All this to produce a comprehensive overview of the car-sharing landscape in Gothenburg. Following Creswell's (2014) framework, qualitative and quantitative findings were cross-referenced to reinforce the validity of conclusions. This study also assumes an inductive approach, meaning that the observations made during the analysis are used to develop broader insights concerning stakeholder actions that could enhance car-sharing initiatives in the city (Bell et al., 2019).

An exploratory-sequential strategy structured the research process (Creswell, 2014). Initial semi-structured interviews with mobility stakeholders provided an introductory understanding of how car-sharing works in Gothenburg. These insights informed subsequent stages of data collection, including targeted literature reviews and additional stakeholder interviews designed to address the first research question. The results gathered from the qualitative and quantitative data collection was then continuously reviewed, to find potential gaps that need to be further explored. This process was repeated until research questions and connected sub-questions were answered.

This further indicates the iterative, inductive nature of the study (Tracy, 2020). With this description, it becomes evident that the target is to achieve saturation during the data collection, related to information on the topics of the research questions. An idea stemming from Charmaz (2006) and her concept of grounded theory, which says that theory is built from the ground-up and that researchers should stop collecting data only when the studied themes do not generate new insights or theories. The research process is visualized in Figure 3.1.

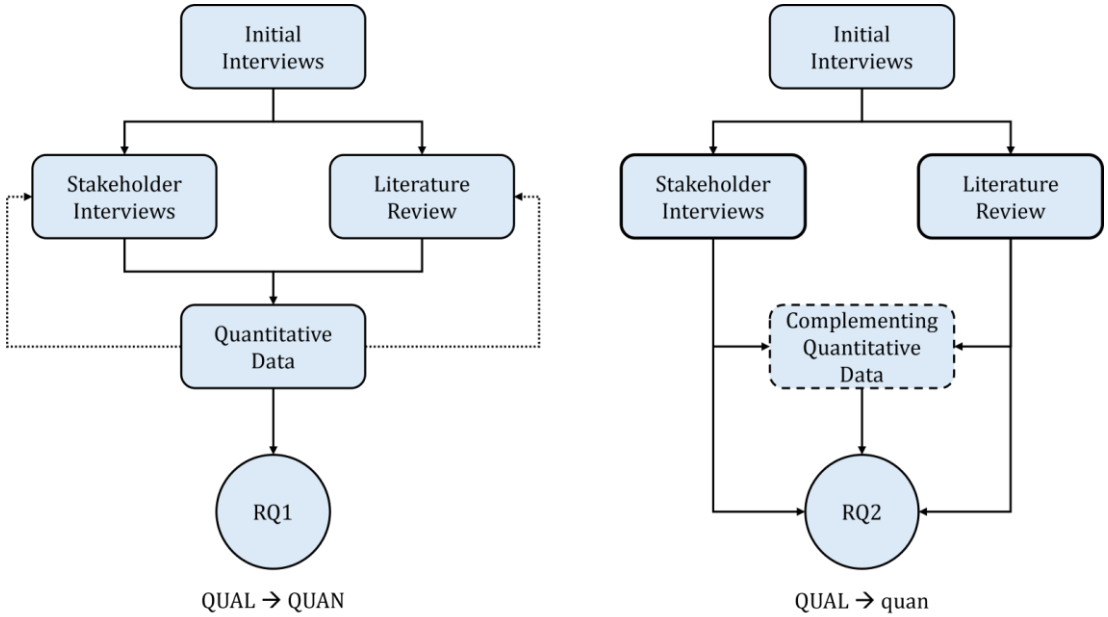

Figure 3.1: Overview of research methods used to answer main research questions.

Regarding the first principal research question of mapping both physical infrastructure and stakeholder networks, the study balanced qualitative and quantitative data, drawing from both sources to get an overview of respective networks. In contrast, the second principal research question on leveraging stakeholders' subjective perspectives to identify objective strategies for unlocking Gothenburg's car-sharing potential, relied mostly on interview data.

One of the study's core tasks was to map the existing car-sharing landscape in Gothenburg, focusing on both the actors involved and the location of open car-sharing stations. To ensure sufficient depth of analysis, the geographical scope was confined to the city limits, and a case study approach was adopted.

The case study methodology proved appropriate for three reasons. First, it enabled in-depth exploration of stakeholder perspectives within a bounded system (Bell et al., 2019). Second, as asserts, a case study facilitates rigorous examination of both micro-level (interactional) and macro-level (societal and cultural) dynamics. Examining these dynamics was essential for understanding the multi-actor car-sharing system and its consumer interactions. Third, using a case for the study permitted the transfer of insights from previous case studies on similar topics (Bell et al., 2019). Something that saved both time and prevented some overlapping research.

3.2 Data Collection Analysis

As shown in the 2.1 section, answering both research questions demands somewhat different approaches. This section intends to present the different methods used in the study, both in the sense of how they were employed, but also how the collected data was analyzed.

3.2.1 Mapping

The mapping task comprised two dimensions, the physical infrastructure and stakeholder networks. The physical dimension primarily includes listing car-sharing stations and locations. The stakeholder network dimension focused on public and private actors, their roles in promoting car-sharing, and the underlying needs for increased user adoption in relation to car-sharing.

For the physical map, two primary data sources were employed. Firstly, publicly available maps and station lists on service providers' websites and mobile applications identified current car-sharing stations. Secondly, stakeholder interviews supplemented this information by revealing past station locations and fleet sizes within the city.

To balance comprehensiveness with clarity, the city was subdivided according to one of the city's own definitions of its urban districts, namely mellanområden (eng: middle areas). This spatial framework made data collection easier and facilitated analysis by allowing station distributions to be compared directly with demographics from the city of Gothenburg's own database, and market information provided by the car-sharing operators.

Mapping the stakeholder network required a different approach. An initial list of relevant actors was generated through internal discussions between the authors and a preliminary literature review. Public records and organizational websites then confirmed their historical and current involvement in Gothenburg's car-sharing landscape. Once an initial pool of stakeholders was identified, purposive interviews were scheduled with representatives from local government departments, municipal companies, private car-sharing providers, and other related organizations (more on this under section 3.2.2). These conversations produced referrals to additional stakeholders, creating a snowball sampling effect that ensured coverage of all key participants in the network.

3.2.2 Interviews

A major component of data collection involved 30-45 minute long semi-structured interviews with Gothenburg's car-sharing stakeholders. This format enabled targeted questioning while preserving flexibility to explore unanticipated themes and not limit the study to the previous knowledge that the authors had in this field (Tracy, 2020). Semi-structured interviewing aligns with the inductive approach by allowing iterative movement between data collection and analysis as new insights emerged Bell et al. (2019), and it discouraged premature closure on preliminary findings. The interview guide that was used for the interviews can be found in Appendix A, with questions and topics prepared and changed ahead of each respective interview.

Interview data were processed through two primary stages. First, interviews were recorded and transcribed wherever permission was granted (see Section 3.3 for consent procedures). In cases where recording was not possible, detailed notes were taken during the conversation. Second, transcripts and notes were subjected to interview coding where emerging topics, keywords, and patterns were assigned color codes and then clustered across interviews. Coding allows for topics, words, and discussions to be grouped across different interviewees which will be of essence in answering the second research question (Bell et al., 2019). The method of coding is also part of the grounded theory strategy, which when combined, results in a structured way of working iteratively and adding new findings to previous ones (Charmaz, 2014).

Three stakeholder categories were initially targeted in municipal authorities, car-sharing operators, and end users. After assessing time constraints and potential informational gain related to the research questions, end users were excluded, and only municipal and operator representatives were interviewed. Each category, however, comprised multiple sub-groups that could not be fully specified in advance.

Initial interviewees were selected through purposive sampling, based on their relevance to the study's aims (Tracy, 2020). Subsequent participants were identified via referrals from earlier interviewees, implementing a snowball sampling strategy. This approach leveraged stakeholder knowledge to efficiently expand the pool of potential interviewees. Table 3.1 outlines the respondents, including which stakeholder category they belong to and their organizational role. This plan evolved throughout the study as new stakeholders were recommended and additional needs were identified.

Table 3.1: List of interview respondents in chronological order of when the interviews were conducted.

Respondent Title	Respondent Position	Type of Actor
Respondent 1	Project manager sustainable mobility	Municipal land development department
Respondent 2	Manager over Gothenburg region	Car-sharing provider
Respondent 3	Business developer mobility	Sustainability consulting
Respondent 4	Sweden manager	Car-sharing provider
Respondent 5	Project manager electromobility	Municipal business development office
Respondent 6	CEO	Former car-sharing provider
Respondent 7	CEO	Car-sharing provider
Respondent 8	Business developer mobility	Car-sharing provider
Respondent 9	Business development manager	Municipal parking company
Respondent 10	Business developer mobility	Municipal real estate company
Respondent 11	Real estate development manager	Municipal real estate company

In the event that an interview was cancelled, efforts were first made to reschedule with the same participant. If rescheduling proved impossible, an alternative individual holding a comparable role within the same organization was recruited. If that also had failed, there was a plan to reach out to professionals in equivalent positions at similar organizations. If all direct replacements had proven unavailable, secondary sources would have been used. These include organizational reports, public statements, and industry papers.

3.2.3 Literature Review

An initial literature review was conducted to establish the broader state of car-sharing research beyond the Gothenburg context. This review clarified the common objectives and methodologies employed in prior studies and revealed a gap that this study aims to fill. Few, if any, investigations had systematically mapped both the physical car-sharing stations and stakeholder networks of car-sharing within a single urban area in Sweden.

Despite this specific gap, several relevant case studies addressed complementary aspects of shared mobility. For example, Svennevik et al. (2021) compared car-sharing systems across cities in different countries, while Styre and Johansson (2024) examined business models for car- and bike-sharing in relation to flexible parking policies. These and similar peer-reviewed articles were analyzed for transferable insights, in line with the guidance of Bell et al. (2019) on adapting findings from similar cases. In addition to scholarly publications, the review incorporated reports issued by municipal and national authorities, as well as articles and web-based materials from key private and non-profit stakeholders.

3.3 Ethical Considerations

The study adhered to Chalmers University of Technology's "Föreskrifter för examensarbeten vid Chalmers" (Chalmers University of Technology, 2024), which informs on ethical standards for master's-level research. All interviews were conducted according to these guidelines and followed the ethical protocols. Prior to each interview, participants had the opportunity of reviewing an informed-consent form detailing the purpose of the study and their right to withdraw at any time from the study. Interviewees were also offered the opportunity to review draft excerpts in which they were quoted. Recordings were made only with explicit permission, when recording was declined, detailed notes were taken. Upon completion of the project, all audio files, recordings, and transcripts were securely deleted to safeguard participant confidentiality.

4. Results

The results are divided into three sections, with the first presenting the different actors in the Gothenburg car-sharing system and their roles. The second focuses on the physical mapping of open car-sharing stations within the city, and how these are divided across the different providers and areas of the city. Lastly, results related to current hinders and thereby future possibilities will be presented both as described by literature and during the conducted interviews.

4.1 Mapping Key Car-sharing Stakeholders in Gothenburg

This study has focused on car-sharing service providers during the interviews along with other actors as mentioned in the methods chapter. All of these actors will be described in this section, as well as areas they are currently working on related to car-sharing. It should be noted that the city of Gothenburg (i.e. the municipality) operates both on the parking market through Göteborg Stads Parkering AB and the real estate market through Förvaltnings AB Framtiden (Framtiden), which are both publicly owned companies. These respective companies and their competitors will be presented under the respective titles in this section. Whilst the city's general roles and initiatives within car-sharing will be presented under the title Local and National Government.

4.1.1 Car-sharing Providers

The providers of car-sharing services hold a key position in making shared mobility with cars possible in a city like Gothenburg. They are the original source to be able to provide users with capital intensive products such as cars in a shared format. At least in the case of companies that have opted for a station-based business model. In the data collection, a variety of car-sharing providers were interviewed, ranging from the largest to smaller ones. Another difference between the actors that were spoken to was that some were currently active on the Gothenburg car-sharing market, whilst others had exited (like Volvo on Demand),s or had never fully launched locally.

At the time of this study, Gothenburg had five operative companies providing open car-sharing stations that can be seen in Table 4.1. The number of stations and in which areas of Gothenburg these were located will be presented more in-depth in Section 4.2. Based on the origin of these and other studied companies in the industry, three categories of providers can be singled out.

Table 4.1: Car-sharing providers that were examined in this study, and where they originate from.

Car-sharing Provider	Operation Status in Gothenburg	Category	Origin
Kinto Share	Active	Car manufacturer	The car-sharing subsidiary of car manufacturer Toyota, focusing solely on open car-sharing stations
OKQ8 Bilpool	Active	Fuel retail (other)	Originally a fuel supplier that aim to use petrol stations as a hub for maintaining surrounding car-sharing stations
Rulla	Active	Car retail (other)	An interest association of Swedish car retailers, whose intention is to grow through adding local retailers to the co-op who operates the local car-sharing stations
Bilpoolen.nu	Active	Mobility	A company focusing on car-sharing, with both open and closed solutions
OurGreenCar	Active	Mobility	Focused on car-sharing, but also provides bike-sharing and other mobility solutions
Volvo on Demand	Not active (ceased operations in January of 2025)	Car manufacturer	A mobility project by car manufacturer Volvo (from Gothenburg) focusing on open car-sharing stations
Hyre	Not active	Mobility	A car-sharing company from Norway that are currently only active in Stockholm on the Swedish market

The first type of car-sharing provider are the ones backed by car manufacturers. In Gothenburg these are represented by Kinto Share, backed by Toyota, and previously also Volvo on Demand. In their case the incentives as to why they are interested in the car-sharing market are quite clear. Car-sharing can be used as a marketing platform as mentioned by multiple respondents. This effect is achieved through increased visibility via physical placement in the city and by

allowing customers to test the vehicles without fully committing to purchasing a car. There is also the aspect of hedging in uncertain times as the one the automotive industry is currently experiencing, with for example new technologies (e.g. electric and/or autonomous vehicles) emerging, and a growing sharing economy (Simonazzi et al., 2020). Where the demand for mobility might change from the traditional private vehicle ownership model. It is also a way for car manufacturers to explore new revenue streams and once again hedge their position towards increased sharing in the mobility sector, whilst the new mobility market is settling (Liu et al., 2022).

Beside car-sharing providers originating from car manufacturers, there are also other singular examples such as OKQ8 and Rulla. Where OKQ8 has its main operation in the fuel retail sector, while Rulla is a joint venture between car retailers (originally in the south of Sweden). *Respondent 8* reasoned about OKQ8's business and that they are managing a large number of properties around Sweden, which gave them the opportunity of diversifying into car-sharing. The main properties in this case are petrol stations, and the ones in context are manned, not self-service. These stations act as hubs for the car-sharing stations in their respective proximity, meaning that the maintenance needed to uphold the car-sharing service is provided by the staff at the already existing petrol stations. Even though car-sharing is not seen as the primary source of revenue for OKQ8, it is a way for them to tap into new revenue streams, without stepping away from their core business.

In the case of the car-sharing service Rulla, a group of car retailers created a joint venture to supply the service within their catchment area. The benefit of this arrangement was explained by *Respondent 2* in that the respective retailer has good knowledge about the customers in their region making sure that they can provide an offering that suits a broader clientele than if they only sold vehicles. In Gothenburg however, Rulla had some issues finding a local retailer wanting to join the venture. In that case the organization made the decision to enter the market anyway, which to some extent goes outside the initial scope of Rulla.

There are also car-sharing companies that have mobility as their main business. In Gothenburg, these are represented by Bilpoolen.nu and OurGreenCar. When looking at the Swedish market, an additional provider falling into this segment can be found in for example Hyre. These companies have a lower degree of diversification than the other provider categories, meaning that they are more dependent on regulations and changes in the market environment related to

car-sharing and shared mobility, than the other service providers are with more diversified business portfolios.

Car-sharing companies operating on the open station market in Gothenburg, but not limited to it, are in general quite similar regarding their characteristics. One area in which they have both similarities and differences are in the price models. Similarities include them having subscription offers, a set fee for each type of vehicle (i.e. compacts, combis, SUVs) per time unit it is used (e.g. hour, day, week), and an additional fee in regards to how many kilometers the user drives during the rented time period. Differences are mostly seen in different provider categories and usually relates to price points, number of subscription alternatives, and whether they offer free kilometers.

To summarize the B2C price models of different providers two tables are presented. Table 4.2 shows the pricing models from two of the provider categories, namely car manufacturers and the 'other' category. Furthermore, Table 4.3 does the same for companies with mobility as their core business. It should be noted that the prices of Hyre's services also are included in Table 4.3, even though they are not currently active in Gothenburg. The reason for this is that it gives an indication of how other markets, such as Stockholm, are priced in comparison, and in which Hyre holds a competitive price point.

Table 4.2: Comparison of cheapest subscription plans for car-sharing services (Kinto Share, OKQ8 Bilpool, and Rulla) as of April 29, 2025. All prices in SEK. Data gathered from providers' websites.

	Kinto Share			**OKQ8 Bilpool**		**Rulla**	
Subscription plans	*Free*	*Light*	*Plus*	*Free*	*Plus*	*Prova*	*Rulla*
Subscription fee (per month)	0	99	499	0	99	0	99
Hourly fee	79	65	49	125	99	130	65
Daily fee	795	695	495	998	829	-	695
3-day fee	1295	1195	995	1316	1089	-	1195
Weekly fee	2995	2795	2395	-	-	-	2595
Cost per km	2,25	2	2	1,5	1,5	4	2
Free km	-	-	-	150 per day[a]	150 per day[a]	-	-

Note. [a]Only applicable on electric vehicles.

Table 4.3: Comparison of cheapest subscription plans for car-sharing services (Bilpoolen.nu, OurGreenCar, and Hyre) as of April 29, 2025. All prices in SEK. Data gathered from providers' websites.

	Bilpoolen.nu			**OurGreenCar**			**Hyre**		
Subscription options	*Pay&Go*	*Light*	*400*	*Small*	*Medium*	*Large*	*Free*	*Plus*	*Premium*
Subscription fee (per month)	0	175	475	0	99	199	0	89	489
Hourly fee	59	32	32	99	79	59	69	59	39
Daily fee	590	448	448	695	495	395	499	399	299
3-day fee	699	649	649	1295	895	695	1189	889	589
Weekly fee	2891	2899	2899	-	-	-	2499	1989	1337
Cost per km	2,25[a]	1[a]	1[a]	1,9	1,9	1,9	2,5	2,5	0
Booking fee	25	25	25	-	-	-	-	-	-
Free km	-	-	400 /month	-	-	-	150 /day	150 /day	∞

Note. [a]Cost per kilometer excludes fuel cost, at the time of this study this cost was an additional 1,22 SEK/km.

As can be seen in Table 4.2 and Table 4.3, all but OKQ8 Bilpool and Rulla offer three different subscription models. *Respondent 2* mentioned that they wanted to keep their price model simple and easy to overview for the user. Which can be seen as a reason to limit the number of options the customers need to consider before using the service. Rulla also has what they call package deals, which is something none of the other providers offer. This allows the customer to load their account with fixed amounts in three stages, and then use these as credits when paying for the normal car-sharing fees. An example of this is that the smallest package charges the customer 849 SEK, but allows for 1,000 SEK of rent within 90 days of the transaction. Effectively these are discounts for preloading your account.

Kinto Share, Bilpoolen.nu, OurGreenCar, and Hyre all have three subscription models. Bilpoolen.nu adds some complexity to their offering by having both a booking fee and an additional fuel cost. This could make it more difficult for users wanting to get an overview of their cheapest option, and how much that would cost.

One reason for the different price points, that was mentioned during the interviews (except for competition within the market), is that the different providers have different cars in their respective fleets. For example, Kinto Share only has Toyota cars since they are backed by the manufacturer, while Rulla mostly has Renault and Volvo cars since they are retailers for those brands. The different car brands differ in prices to some extent, therefore depending on which brand of cars the providers have they need to alter their fees to cover the cost of having a more premium car brand.

Some of the providers also offer free kilometers, either daily or monthly. OKQ8 limits their free kilometers to electric vehicles, while both Bilpoolen.nu and Hyre include this on all types of cars. Hyre are the only ones that have unlimited free kilometers in one of their offerings. However, to be eligible for this the user needs to have the Premium subscription.

Moving on to the business models of providers. When it comes to having a sustainable business model and operating profitably, pricing of the service is of course one key aspect. Another aspect that was mentioned during interviews across all categories of car-sharing providers was that both private and B2B markets were key in achieving profitability when providing car-sharing. One issue with the tradition of every household owning a car, is that cars owned in this

model get utilized sparingly, with cars standing still roughly 95 percent of the time (Bricka et al., 2024). Several respondents said that providers need to aim for both of the mentioned customer segments. If they do so, utilization rates can be increased further than if choosing only one of the two segments. However *Respondent 7* said that reaching both of these segments require different resources, with private households reachable through for example digital marketing, whilst businesses often need to be approached with a complete solution through a sales team.

On the topic of B2B offerings, these differ significantly between providers. *Respondent 7* said that their B2B offering mostly revolved around the management of the client car fleet. Meaning that they supply a complete solution where the buyer receives a car fleet ready to use, without needing to be concerned about for example maintenance or tied-up capital. *Respondent 7,* representing a car-sharing provider, emphasized the potential for cost savings among corporate clients, claiming that their service could reduce expenses by 30 to 50 percent compared to traditional vehicle leasing. They also reported a substantial increase in B2B customers during 2024, suggesting a growing interest in car-sharing solutions within the business sector. Other B2B offerings in the industry are more focused on providing the same solution for companies that they offer to private consumers, i.e. that companies can use cars that are part of the open car-sharing stations.

4.1.2 Local and National Government

The local and national referred to in this work are represented by the city of Gothenburg and the Swedish government. In their role as policy-makers, these institutions play a significant role in creating a market environment that facilitates the diffusion of technologies and concepts such as car-sharing. In Sweden however, the legislative responsibility falls entirely on the national government (Regeringskansliet, 2024). Limiting the impact the local governance can have on such policy creation according to the Kommunallag (SFS 2017:735).With this said, the local government has many key decisions to make in relation to car-sharing, and can to a wide extent influence how attractive a local market is for service providers to enter.

The local government in Gothenburg is currently working on multiple projects encouraging the establishment of multiple car-sharing providers within the city limits. For example, *Respondent 1* explained the so called mobility agreements, which is one of the the main initiatives the city have created to stimulate the organic growth of car-sharing services in the city. The idea behind

the mobility agreement is that real estate developers are able to decrease the number of required parking spaces per built apartment (p-norm) connected to a new real estate project by instead providing other mobility alternatives, such as car-sharing (Göteborg stad, 2018). A measure that can save developers in construction costs related to the needed parking spaces. In Sweden, each municipality has the right to decide the p-norm in a specific area within the municipality (see Figure 4.1), i.e. the required number of parking spaces that the developer has to provide when constructing a new residential building according to the Plan- och bygglag (2010).

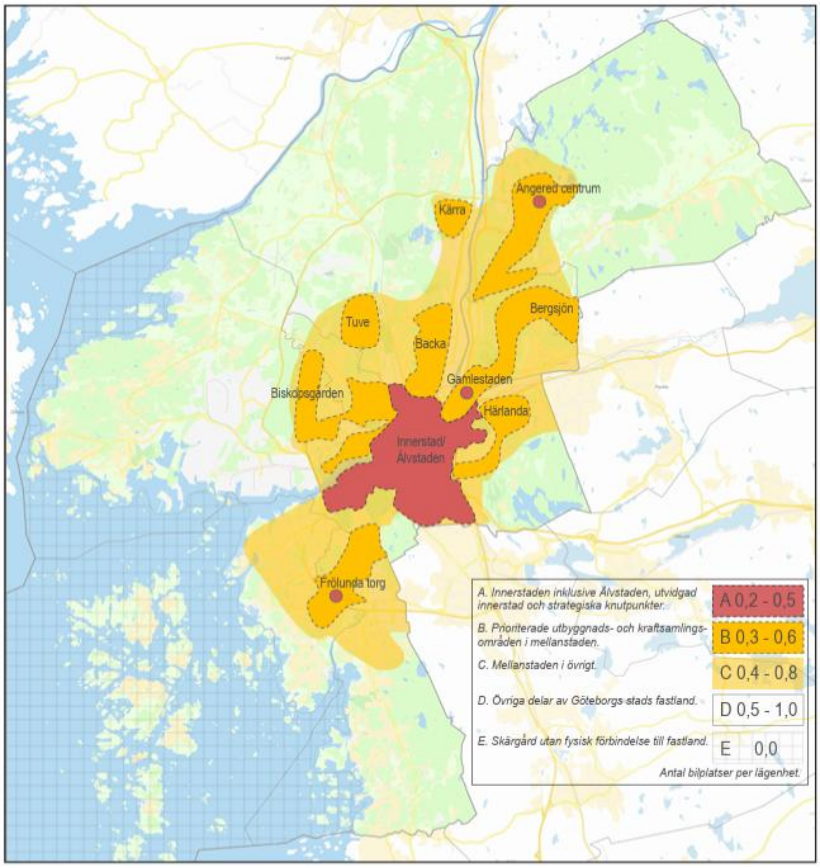

Figure 4.1: Map created by the city of Gothenburg showing the p-norm in different areas of the city (Göteborg stad, 2018).

The city of Gothenburg also takes part in multiple sustainability initiatives. Examples of this are FastForward which is part of the EU's Horizon Europe programme and Move21, a mobility project hosted by the city of Oslo (NetZeroCities, 2025; Move21, 2025). These projects do not solely focus on the concept of car-sharing. However, as a measure to increase sustainability and improve sustainable mobility solutions, car-sharing becomes an inevitable part of projects such as these.

Except for the two previously mentioned initiatives hosted from abroad that the city of Gothenburg takes part in, the city also participates in the nationwide project Drive Sweden. Their ambition is to gather actors and finance innovations related to mobility solutions, which closely relates to car-sharing (Drive Sweden, 2025).

Furthermore, the city also runs its own projects through its real estate companies. A current example of this is Gamlestaden Mobilitet which aims to gather all mobility services in Gamlestaden in one place, and through that make them more available for users (Gamlestaden Mobilitet, 2025). Gamlestaden Mobilitet involves many of the studied actors in this report, including as mentioned real estate owners, but also mobility providers, the city of Gothenburg, and RISE (Gamlestaden Mobilitet, 2025). The goal of the project is to gather and supply easy-to-use mobility solutions for people living in the area.

Aside from projects with clear goals and targets, the city also keeps local actors engaged through initiatives such as car-sharing forums and discussion venues. Even though there is not a clear end goal with these platforms, it creates a meeting point for professionals interested in bettering the conditions for car-sharing within the city. Business Region Gothenburg is one of the main driving actors in these initiatives, and through their networks they are able to further connect public and private organizations.

Respondent 2, who works with one of the city's current providers, gave an account for the reception they received when they notified the city about their interest to establish their service in the city. The city responded by showing the provider attractive locations where stations could be established and explained the dynamics of those locations in regard to everyday city life. According to *Respondent 2* it was evident that the city was both encouraging their entrance into the Gothenburg car-sharing scene, and that they were keen on having a healthy market in regards to competition. Not only providing service to providers already established in the city.

The national government differs significantly from the local government in regards to what their responsibilities are. As mentioned, the national government is the only political body that has rights to create and change laws (Regeringskansliet, 2024). As a result, only the national government can change the current legislation regarding parking, which has become a key issue for other actors working for increased diffusion of car-sharing services. The topic will be further developed in 4.3.1, for now it is sufficient to remember that this becomes an issue related to the

national government. That parking becomes a problem has been described during the interviews with not only all the car-sharing providers, but also the interviewees working for the local government. That goes for all actors in this category, such as municipal departments, parking companies, and real estate companies.

When it comes to taxes, the national government also bears most of the responsibilities related to car-sharing. During the interviews the value-added tax (VAT) issue became a recurring topic, which will be further developed in section 4.3.1. There is however another tax that the local, regional, and national government decided to introduce in 2013, and that is a congestion tax charged when entering the more central areas of Gothenburg (Göteborgs stad, 2014). In the interviews with *Respondents 7* and *8* this topic received some focus, where *Respondent 7* claimed it an issue for car-sharing providers since it becomes a situation of double taxation when the congestion tax is charged on the customer driving the car. In a case like that the fee charged towards the customer becomes subject to the VAT, meaning that the customer gets taxed twice when passing one of the control points. *Respondent 8* saw it somewhat differently, arguing that both car-sharing and the congestion tax have the same objective, limiting traffic in the city center. Meaning that while the situation is a flaw in the regulatory work, the effect is minor for the customer in the end compared to other issues. Also saying that if car-sharing providers are genuinely interested in limiting traffic and decreasing the number of cars within the city, the congestion tax actually achieves similar things.

4.1.3 Parking Companies

Municipal parking companies are typically wholly owned subsidiaries of the local government and operate as public enterprises with a mandate to manage parking infrastructure in the city (Parkering Göteborg, n.d; Stockholm Parkering, n.d; Parkering Malmö, n.d). While they function as independent legal entities, they remain accountable to the municipality, which sets overarching goals and expectations, often tied to urban development, accessibility, and sustainability. These companies are usually self-financed, meaning they generate revenue primarily through user fees such as hourly parking charges, permits, and leasing of parking spaces, rather than relying on municipal tax funding. This model allows municipalities to maintain strategic control over urban space and mobility policies, while the parking company handles the day-to-day operations, maintenance, and development of the parking infrastructure.

Their primary responsibilities include the management and operation of parking infrastructure, such as public parking lots, garages, and on-street parking. In addition to ensuring the availability and accessibility of parking, these companies aim to provide secure, efficient, and user-friendly parking solutions for both private individuals and commercial clients. Beyond operational functions, municipal parking companies increasingly engage in efforts to support sustainable urban development. This includes facilitating the integration of electric vehicle infrastructure, bicycle parking, and increasingly, designating and managing spaces for shared mobility services, including car-sharing.

Respondent 9, representing a municipal parking company, described how they have been actively working with car-sharing services for over a decade by prioritizing access to parking spaces. Specifically, when demand arises, car-sharing providers are placed first in the queue for available spaces at existing facilities, particularly premium spaces, such as near exits or areas with high visibility, which are considered crucial for attracting users. However, due to their status as a municipally owned company, they are not permitted to offer differentiated pricing in the same way that private actors can. Car-sharing companies instead lease parking spaces at standard rates, though efforts are made to ensure that these spaces are located in strategically advantageous and highly visible areas. An interest was also expressed in establishing a standardized sign for car-sharing services, with the aim of increasing public awareness and visibility.

The respondent further noted that while there was previously surplus capacity in centrally located parking facilities, this is no longer the case. Nevertheless, when car-sharing operators request additional spaces they are still given priority in the allocation process, although existing customers are not displaced. This practice aligns with the company's ownership directive, which mandates that the company should be financially self-sustaining while simultaneously promoting sustainable modes of transportation. As the respondent explained, the ideal outcome is to encourage a shift toward more sustainable urban mobility, even if it involves a degree of cannibalization of their own traditional parking business. Finally, the respondent emphasized that their work extends beyond their own 27 facilities, encompassing collaboration with other municipal actors to prioritize car-sharing across the entire city's parking infrastructure, not solely within their directly managed properties.

4.1.4 Real Estate Companies

The real estate companies focused on in this study are primarily the ones owned by the municipality. In Gothenburg the municipality's real estate group is called Framtiden and includes real estate companies such as Poseidon, Bostadsbolaget, and Familjebostäder. The group manages over 75,000 apartments in the city, making them a major player on the real estate market in the city. In the context of car-sharing they also take part in multiple forums within the city to improve the conditions surrounding car-sharing. With one concrete example of their contribution being the mobility map that Poseidon has developed, gathering all car-sharing stations within the city (Poseidon, 2025).

Both *Respondent 10* and *11* described how they formulate concrete targets aimed at improving access to sustainable mobility options within residential areas. These efforts reflect a broader ambition to integrate car-sharing and other shared transport services into the everyday lives of residents. One example comes from a real estate company, as described by *Respondent 10,* that has set an explicit goal to, by 2030, ensure that all its housing developments provide access to a set of mobility services within a 400 meter radius. This includes secure bicycle parking with individually assigned spaces, availability of cargo bike pools, and access to both car-sharing and bike sharing services.

In addition to promoting shared mobility, the company is also working to strengthen the role of public transport by improving its visibility and accessibility. This includes installing real-time digital displays that show departure times for nearby public transport lines and designing attractive, walkable routes from residential buildings to transit hubs. *Respondent 10,* just as *Respondent 9,* also expressed a clear interest in the development of standardized car-sharing signs, preferably by the City of Gothenburg, to increase visibility and strengthen the legitimacy of car-sharing in the urban environment.

In the case of the previously mentioned mobility agreements, the real estate companies become the second party of these arrangements. Where these agreements is an offer the local government gives to real estate companies to decrease the number of parking spaces the latter needs to build, it is up to each real estate developer to sign contracts with mobility partners to fulfill the terms and conditions included in the mobility agreements. *Respondent 10* even gave an account that the city owned real estate companies took part in developing and shaping these

agreements. The partnerships between real estate companies and car-sharing providers are established through framework agreements. These agreements define the overarching terms of collaboration without committing to immediate implementation. When a new residential or commercial property is developed and car-sharing is to be included, the real estate company initiates a specific request under the existing framework agreement.

4.2 Mapping of Gothenburg Car-sharing Stations and Relevant Areas

Mobility mappings have been mentioned in multiple interviews as a way of increasing the accessibility for users, both new and experienced. In Gothenburg the only comprehensive work conducted in this field is made by one of the city's own real estate companies, namely Poseidon as mentioned above (Poseidon, 2025). On their website they offer a map open to everyone where users can see mobility services such as open car-sharing stations, bike-sharing stations, and bike pumps. According to *Respondent 10*, who personally worked with creating the mobility map, the aim of mapping mobility solutions was to show their residents where they could easily find mobility services. The interview also revealed that the city of Gothenburg recognized the value of such a map and is considering hosting it on their official website to broaden its reach. The only issue is that municipalities must avoid any appearance of endorsing specific private companies, also according to *Respondent 10*.

The mapping conducted in this study offers other dimensions, it uses the city's own area distribution, specifically middle areas to show the density of open car-sharing stations in said areas. This way of dividing the municipality of Gothenburg into smaller sub-areas is made by the city themselves, and cannot be found in for example national statistics (Göteborg stad, 2025g). It is the second largest zoning measure in Gothenburg after the larger city areas.

The city contains four Stadsområden, 'Nordost' (eng: north east), 'Centrum' (eng: center/central), 'Sydväst' (eng: south west), and Hisingen. In total these city zones consist of 36 mellanområden, where names of the areas and their respective city areas can be seen in Appendix B. Across the 36 middle areas a total of 149 open car-sharing stations were found when searching all the providing companies' websites and mobile apps, meaning that these were the ones available to customers as of 2025-02-28 when the last collection of data in relation to this occurred. In the duration of the data collection, it was however recorded that changes in the total number of stations frequently changed, due to actors primarily opening, but also closing

stations sporadically. Table 4.4 provides the number of stations from every operational service provider in Gothenburg and in each of the respective middle areas, but disregards areas with zero stations as of the date mentioned previously.

As can be seen in Table 4.4 the largest service provider is Kinto Share with this way of measuring. Kinto Share provides 78% of the open stations in Gothenburg with Bilpoolen.nu being the second largest with 10% of the stations. There is a significant difference in the size of the city's number one and two providers of car-sharing services currently. However, this changed just before this study was initiated when one of the city's largest service providers, namely Volvo on Demand, shut down their services completely (Volvo Cars, 2024). Before the closure of their operations Volvo on Demand had between 300-400 vehicles in Gothenburg depending on the season according to *Respondent 6.* Kinto Share had, in comparison, 353 vehicles at the time of the data collection according to *Respondent 4*.

In the vacuum that emerged in the wake of Volvo on Demand's exit, which was described in multiple interviews with competitors. *Respondents 2* and *4* recognized some positives in their perspective as competitors, meaning that the loss of the largest competitor gave them the opportunity to expand and take over areas in which Volvo on Demand previously operated. However, the respondents also saw Volvo on Demand as one of the main drivers behind the development of the car-sharing industry, both in Sweden and locally in Gothenburg. Creating not only a physical vacuum but also a vacuum in development and industry drive.

Table 4.4: Number of open car-sharing stations by Mellanområde and service-provider as of 2025-02-28.

Stadsområde (eng: city area)	Mellanområde (eng: middle area)	Kinto Share	OKQ8 Bilpool	Bilpoolen.nu	OurGreenCar	Rulla
1 Nordost	12 Gamlestaden-Utby	5	0	0	0	0
1 Nordost	13 Kortedala	1	0	0	0	0
1 Nordost	15 Centrala Angered	1	0	0	0	0
2 Centrum	30 Kålltorp-Torpa-Björkekärr	4	2	0	0	0
2 Centrum	31 Kallebäck-Skår-Kärralund	5	0	0	0	0
2 Centrum	32 Krokslätt-Johanneberg	10	1	3	0	0
2 Centrum	33 Guldheden-Landala	5	1	0	1	0
2 Centrum	34 Olivedal-Haga-Annedal-Änggården	9	0	1	0	2
2 Centrum	35 Kungsladugård-Sanna	7	1	0	0	0
2 Centrum	36 Majorna-Stigberget-Masthugget	11	0	1	0	0
2 Centrum	37 Norra Centrum	21	2	7	0	2
2 Centrum	38 Lunden-Härlanda-Överås	5	0	0	0	0
2 Centrum	39 Olskroken-Redbergslid-Bagaregården	3	0	0	0	0
3 Sydväst	50 Stora Högsbo	7	0	0	0	0
3 Sydväst	51 Askim-Hovås	0	1	0	0	0
3 Sydväst	55 Centrala Tynnered	0	0	0	1	0
3 Sydväst	56 Frölunda Torg-Tofta	2	1	0	0	0
3 Sydväst	57 Älvsborg	1	0	1	0	0
4 Hisingen	71 Backa	3	0	0	0	0
4 Hisingen	72 Kvillebäcken	6	0	0	0	1
4 Hisingen	73 Kyrkbyn-Rambergsstaden	3	0	0	0	0
4 Hisingen	74 Norra Älvstranden	5	1	1	0	0
4 Hisingen	75 Södra Torslanda	1	0	1	0	0
4 Hisingen	78 Kärradalen-Slättadamm	1	0	0	0	0
4 Hisingen	79 Östra Biskopsgården	0	1	0	0	0
	Total	**116**	**11**	**15**	**2**	**5**

The findings also show a consolidation of stations near the city center. Using the broader zoning measure of ‘city area’, Centrum holds 104 car-sharing stations. Which makes up roughly 70% of the car-sharing stations in the city. While the area with the second highest number of stations is Hisingen with only 24, or 16% of the city’s total stations. The last two city areas being Sydväst and Nordost hold 14 and 7 stations respectively.

With middle areas, a more detailed picture can be drawn. Among the top five areas with the most stations in the city, all five lie in Centrum. These areas have a total number of stations ranging from 8-32 stations, with Norra Centrum having most of them. Norra Centrum is a key junction for the people of the city. Not only does it connect the different city areas with public transport, it also inhibits the city’s train station which links Gothenburg to other cities and towns in the region. Aside from transportation infrastructure, Norra Centrum is also the home of offices, restaurants, and one of the city center's largest shopping centers in Nordstan. It should be noted that the area is also the fourth most populated middle area in Gothenburg, indicating that people reside in the area as well (Göteborg stad, 2025c).

The rest of the top five areas (the four areas marked in medium green in Figure 4.2) are also well populated, and contain a higher number of households than the city average. Something that eight of the nine middle areas with the most car-sharing stations have in common, with the only exception being Kvillebäcken. These same areas also have a higher density of both stations and households than the city has on average. Meaning that stations located in these areas have a higher possibility of lying close to a large number of households than in other middle areas of the city. Increasing the opportunity of decreasing people’s average distance to car-sharing stations. For more detailed statistics on these topics see Table 4.5.

When it comes to the average income of residents in an area only four areas, of the same nine as before, have an average income that exceeds the city average. Meanwhile, a higher share of people in these areas have post-secondary degrees, indicating that the average education level of people in areas with the most car-sharing stations is higher than the mean in Gothenburg. These numbers, as well as the number of cars owned per person in the nine areas with the highest number of car-sharing stations, can also be seen in Table 4.5 below.

Table 4.5: Data on total number of car-sharing stations, households, station density, average yearly income, educational level, and car ownership in the middle areas with the most open car-sharing stations in the city.

Mellanområde (eng: middle area)	**Number of car-sharing stations**	**Stations per km² of land**	**Number of households**	**Number of households per km² of land**	**Average yearly income[a]**	**% with post secondary education[b]**	**Cars owned per person**
37 Norra Centrum	32	6.05	14,894	2,815	452,401	61.7	0.22
32 Krokslätt-Johanneberg	14	5.65	15,797	6,370	341,363	71.7	0.19
34 Olivedal-Haga-Annedal-Änggården	12	2.07	11,547	1,987	443,786	67.4	0.22
36 Majorna-Stigberget-Masthugget	12	5.33	17,390	7,729	376,348	65.8	0.22
35 Kungsladugård-Sanna	8	2.9	8,684	3,146	341,387	64.2	0.22
33 Guldheden-Landala	7	4.19	9,372	5,612	354,183	68.5	0.21
50 Stora Högsbo	7	0.96	16,695	2,293	340,434	56.4	0.25
72 Kvillebäcken	7	2.03	7,484	2,176	354,171	55.3	0.20
74 Norra Älvstranden	7	2.37	8,885	3,012	448,310	63.3	0.27
Gothenburg average	-	**0.33**	**8,215**	**660**	**374,219**	**52.9**	**0.27**

Note. Data gathered from the city of Gothenburg's statistics database (Göteborg stad, 2025a, 2025b, 2025c, 2025d, 2025e, 2025f) and Service providers' websites.

[a]Average yearly income for individuals over the age of 18.

[b]Percentage of people between the ages of 18-74 that hold a post-secondary education.

Outside of the top five areas with the most car-sharing stations there are four contender areas tied in sixth, with seven stations respectively (marked with light green in Figure 4.2). These four are geographically connected to the top five areas, meaning that all nine of the areas with the most number of stations are located in close proximity to the city center. On the other side of things, there are eleven areas without any open car-sharing stations as of the time of this

study. These eleven areas have in common that they are located towards the outskirts of the city area. Meaning that the general pattern is that the number of car-sharing stations in a given area decreases when you travel outwards from the city center. To get a better picture of the respective areas and the occurrence of car-sharing stations see Figure 4.2 below.

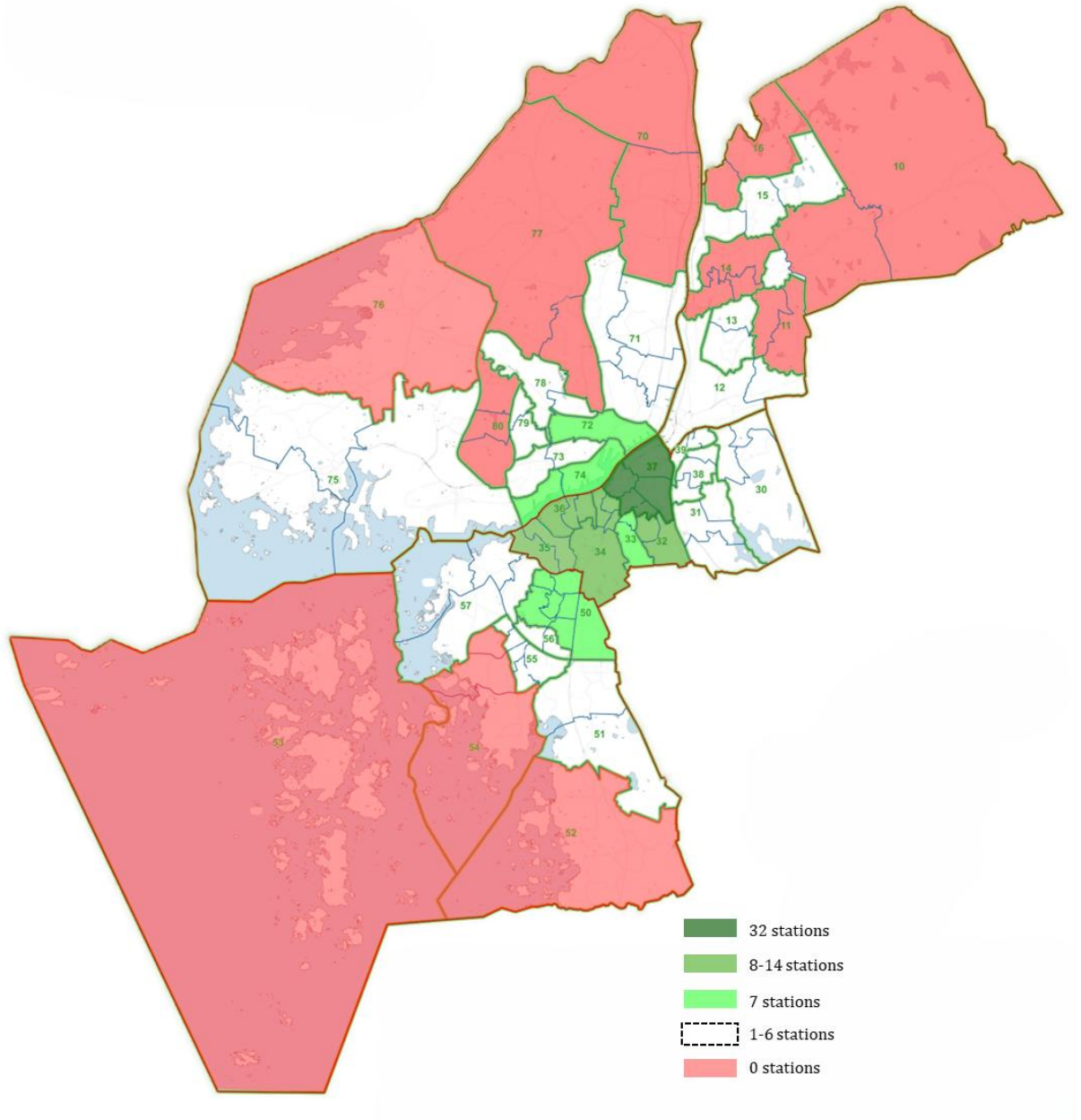

Figure 4.2: Based on Gothenburg city's map over Mellanområden, with colors indicating the presence of open car-sharing stations in each area respectively.

4.3 Main Challenges for Car-sharing

Based on the empirical findings from interviews with key stakeholders, several recurring challenges were identified that hinder the broader development and adoption of car sharing in Gothenburg. Among these, two themes were particularly prominent across different types of actors: first, regulatory and legal barriers, and second, behavioral and cultural factors tied to established norms of private car ownership. The following sections present these challenges in more detail, drawing on insights from the respondents to illustrate how they manifest in practice.

4.3.1 Taxation and Parking Legislation

A recurring theme across the interviews was that multiple respondents, representing various types of actors, expressed a perceived lack of action from the national government regarding car-sharing. Particularly in terms of implementing meaningful policy changes to support its growth. Several respondents pointed to specific regulatory issues, such as tax policy and parking legislation, that have been recognized for years but where no significant progress has been made, reinforcing the perception of inertia at the national level.

A review of recent developments shows that several Swedish government public inquiries have, in different ways, addressed the topic of car-sharing. One such inquiry, titled Motorfordonspooler (SOU 2020:22), conducted in 2020, focused on establishing a legal definition of car-sharing, exploring strategies to promote shared mobility, and assessing whether a reduced VAT rate would be appropriate in this context (Finansdepartementet, 2020). However, since the results of the state public inquiry were sent out for referrals with relevant authorities and municipalities in 2021, not much has happened. This is despite some legislation being outdated, and when it comes to parking, sometimes even contradicting (Romson, 2025). However, even though there might be a lack of significant changes on a national level, the local government can often do more in parking related questions than they might anticipate, due to room for interpretations in the legislation (Romson, 2025).

The taxation structure applied to car-sharing services in Sweden, which was brought up by several respondents, is seen as a non-primary structural barrier to profitability and growth. Currently, car-sharing services are subject to a 25% VAT, which is significantly higher than the 6% VAT applied to other mobility services (Skatteverket, n.d.) such as public transport, taxis,

limousines, and even helicopters. The primary factor determining the applicable VAT rate is whether the service constitutes passenger transport, in which case a reduced rate of 6% applies (Skatteverket, n.d.).

A key underlying issue is that car-sharing is not formally defined as a distinct category within current Swedish legislation, particularly in relation to transport and taxation law. As a result, car-sharing services are not legally recognized as mobility services. Instead, car-sharing is interpreted as a vehicle rental service, primarily because the user operates the vehicle independently without a professional driver. This classification subjects car-sharing to the standard VAT rate of 25%. Multiple respondents, in different actor categories, highlighted this discrepancy as a regulatory inconsistency that places car-sharing operators at a competitive disadvantage.

However, not all respondents were optimistic about the prospects for a regulatory change in the taxation structure in the near future. *Respondent 8* pointed out that VAT-related issues are extremely difficult to influence or bring about change in, reinforced by the fact that traditional car rental services, a sector that has existed for decades, still are affected by the same VAT-regulations. From this perspective, the persistence of the higher VAT rate is seen as indicative of a policy inertia that is unlikely to shift in the short term. Consequently, some respondents viewed the tax issue as a structural constraint that operators must work around, rather than a decisive factor that determines business viability.

Overall, while the VAT issue is not viewed as a singular barrier to the development of car-sharing in Gothenburg, it is understood as a relevant policy lever that, if adjusted, could meaningfully contribute to the economic sustainability and affordability of car-sharing as part of the city's broader mobility ecosystem.

As mentioned in the beginning of this section, another theme raised by all respondents concerned the outdated parking legislation in Sweden. Which poses a barrier to the expansion of car-sharing services currently. At present, municipalities are not permitted to allocate public street space specifically for car-sharing vehicles, as the legal framework lacks the provisions necessary for such designations. This limitation stems in part from the absence of a formal legal definition of car-sharing as a mobility service, which prevents service providers from applying for residential parking permits or securing dedicated on-street parking. As a result, operators

are often forced to rely on private garages or commercial parking facilities, which are typically more expensive, particularly in dense urban areas.

This regulatory ambiguity also limits the ability of car-sharing providers to secure high-visibility parking spaces in strategic locations. Such spots, often situated in areas of high foot traffic, are considered essential by several respondents for attracting new users, as vehicle visibility in public space functions as both a marketing tool and a point of entry into the service. By restricting access to these spaces, the current legal framework reduces both the availability and accessibility of car-sharing services, ultimately undermining their potential contribution to sustainable urban mobility.

Respondent 7 further emphasized that car-sharing is treated less favorably in Sweden compared to neighboring countries such as Norway and Denmark, especially in terms of parking policy. While these countries have adopted supportive regulatory frameworks and granted exemptions grounded in research demonstrating the positive externalities of car-sharing, Sweden has yet to integrate similar recognition into its legal and policy framework. The ability to allocate public land and on-street parking for car-sharing in Denmark and Norway was highlighted as a key enabling factor in the growth of such services.

In relation to the costs linked with private ownership of cars for individuals, there are complications when this type of mobility is subsidized according to multiple respondents. Resident parking in Gothenburg is currently subsidized by both the local government and other members of the individual's homeowners' association. This means that car owners utilizing resident parking do not have to pay the full amount that the used parking space carries in construction and maintenance costs. Furthermore, in the case when the city subsidizes resident parking, there is a maximum rate for residents needing to park in their residential area. The difference between this maximum rate and the market price (including all connected costs) of that parking space, is the subsidy the city offers.

Additionally, multiple respondents noted that Sweden's current legal restrictions significantly increase the operational costs for car-sharing providers in relation to other geographical venues in close proximity. In Denmark, for instance, providers may pay as little as 200 DKK (equal to roughly 292 SEK at the time of this study) per year for a dedicated parking space on public land. In contrast, respondents reported that in Sweden, monthly parking costs can reach up to

8,000 SEK, especially in central locations. This financial disparity, driven by regulatory differences, was seen as a substantial obstacle to achieving a viable and scalable business model.

4.3.2 Behavioral Change

One frequently mentioned challenge in the interviews regarding the diffusion of car-sharing was the need for behavioral change among potential users. Our society is in some ways shaped around having access to a car, especially when living outside of the city centers. Aspects of life in which car access comes into play includes going grocery shopping, driving children to activities, or making a weekend trip to visit relatives. Which can make it more difficult when deciding to give up on owning a car, even though it might seem beneficial both economically and environmentally.

An initial problem that the interviewed actors mostly agreed upon was that there is a lack of knowledge among individuals about car-sharing. Issues related to this include people not knowing what car-sharing entails and that they commonly have car-sharing stations more closely located to their urban residencies than they know of.

One way of dealing with this, which all providers mentioned, was increasing the visibility of car-sharing cars in the urban setting. Having access to street parking where cars are visible, rather than having to place stations in parking garages would alleviate this issue by simply allowing people to see the cars more frequently. Which would not only increase the usability of the service, but also encourage curiosity to find out more about car-sharing themselves. Furthermore, *Respondent 7* highlighted two primary ways in which new users are typically introduced to car-sharing services. The first is through personal recommendations from friends or colleagues, which serve to build trust and reduce uncertainty about the service. The second is by encountering car-sharing vehicles in the urban environment, where their physical presence functions as both a form of advertising and a signal of accessibility. According to the respondent, visibility in public space plays a key role in encouraging first-time use.

One problem with this idea is that street parking, as mentioned previously, is not currently allowed by the Swedish parking legislation. However, to exemplify which effects this can have on people's knowledge of existing services, *Respondent 7* referred to a market study their company had conducted in Stockholm, Copenhagen, and Oslo. In which the latter two allows

for street parking of car-sharing cars. In Stockholm 67 percent knew of any car-sharing services, while the number was 86 and 87 percent for Copenhagen and Oslo respectively. Even though this only works as an indication of the importance of education on car-sharing, it shows that a first step can be by people simply learning about the existence of the services.

When individuals know of car-sharing as a mobility option, there are multiple ways of encouraging the needed behavioral change. Hou et al. (2025) made a study on which service factors users saw as most important in relation to car-sharing, with many of them also being mentioned during the actor interviews conducted in this study. These include having high availability and accessibility of car-sharing cars, ease-of-use regarding mobile apps as an example, and having a competitive price point relative to owning a car. Furthermore, several respondents mentioned that they are currently taking part in a research study regarding behavior conducted by Nordic Behavior Group and RISE.

When it comes to availability and accessibility of cars, as well as reliability of the service, all of the interviews with car-sharing providers brought up this as key aspects for users. *Respondent 4* exemplified this by saying that not having access to a car when you need one is like having a car that only works nine times out of ten. Which can create frustration among users and decrease trust in the service. It becomes important both as a barrier when individuals consider car-sharing as a mobility option and in retaining users that are using the service.

The same interviewee also brought up the concept of having a 'critical mass' in regards to the number of car-sharing cars needed within a city for car-sharing to be an actual option for people. Meaning that cars need to be placed out in communities first for people to consider car-sharing as an option for their mobility. *Respondent 2* provided a different view on the matter, saying that you cannot distribute car-sharing cars without knowing you have customers in a certain area that will actually use them. These views highlight that while different providers agree on the overarching issue of establishing a reliable service for customers, different approaches are applied in how to get there while still maintaining a sustainable business model.

Regarding the pricing of car-sharing services, which according to the interviews and Hou et al. (2025) is one of the key aspects for users considering car-sharing. Multiple perspectives have been uncovered during the discussion with our respondents. First off, an underlying problem hindering the change from owning to sharing cars is that it is difficult for individuals to get an

overview of all the costs connected to owning the vehicles. This issue of visibility of costs is a problem in the sense of knowing how much the average monthly expenditure of owning a car actually is. Counting in everything from fuel/electricity and maintenance to devaluation over the years the vehicle is owned. *Respondent 6* mentioned that educating people in this matter could help in dealing with this issue, which they had tried through marketing, but had not fully succeeded in. In line with this, *Respondent 7* provided a market study that their company had conducted, where the average person underappreciated the monthly cost of owning a car by over 50%. Creating a significant discrepancy between perceived and actual costs that can skew the decision making of individuals.

Another reason why car-sharing might seem more expensive than it actually is for a traditional car owner considering selling their car(s), are the definitional differences between concepts such as fixed and variable costs. *Respondent 7* said during the interview that one reason why people might hesitate from using car-sharing is that the variable cost per time you use a shared car is higher than if you own the car you are using. Which can make it seem like the general cost is higher even though that might not be the case. Litman (2000) focused on the variable costs in his evaluation on car-sharing benefits in the early 2000s, which can still be applied today. He writes that because car-sharing offers lower fixed costs and instead higher variable costs, car-sharing becomes an affordable option when the user only has the needs for a vehicle occasionally. He further develops this into an incentive for people opting out of owning a car to choose other mobility options, such as public transport, instead.

5. Discussion of Results

5.1 Discussion of Physical Mapping

For potential users of car-sharing services, maps of mobility services can help with getting an overview of which services they can access in close proximity to locations such as their residencies or workplaces. Since the mapping of stations in this study focused on somewhat different objectives, it might not serve as the most user-friendly map for users of car-sharing services. Instead, the aim of the mapping conducted in this study was to see if any conclusions could be drawn from the dispersion of stations in the city, based on the theory introduced above.

First off, when promoting new technologies or regimes, lowering the entry barriers for adopters is a key activity for stakeholders that want to increase the diffusion of a system like car-sharing. The mapping conducted by the municipal real estate developer Poseidon was developed with this purpose. If made more accessible for users, for example by including the map in an app that gathers mobility services, or by promoting it on the city's website, it can help in educating people on the existence of car-sharing stations in their neighborhoods.

In summary, a mobility map such as the one developed by Poseidon increases the visibility of car-sharing services, without having to change in taxation policies or legislations. It also allows for an improvement in regard to the ease-of-use of car-sharing services, if it is combined with easy access to the services shown on the map. Therefore, it can be encouraged to further continue the development of the mobility map and complementary services, with having real-time data being one of the key improvements to make to the utility of the map.

The mapping conducted in this study provides further proof that car-sharing works best as a mobility solution when combined with other transport systems such as public transport and biking. As this study's mapping shows, areas of the city in which car-sharing stations are the most frequent and long-lived, are more centrally located. These areas are also the ones with the best public transport connections and the most developed bicycle paths in general. Meaning that the opportunities of using buses, trams, trains, and bikes as everyday transportation methods are more convenient in these central areas. The low car ownership numbers of the central areas, with none of the most central areas exceeding the city's average for private cars

per person, provides evidence of the existence of efficient transportation alternatives to privately owned cars.

If the results of the mapping is further compared with the theory by Rogers (2003) on adopter categories, this study suggests that there could be a connection between the education level of individuals in an area and the success of establishing car-sharing stations in those areas. All of the nine middle areas with the highest number of car-sharing stations exceed the average education rate in the city, with quite a broad margin. Rogers (2003) says that so called 'innovators' and 'early adopters' in general have a higher level of education than later adopters, which this study seemingly aligns with. Rogers (2003) also suggests that income levels of the early adopter categories in general are higher than for later adopters. Regarding this claim, the conducted mapping gives an ambiguous answer. Since only four of the nine middle areas with the most car-sharing stations have an average income level that is higher than the city's average.

5.2 Transition and Diffusion of Car-sharing

The diffusion of car-sharing as a mobility solution in Gothenburg reflects many of the core challenges identified by Markard et al. (2020) in relation to sustainability transitions. These include, as previously outlined, the need for whole system change, the interaction between multiple socio-technical systems, resistance from incumbents, the role of consumers, and governance complexity. The following analysis outlines how each of these challenges manifests in the case of car-sharing in Gothenburg.

5.2.1 Whole System Change and Multimodal Mobility Solution

In the case of car-sharing, both in Gothenburg and more broadly, a fundamental challenge lies in the need for whole system change, which entails transforming not only the car-sharing service itself but the wider socio-technical mobility system in which it operates. In relation to this challenge, Markard et al. (2020) highlights the need for development of complementary interactions between multiple systems, and insights from the conducted interviews indicate a shared understanding among all actors that car-sharing is not intended to serve as a one-to-one replacement for private vehicle ownership. Instead, it is envisioned as one component within a broader multimodal mobility solution, alongside services such as public transportation, bike-sharing, and micro-mobility options like electric scooters. Collectively, these services are expected to replicate the flexibility and accessibility traditionally associated with private car

use, while offering benefits in terms of lower costs, reduced congestion, and less environmental impact.

Consequently, the transition of car-sharing is not solely dependent on the diffusion and advancement of the service itself. Its success is closely interlinked with the effectiveness, reliability, and integration of complementary mobility systems, particularly public transportation, as described by Huwer (2004). To offer a viable and attractive alternative to private car ownership, the parallel development and coordination of these systems is essential. Accordingly, policy efforts during the acceleration phase should focus not only on promoting individual innovations, but also on enabling broader systemic transformation (Markard et al., 2020). Without such systemic alignment, car-sharing is likely to remain a niche solution favourable only to a small number of users, lacking the capacity to appeal to the broader public and effectively challenge the prevailing system of private vehicle ownership.

In the context of Gothenburg, respondents from both municipal agencies and real estate companies emphasized the importance of ensuring resident access to a range of mobility services within a defined proximity. Several actors had established explicit targets aimed at enhancing local mobility ecosystems. Such as the examples mentioned in 4.1.4 in relation to proximity, availability, and attractiveness of using shared mobility services and public transport

Additionally, initiatives such as Gamlestaden Mobilitet aim to integrate various mobility services into a unified and easily accessible package for local residents. By doing so, multiple mobility systems are simultaneously supported, reducing the risk of system-level bottlenecks that may arise if one component lags in development. Looking ahead, similar initiatives at the niche level can serve as important testbeds for innovation and collaboration, with the potential to scale and inform broader, city-wide integration of mobility services. Achieving such integration is essential for enabling the whole system transformation of Gothenburg's socio-technical transportation system. Policymaking should therefore remain attentive to the interdependencies between mobility solutions, ensuring balanced development so that no component falls behind. These considerations are particularly important for the diffusion of car-sharing, as its success is closely tied to the strength of the overall mobility ecosystem. Coordinated efforts are necessary to increase adoption and reduce private car ownership, thereby realizing the environmental and spatial benefits associated with shared mobility services.

5.2.2 System Interaction

While system interaction is presented by Markard et al. (2020) as a potentially significant acceleration challenge in sustainability transitions, often involving competition for shared resources or conflicting institutional logics, this dynamic appears less pronounced in the case of car-sharing as a specific technology. One form of competition that does emerge involves the allocation of urban space, particularly parking areas, between car-sharing providers and actors within the housing system, such as real estate developers and parking companies. However, rather than creating conflict, these interactions seem to result in strategic cooperation. Car-sharing providers are often granted access to operate within the parking facilities of residential buildings through mobility agreements. These arrangements are typically initiated by real estate firms to fulfill planning requirements or enable increased housing density by offering shared mobility services in place of conventional parking.

In a similar way, municipal parking companies, operating under policy goals that support sustainable transport, often prioritize access to visible and well-placed parking spots for car-sharing providers. Therefore, while spatial allocation remains an important consideration, the interaction between the transportation and housing systems in Gothenburg appears to be defined more by coordination and mutual benefit than by systemic tension or competition.

5.2.3 Incumbent Inertia

In the case of car-sharing, resistance from incumbent actors appears limited, especially when compared to transitions that involve the replacement of core technologies. Car-sharing does not seek to replace the automobile itself, but rather challenges the existing norm of private ownership by promoting access-based usage models. As such, it redefines the relationship between individuals and vehicles rather than the technology of the vehicle itself. This distinction helps explain why traditional automobile manufacturers have shown relatively low resistance and, in some cases, have actively embraced the shift. Several incumbents have launched their own car-sharing services, such as Toyota's Kinto Share and Volvo's former Volvo On Demand, demonstrating a willingness to adapt. This engagement likely stems from an understanding that a large-scale shift toward shared mobility could reduce total vehicle sales, thereby requiring manufacturers to explore alternative revenue models. Offering vehicles as a service represents one such strategy to capture value in a future with potentially lower demand for private ownership.

Another incumbent actor that could theoretically face reduced revenue in a transition away from privately owned vehicles is the municipal parking company. These companies generate income from individual car users who pay for parking, and a decline in private car ownership could lead to decreased demand for such services. However, as these entities are publicly owned, their objectives extend beyond profit maximization. They are also mandated to support the municipality's broader sustainability goals as mentioned by *respondent 9*. As a result, they play an active role in facilitating car-sharing by, for example, offering visible and strategically located parking spaces within their facilities. Given their alignment with public policy objectives, municipal parking companies are unlikely to pose significant resistance to the transition toward shared mobility.

Moreover, incumbent mobility providers such as public transport systems are not positioned as competitors in this transition, but rather as complementary components within a broader, integrated mobility ecosystem. The role of car-sharing is not to displace public transit, but to fill in the gaps it cannot efficiently cover, thereby increasing overall system flexibility and reducing dependence on private cars. In this sense, the primary regime being challenged is not the automobile or traditional mobility providers per se, but the deeply embedded norm of private car ownership. It is this socio-technical arrangement, i.e., linking car use to personal ownership, that car-sharing seeks to disrupt.

5.2.4 Consumer Behavior and Social Practices

The results indicate that the challenge associated with consumer behavior and social practices surrounding private car ownership is significant for the development of car-sharing. This is closely connected to the same reasoning behind why resistance from incumbent actors is expected to be limited. Since car-sharing does not seek to replace the car as a technology, but rather redefines how individuals interact with and access vehicles, the shift primarily affects patterns of use and cultural norms around car ownership. As a result, overcoming deeply embedded habits and expectations among users becomes a central barrier to wider adoption.

Furthermore, behavioral change and social norms connected to car-sharing and multimodal transportation are particularly difficult to stimulate or influence, as noted by Markard et al. (2020). Given the behavioral challenges associated with shifting away from private car ownership, several actors in Gothenburg are working to increase the visibility and ease of using

shared mobility services. As highlighted in the results, real estate developers and municipal actors are pursuing measures that integrate car-sharing and other mobility solutions into the everyday environment of residents.

These efforts include ensuring proximity to shared mobility services, improving access to real-time travel information, promoting bundled mobility options, and making the existing service offerings more visible through accessible mobility maps. While these initiatives vary in form, they share the common goal of making shared mobility a natural and convenient part of daily life. By lowering the cognitive and practical barriers to use, such efforts aim to gradually reshape social norms and user behavior, thereby supporting the broader transition away from private car dependency.

Another problem that could limit adoption of car-sharing services is the complexity of their cost structures. Unlike car ownership or public transport subscriptions, where costs are typically expressed as a predictable monthly average or per kilometer rate, car-sharing fees depend on two variables in rental duration and distance driven. This pricing model makes it difficult for users to compare directly with the fixed costs of ownership. Including costs such as insurance, maintenance, and depreciation averaged over monthly mileage. The same goes for public transport tickets that let you use these services within a set period (e.g., 90 minutes, 24 hours, or 30 days). Which similarly to owning a car, limits the unknown variables of time and distance even further.

Although it might seem counterintuitive, the visibility of costs increases for the end user when using car-sharing compared to owning a car. The problem with complexity of cost structures is only an issue before using the service. Since every user receives a single, detailed invoice at the end of each month that breaks down all charges from the fixed subscription cost to the amount of time used, and kilometers driven. By contrast, private car owners pay for maintenance, fuel, insurance and other expenses across multiple bills throughout the year, making it more difficult to calculate an accurate average monthly cost. Car-sharing (and even public-transport subscriptions) makes this overview simpler, consolidating all expenses into one clear statement.

Some car-sharing providers attempt to reduce the previously mentioned uncertainties by offering free kilometers, such as the first 150 km at no charge, or unlimited mileage for premium subscribers. Although these incentives can lower the entry barrier and encourage individuals to

switch to car-sharing, they may inadvertently promote increased driving. Counteracting the broader goals of reducing congestion and private vehicle usage.

While reducing the barriers to shared mobility is essential for encouraging behavioral change, there is also a need to address the relative attractiveness of private vehicle ownership. This can be achieved by increasing its associated costs and inconveniences through measures such as higher parking fees, elevated vehicle taxation, and the removal or reduction of parking subsidies for private vehicles. These strategies can effectively discourage car ownership and promote more sustainable alternatives like car-sharing.

However, limiting consumption or influencing individual lifestyles through policy carries notable political and social risks (Markard et al., 2020). Such measures may provoke resistance or dissatisfaction among residents, potentially undermining public acceptance of the shared mobility alternatives they are intended to support. Therefore, this approach must be pursued with caution. If private vehicle use is to be discouraged, it is essential that policymakers and city planners simultaneously ensure the availability of attractive and reliable alternatives. This underscores the importance of developing a well-integrated multimodal transportation system in parallel, so that reduced reliance on private cars is both feasible and acceptable for a broad range of users.

5.2.5 Governance and Policy Alignment

In the case of car-sharing in Gothenburg, horizontal policy coordination appears relatively strong. Local stakeholders, from different sectors, including municipal departments, parking companies, real estate developers, and of course car-sharing companies generally share a common vision of promoting car-sharing as part of a broader transition toward sustainable urban mobility. These actors are actively working to support the development of the service through planning efforts, collaborative stakeholder meetings, and mobility integration, with limited evidence of conflicting objectives or system level tensions.

However, vertical policy alignment presents a more significant challenge. Although sustainability goals are often articulated at international, national, and local levels, and may appear aligned in principle, their interpretation and practical implementation can vary significantly across governance levels. Higher levels of governance may set broad climate and mobility targets, but lack the tools or flexibility to address specific local needs. Local

governments, despite often taking initiative on sustainable transport, may face obstacles such as outdated regulations or limited authority, which restrict their ability to support solutions like car-sharing. As a result, even if high-level sustainability ambitions are formally shared, the lack of coordinated and consistent implementation across governance levels can create significant barriers to progress on specific solutions like car-sharing.

Several regulatory and financial barriers that hinder the expansion of car-sharing such as VAT classification and outdated parking legislation fall under the jurisdiction of the national government. Interviews revealed a perceived disconnect between local ambitions and national policy priorities, suggesting that higher level authorities have not yet fully embraced car-sharing as a strategic component of sustainable transport. As a result, the lack of vertical alignment and interventionist approach in national policy is currently one of the most pressing governance challenges facing car-sharing development in Gothenburg.

5.3 Multi-level Perspective and Niche Stimulation

Using the Multi-level Perspective (MLP) developed by Geels (2002) as an analytical lens, the dynamics surrounding the development of car-sharing in Gothenburg can be understood by examining processes at the niche, regime, and landscape levels.

5.3.1 Niche Level and Stimulation

Car-sharing has established a foothold in Gothenburg and appears to be positioned between the niche phase and a broader acceleration stage. Several companies are actively participating in a competitive market environment, and some are approaching profitability within Sweden. In other national contexts, such as Denmark and Norway, providers report stronger financial performance, suggesting that the car-sharing business model can become self-sustaining and successful when supported by appropriate policy conditions and user demand.

As noted by *Respondent 7*, representing a car-sharing provider, the business is largely capable of operating on a self-sufficient basis. According to their perspective, the sector no longer requires protection, but rather depends on the establishment of appropriate operating conditions, referring to outdated regulatory frameworks in Sweden. In line with niche stimulation theory, the focus should be placed on further nurturing and empowering car-sharing, rather than protecting it through passive shielding. Key elements of nurturing include the development of

shared positive expectations, social learning, and actor network building. Establishing clear and realistic expectations is particularly important in the case of car-sharing, as the service is often misunderstood as a full replacement for private car ownership. Addressing this misconception through targeted communication and user engagement can help align expectations with the intended role of car-sharing within a multimodal transport system.

A related dimension involves raising awareness of the economic trade-offs between private vehicle ownership and shared mobility. Many individuals underestimate the true cost of owning a private car, which includes substantial fixed costs but lower variable cost (cost per distance driven). In contrast, the variable cost of each car-sharing is higher and more visible, which can deter users despite the potential for overall savings. Promoting greater transparency around these cost structures could contribute to more informed decision-making and more favorable perceptions of car-sharing, particularly among urban residents who drive infrequently and have access to complementary transport options.

Current efforts such as the gathering of relevant actors in a discussion forum fosters knowledge exchange and actor network building. Also, development of a city-wide mobility map, gathering all car-sharing stations, as well as explicit targets set by real estate developers to ensure access to shared mobility services within a defined proximity of residential buildings contributes to the niche stimulation. These types of initiatives contribute to nurturing the car-sharing niche by increasing visibility, improving accessibility, and embedding the service into everyday urban infrastructure and routines. The mobility map could gain greater legitimacy and effectiveness if it were endorsed or promoted by a neutral and publicly trusted actor, such as the City of Gothenburg, an ambition that is also shared by the map's creators.

However, this raises concerns related to the municipality's role in promoting or appearing to advertise private companies. Although such endorsement enters a legal and ethical gray area, the map itself includes all relevant actors in an impartial manner, with no single provider given preferential treatment. As such, the initiative may reasonably be viewed as a tool for public information rather than commercial promotion, although its status remains subject to interpretation within municipal guidelines.

In terms of empowerment, car-sharing primarily requires support through stretch and transform mechanisms. Due to the innovation not aiming to replace private car ownership, emphasis

should lie in reshaping the selection environment so that it becomes more favorable to shared mobility solutions. This implies a more transformative shift in mobility habits and societal expectations. As private vehicle ownership is increasingly problematic due to external landscape pressures, there is growing potential for the selection environment to evolve. In this evolving context, car-sharing can emerge as a more attractive and viable alternative within a broader shift toward sustainable urban transport.

Given the growing success and importance, as noted by respondents, of car sharing within the B2B segment, this market may present a particularly strategic area of focus for car-sharing providers. One notable advantage is that employees and organizations are often already accustomed to sharing vehicles within their operations. As a result, the behavioral shift required for adoption is considerably less significant than in the context of private car ownership. This makes the B2B segment an appealing target, as it presents a lower barrier to entry and may facilitate smoother integration of car sharing into existing mobility routines.

It is also worth noting that future developments in autonomous vehicle technology could significantly alter the conditions under which car-sharing operates, and thus necessary stimulation. If widely implemented, autonomous vehicles would reduce the importance of station-based proximity, as vehicles would no longer need to be parked near users. Instead, they could be centrally located at designated charging or maintenance hubs and dispatched on demand, driving themselves to the customer. This shift would not only affect the spatial logic of current car-sharing systems but also blur the boundaries between car-sharing and taxi services. In a context where vehicles operate without drivers, both services would effectively offer the same user experience, thereby suggesting a likely convergence or integration of these sectors in the long term. As such, autonomous mobility could fundamentally reshape the business models, infrastructure needs, and regulatory considerations associated with car-sharing.

5.3.2 Regime Level

At the regime level, significant barriers continue to hinder the broader adoption of car sharing. However, these obstacles are less related to resistance from incumbent actors, particularly when compared to cases such as the transition from internal combustion engine manufacturing to electric vehicles. As discussed in 5.2.3, the regime barriers instead mostly relate to private vehicle ownership structures that continue to be strongly embedded in societal norms, urban

planning practices, and institutional frameworks. An example of embedded societal norms surrounding car ownership is the continued subsidization of residential parking within housing developments. Historically, housing projects were required to include parking spaces, reflecting the deeply rooted cultural norm that private car ownership is a given. However, these parking spaces were often costly to construct and maintain, and their full cost was frequently not passed on to individual car owners. Instead, the expenses were partially subsidized, either through public funding or by being integrated into general housing costs. This practice persists today, contributing to a situation in which car ownership does not reflect its true societal and spatial costs, thereby reinforcing car dependency. This integration reinforces car ownership as the dominant mobility model, making it challenging for shared mobility solutions to displace existing patterns. These dynamics reflect the stability of the existing regime and the difficulty of achieving structural change without coordinated intervention.

5.3.3 Landscape Level

Finally, at the landscape level, growing external pressures are increasingly straining the dominant mobility regime. Rising concerns about climate change, worsening urban congestion, and the influence of ambitious climate targets at the European level are gradually opening space for alternative mobility solutions to emerge. In this context, multimodal transportation systems, including car-sharing, are gaining relevance as part of a broader transition. Urbanization, as outlined in the introduction, places increasing pressure on urban space and contributes to rising levels of congestion. These are areas in which car-sharing has demonstrated clear advantages, particularly through more efficient use of space and a reduction in the number of privately owned vehicles. At the same time, broader cultural shifts toward access based consumption and the continued growth of the sharing economy have contributed to greater public acceptance of shared mobility services. Together, these developments suggest that car-sharing is becoming more closely aligned with evolving societal values and expectations. This alignment increases the pressure on the dominant regime, creating more favorable conditions for the growth and diffusion of the technology.

5.4 Policy Mix

As previously noted, car-sharing in Sweden faces challenges related to acceleration, although it has established a functional pattern of development. When examining blocking mechanisms, particularly in relation to the policy mix, two main policy related barriers can be identified.

Both originate from the absence of a formal legal definition of car-sharing that would allow it to be recognized as a mobility service reflecting its sustainability benefits, especially with regard to congestion reduction and efficient space use. The most significant barrier concerns outdated parking regulations in Sweden, which limit the ability of municipalities to allocate public space specifically for car-sharing. Observations from neighboring countries suggest that more modern parking policies can have a considerable positive effect on the growth and viability of car-sharing services.

Furthermore, given that street parking plays a critical role in increasing both the accessibility and visibility of car-sharing vehicles, current regulations also hinder the potential for organic growth and broader adoption of the service. As one respondent noted, seeing car-sharing vehicles in the city is the second most common reason individuals choose to try the service. Increasing the visibility of shared vehicles through strategic placement in public areas can therefore serve as an important driver of user engagement. In addition, promoting car-sharing as part of a broader multimodal transport system may generate synergies with other modes, particularly public transportation (Katzev, 2003).

Secondly, the VAT remains a structural barrier, although not deemed as important by some respondents. From a business perspective, this higher tax rate tightens profit margins and increases the cost for consumers, making it more challenging for car-sharing providers to offer competitive pricing to consumers while maintaining a sustainable business model. A change in taxation structure would thereby support broader policy goals related to sustainable and affordable urban mobility, which has been explicitly recognized as a policy objective by both local municipalities and national-level authorities in Sweden.

Despite a clear consensus among the interviewed actors on the need for regulatory changes, it appears that the national government has not yet fully recognized car-sharing as a strategic component of future sustainable mobility. Although existing public transport systems cover many mobility needs, they do not address all travel demands. At the same time, universal reliance on private vehicles is increasingly seen as unsustainable and impractical in urban contexts. car-sharing thus serves a critical function within a multimodal transport system by filling mobility gaps in areas or use cases where public transport is less effective.

Some hesitation at the national level may stem from the mixed findings in research regarding car-sharing's environmental impact, particularly in terms of emissions and total distance traveled. However, as discussed earlier, these outcomes often arise from unintended use cases, such as when car-sharing replaces public transport rather than private car trips. With appropriate policy design, this risk can be mitigated. For example, control policy measures aimed at destabilizing existing regime (Kivimaa & Kern, 2016), such as congestion charges, limited parking in city centers, as well as city planning prioritization of public transport, can help ensure that car-sharing is not used as an alternative to public transport and its usage revolves around travel outside transit coverage areas or when transporting bulky items.

It is also important to recognize that policies aimed at reducing car use in cities, such as increased parking fees, restricted access to central areas, or congestion charges, will affect both private cars and car-sharing. However, these measures can still improve the relative attractiveness of car-sharing. This is because privately owned vehicles come with high fixed costs, i.e., purchasing cost, which remain the same regardless of how often the car is used. As a result, owning a car becomes increasingly expensive per kilometer driven when used less frequently. In contrast, car-sharing is based on a pay-per-use model, making it a more cost-efficient option for occasional use. Therefore, as policies discourage regular car use, car-sharing becomes a more appealing alternative for those who still need access to a car from time to time.

Thus, adopting a policy mix that combines both supportive measures and mechanisms that gradually discourage private car ownership can enhance the overall effectiveness of car-sharing. By creating favorable conditions for shared mobility while simultaneously addressing the relative inefficiency of private car use in urban settings, cities can foster a more balanced and sustainable transport system. If public transport is promoted as the primary and most convenient mode of travel within dense urban centers, and car-sharing is positioned to complement it, then the risk of car-sharing replacing low-emission transit options can be minimized. This targeted use of car-sharing could help avoid increases in emissions from mode shift, as criticized by Jung and Koo (2018), and instead amplify its benefits in terms of reduced vehicle ownership, improved space use, and lower overall emissions.

5.5 Further Research

Two key areas have emerged from this study that merit further exploration. First, the integration of car-sharing within a broader multimodal transport system requires more focused research. Car-sharing is most effective when used as a complementary mode, supporting travel needs that are not provided by public transport, walking, or cycling. Its role within a well-coordinated transport ecosystem is crucial for realizing its full potential in reducing car dependency, improving space efficiency, and lowering emissions. Many of the inconclusive findings in previous research regarding car sharing's environmental impact, such as increased driving distance or mode shift from public transport, are often linked to its use outside of this intended context. Further studies should therefore investigate how car sharing can be more systematically implemented as part of an integrated mobility system.

Second, the anticipated development and deployment of autonomous vehicles will significantly alter the landscape for shared mobility. Autonomous technology could fundamentally change the logistics, cost structure, and user experience of car-sharing, potentially eliminating the need for station proximity and blurring the line between car-sharing and ride hailing. As such, future research should explore the implications of automation for car-sharing, including both the opportunities it presents and the new challenges it may introduce, particularly in terms of governance, infrastructure, and system efficiency. This perspective is especially relevant when considering the long term evolution of urban mobility systems.

6. Conclusion

This thesis has examined the role of car-sharing in the context of Gothenburg's urban mobility system, drawing on both theoretical frameworks and empirical insights. Several key conclusions can be drawn from the study.

First, car-sharing demonstrates strong potential as part of a sustainable and space-efficient urban transport system. However, it is not a direct substitute for private car ownership in all situations. Rather, it should be seen as a complement to other transport modes, particularly public transport, walking, and cycling. Its main contribution lies in reducing the need for private vehicles and supporting more flexible, multimodal mobility patterns.

Second, one of the most persistent challenges remains the behavioral and cultural attachment to private car ownership. Deeply embedded norms around autonomy, convenience, and status continue to shape mobility choices. Users may perceive car-sharing as more costly, in part due to the visibility of variable costs compared to the often overlooked fixed costs of owning a vehicle. Overcoming these perceptions will require continued public engagement, visibility of shared vehicles in urban space, and clearer communication of the benefits. In connection to this, the B2B segment offers a strategic opportunity for car-sharing providers, as its businesses are often already familiar with shared vehicle use, making adoption easier and reducing behavioral barriers compared to the private ownership context.

Third, the study finds that while Gothenburg has made considerable progress at the local level, with municipal actors, real estate developers, and parking companies actively supporting car-sharing, the lack of national policy alignment constitutes a major barrier. The absence of a formal legal definition, outdated VAT regulations, and constraints on allocating public parking are examples of vertical governance misalignment that limit the ability of local actors to fully support the service. This highlights the need for greater coordination between policy levels. Granting car-sharing access to public land through allocation of public parking spaces and applying the reduced VAT rate of 6%, as is typically extended to other mobility services, would offer several benefits for car-sharing by addressing key factors such as accessibility, visibility, and cost.

Finally, trends such as urbanization, climate policy pressure, and growing openness to access based consumption create opportunities for car-sharing. If used strategically, these pressures can support a shift in the socio-technical regime away from private car dominance. However, this potential will only be realized if policymakers actively recognize car-sharing as a relevant solution and integrate it into broader transport and climate strategies.

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Appendix A - Interview Guide

1. Introduction

Purpose of the Interview:

Thank you for taking the time to meet with us. We are students at Chalmers conducting our master's thesis on car-sharing. We are focusing on the role of car-sharing in Gothenburg's urban transportation system. Our study aims to map the current state of car-sharing, looking at different stakeholders and actors, geographical location, as well as explore opportunities to enhance adoption and effectiveness.

This interview will be confidential, and the information gathered will be used solely for academic purposes.

(Ask for permission to record the interview)

2. Background of the Interviewee

- Can you introduce yourself and describe your role within your organization?
    - …
- What is your experience with and connection to car-sharing services?
    - …
- How long have you been involved in the urban mobility sector, specifically regarding shared mobility solutions?
    - …

3. Current State of Car-Sharing in Gothenburg

Structured around and tailored to each interviewee - depending on organization, role, and expertise.

A. Operations and Distribution

- How would you describe the current state of car-sharing in Gothenburg?
- What car-sharing models are currently available?
- Where are car-sharing services primarily located within the city, and why?
- How does the geographic distribution of services align with the needs of users?

B. Key Stakeholders and Roles

- Who are the main stakeholders in Gothenburg's car-sharing ecosystem?
- What roles do these stakeholders play in facilitating car-sharing services?
- Are there any partnerships or collaborations between stakeholders that influence the availability of car-sharing services?

4. Challenges and Opportunities of Car-Sharing

Structured around and tailored to each interviewee - depending on organization, role, and expertise.

A. Accessibility and Affordability

- What factors currently influence the accessibility and affordability of car-sharing in Gothenburg?
- What are the main barriers for service providers?
    - Users?
- How do you think these barriers could be addressed?

B. Stakeholder Collaboration and Incentives

- What kind of incentives could encourage greater car-sharing adoption?
- How could the government, service providers, and property owners collaborate to support car-sharing growth?
- What role does urban planning and infrastructure play in facilitating car-sharing?

5. Closing Questions

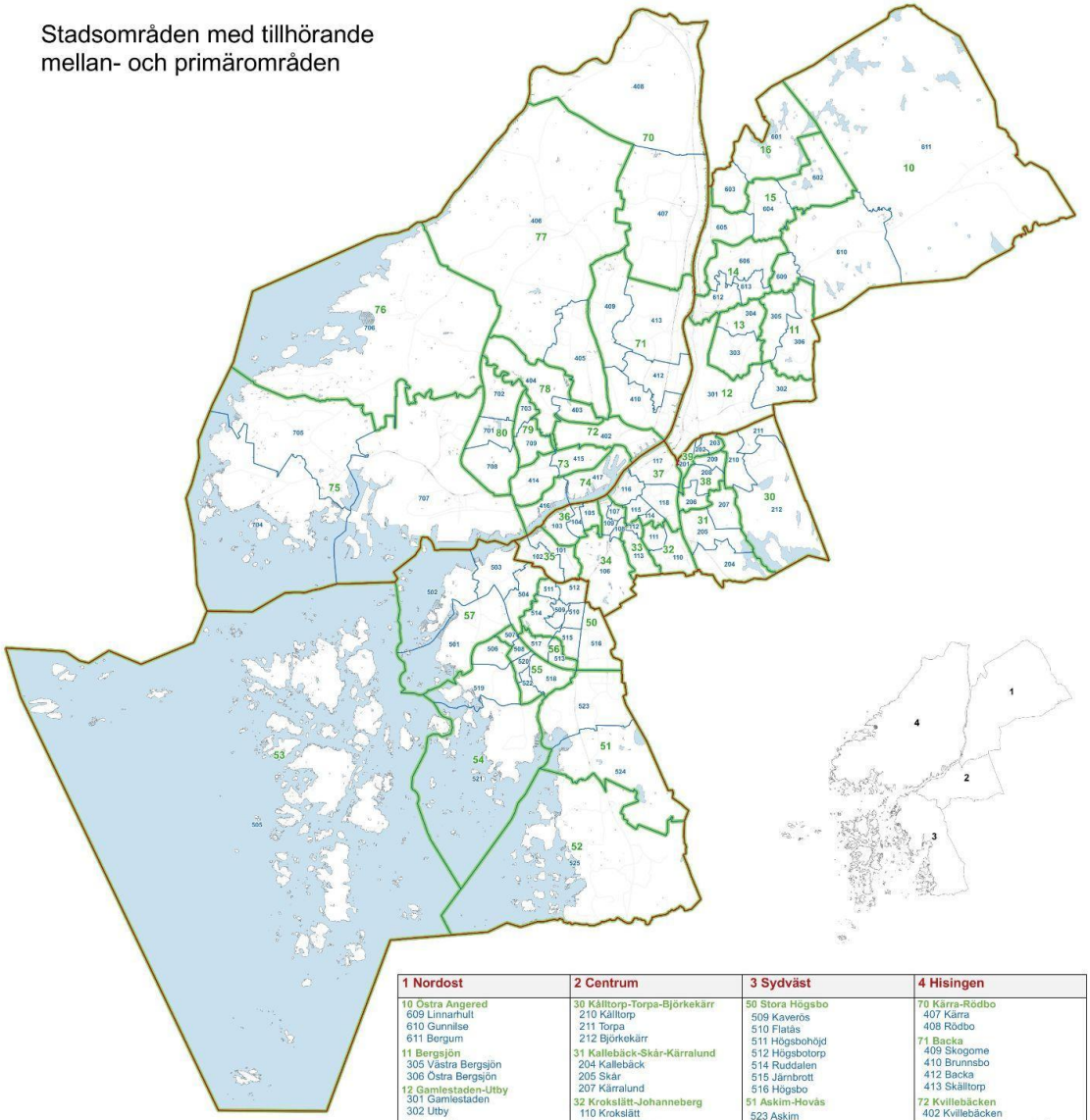
- Is there anything else you believe is important to understand about car-sharing in Gothenburg?
    - …
- Do you have any recommendations or additional contacts that could provide valuable insights for this study?
    - …

Appendix B - Middle Areas of Gothenburg

Table B: All middle areas under each city zone respectively.

1. Nordost	**2. Centrum**	**3. Sydväst**	**4. Hisingen**
10 Östra Angered	30 Kålltorp-Torpa-Björkekärr	50 Stora Högsbo	70 Kärra-Rödbo
11 Bergsjön	31 Kallebäck-Skår-Kärralund	51 Askim-Hovås	71 Backa
12 Gamlestaden-Utby	32 Krokslätt-Johanneberg	52 Billdal	72 Kvillebäcken
13 Kortedala	33 Guldheden-Landala	53 Södra Skärgården	73 Kyrkbyn-Rambergsstaden
14 Södra Angered	34 Olivedal-Haga-Annedal-Änggården	54 Bratthammar-Näset-Önnered	74 Norra Älvstranden
15 Centrala Angered	35 Kungsladugård-Sanna	55 Centrala Tynnered	75 Södra Torslanda
16 Norra Angered	36 Majorna-Stigberget-Masthugget	56 Frölunda Torg-Tofta	76 Björlanda
	37 Norra Centrum	57 Älvsborg	77 Tuve-Säve
	38 Lunden-Härlanda-Överås		78 Kärradalen-Slättadamm
	39 Olskroken-Redbergslid-Bagaregården		79 Östra Biskopsgården
			80 Västra Biskopsgården

Appendix C - Map of City Areas in Gothenburg



1 Nordost	2 Centrum	3 Sydväst	4 Hisingen
10 Östra Angered 609 Linnarhult 610 Gunnilse 611 Bergum 11 Bergsjön 305 Västra Bergsjön 306 Östra Bergsjön 12 Gamlestaden-Utby 301 Gamlestaden 302 Utby 13 Kortedala 303 Södra Kortedala 304 Norra Kortedala 14 Södra Angered 606 Hammarkullen 612 Hjällbo 613 Eriksbo 15 Centrala Angered 602 Rannebergen 604 Angereds Centrum 605 Agnesberg 16 Norra Angered 601 Lövgärdet 603 Gårdstensberget	30 Kålltorp-Torpa-Björkekärr 210 Kålltorp 211 Torpa 212 Björkekärr 31 Kallebäck-Skår-Kärralund 204 Kallebäck 205 Skår 207 Kärralund 32 Krokslätt-Johanneberg 110 Krokslätt 111 Johanneberg 33 Guldheden-Landala 112 Landala 113 Guldheden 34 Olivedal-Haga-Annedal-Änggården 106 Änggården 107 Haga 108 Annedal 109 Olivedal 35 Kungsladugård-Sanna 101 Kungsladugård 102 Sanna 36 Majorna-Stigberget-Masthugget 103 Majorna 104 Stigberget 105 Masthugget 37 Norra Centrum 114 Lorensberg 115 Vasastaden 116 Inom Vallgraven 117 Stampen 118 Heden 38 Lunden-Härlanda-Överås 206 Överås 208 Lunden 209 Härlanda 39 Olskroken-Redbergslid-Bagaregården 201 Olskroken 202 Redbergslid 203 Bagaregården	50 Stora Högsbo 509 Kaverös 510 Flatås 511 Högsbohöjd 512 Högsbotorp 514 Ruddalen 515 Järnbrott 516 Högsbo 51 Askim-Hovås 523 Askim 524 Hovås 52 Billdal 525 Billdal 53 Södra Skärgården 505 Södra Skärgården 54 Bratthammar-Näset-Önnered 506 Bratthammar 519 Önnered 521 Näset 55 Centrala Tynnered 507 Guldringen 508 Skattegården 518 Ängås 520 Grevegården 522 Kannebäck 56 Frölunda Torg-Tofta 513 Tofta 517 Frölunda Torg 57 Älvsborg 501 Fiskebäck 502 Långedrag 503 Hagen 504 Grimmered	70 Kärra-Rödbo 407 Kärra 408 Rödbo 71 Backa 409 Skogome 410 Brunnsbo 412 Backa 413 Skälltorp 72 Kvillebäcken 402 Kvillebäcken 73 Kyrkbyn-Rambergsstaden 414 Kyrkbyn 415 Rambergsstaden 74 Norra Älvstranden 416 Eriksberg 417 Lindholmen 75 Södra Torslanda 704 Hjuvik 705 Nolered 707 Arendal 76 Björlanda 706 Björlanda 77 Tuve-Säve 405 Tuve 406 Säve 78 Kärradalen-Slättadamm 403 Slättadamm 404 Kärradalen 79 Östra Biskopsgården 703 Svartedalen 709 Jättesten 80 Västra Biskopsgården 701 Norra Biskopsgården 702 Länsmansgården 708 Södra Biskopsgården

Figure C: The original map gathered from Gothenburg city, that was used to illustrate car-sharing stations, etc (Göteborg stad, 2021).

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