

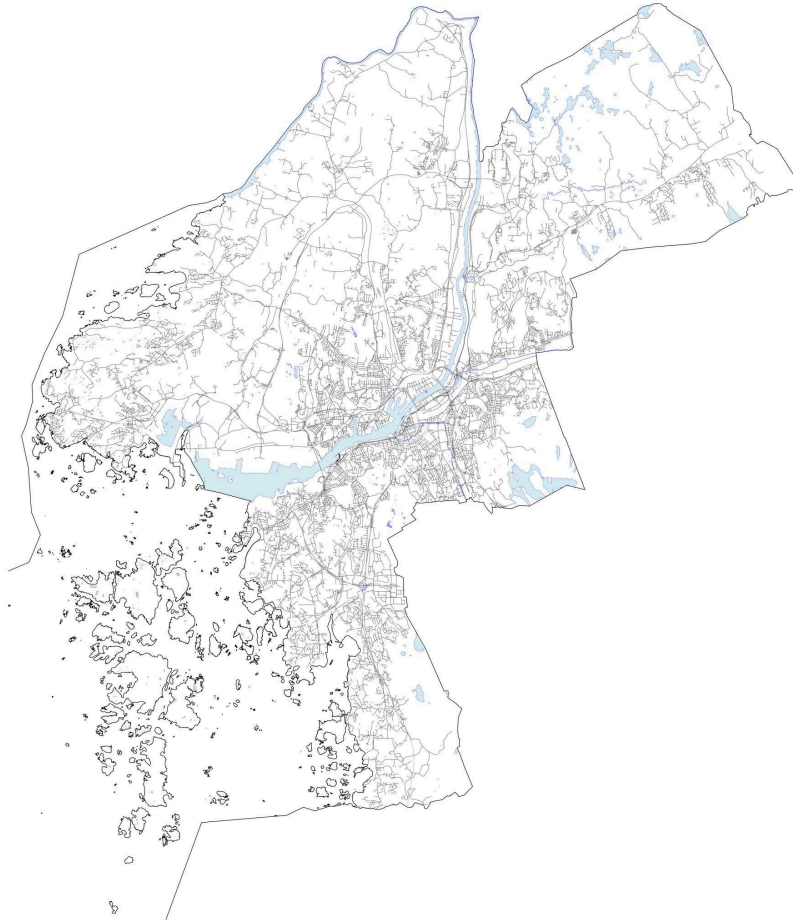


CHALMERS
UNIVERSITY OF TECHNOLOGY

Dynamics of Street Parking and Residential Parking

The Role of Parking Policy and Mobility Agreements in Gothenburg

Bachelor's thesis 13 May 2026



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Abstract

To achieve Sweden's target of reducing transport-related emissions, parking regulation is a key policy tool, as previous research shows a clear correlation between parking availability and increased car ownership and car use. In order to steer towards this goal, Göteborgs Stad has introduced mobility agreements, allowing property owners to construct fewer parking spaces if sustainable mobility measures are provided. For these agreements to contribute to reduced car traffic, residents must not compensate by instead using on-street parking, an issue highlighted by the GotPark project.

This study investigates the relationship between on-street parking and off-street residential parking and how it relates to the city's current parking policy and the mobility agreements. The methodology encompasses a mixed-methods approach, consisting of a literature study of existing policy and research, a quantitative analysis of the Gothenburg Mobility Survey, semi-structured interviews with property owners and municipal officials and an area-based analysis of parking conditions in different areas in Gothenburg.

The results show that 11% use on-street parking options instead of off-street residential parking, although the issue is spatially dependent. The findings indicate that economic factors strongly influence parking choice, as many residents are willing to walk longer distances in exchange for cheaper on-street parking. The study also demonstrates that a high availability of on-street parking contributes to vacancies in residential parking facilities, which may weaken the intended effects of the mobility agreements and reduce their ability to decrease car dependency.

In conclusion, this thesis shows that current on-street regulations do not fully align with Göteborgs Stad's parking policy and sustainability goals. The findings support previous recommendations proclaiming that improved coordination of pricing and availability between on-street and off-street parking is necessary. More proactive parking regulation is also suggested as it could improve land-use efficiency, reduce unused parking infrastructure and create better conditions for mobility agreements to contribute to sustainable mobility.

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1. Introduction

Research indicates that a high availability of parking correlates with increased car ownership and car use (Holm et al., 2025). Logically, a reduced availability of parking presents itself as a strategy for reducing car use, ideally implemented in conjunction with viable alternative transport options, i.e. public transport and cycling infrastructure. In Gothenburg, which constitutes the focus of this report, the transport sector represents the second-largest source of geographically based greenhouse gas emissions (City of Gothenburg, 2025). Building on this background, regulating parking presents itself as a rational step towards reducing the aforementioned greenhouse gas emissions in line with achieving the city's environmental- and sustainable mobility goals.

One type of parking Göteborgs Stad aims to reduce in particular is street parking (henceforth: on-street parking) (Göteborgs Stad, 2021). According to municipal policy, public streets should be accessible to pedestrians, cyclists, cars and public transport, and the use of on-street parking as residential parking, i.e. where people park when at their residence, conflicts with the city's policy regarding land use. One way for the city to ensure that residents do not rely on on-street parking for residential purposes is the p-norm (parking number) (Hammarberg & Brändström, 2021), which requires a minimum number of residential parkings to be provided by property owners.

In 2018, Göteborgs Stad introduced mobility agreements as a tool to promote alternative sustainable methods of transportation to car use. These agreements allow reductions to the p-norm if property owners commit to specific mobility measures. Such measures include bicycle- and car-sharing schemes, free public transport passes, and so forth.

To evaluate whether the mobility agreements actually contribute to reductions in car ownership and car use, the city in collaboration with Chalmers initiated the GotPark project (Holm et al., 2025). The project concludes that property owners who implemented the mobility agreements were able to reduce the number of off-street residential parking spaces, i.e. parking spaces on property, by 25% compared with similar buildings without mobility agreements.

Although the mobility agreements have proven benefits regarding car use and car ownership, the GotPark project also identifies potential challenges associated with its implementation. In some areas, car ownership exceeds the number of available residential parking spaces. This is the case in zone A, which covers the central parts of the city, where the project notes 25% of residents in buildings with mobility agreements make use of alternative parking options rather than off-street residential parking, such as public on-street parking. The project further notes that even when off-street residential parking is available, residents in certain areas prefer public on-street parking, which in some cases is less expensive than residential parking. This leads to unused residential parking spaces. Property owners participating in the GotPark project highlighted these issues as a concern.

In light of these findings, the GotPark project identifies a need for further studies regarding the relationship between the pricing and availability of street parking compared to residential parking when determining p-norms. Previous studies indicate that if parking availability in one area is restricted while parking opportunities remain favorable in surrounding areas, there is a risk that the parking demand, traffic and noise will shift to those neighboring areas (Antonson et al., 2017). Improved coordination in this regard could help ensure that residential parking spaces are utilised while reducing the demand for on-street parking.

Against this background, questions arise regarding which alternative parking options residents, in properties with mobility agreements, make use of, and whether the current arrangements lead to unintended consequences. It is therefore relevant to examine whether the availability of public on-street parking may counteract Göteborgs Stad's policy measures intended to reduce car ownership and car use in the city.

1.1 Purpose and Scope

The overall aim of this thesis is to analyse the relation between on-street parking and off-street residential parking and to examine how this relationship relates to the city's current parking policy and the mobility agreements. The geographical limitation for the study is the metropolitan area of the city of Gothenburg.

The purpose is addressed through the following research questions:

RQ1: Is the use of on-street parking instead of off-street parking common, and in which types of areas does this occur?

RQ2: Does access to on-street parking influence the desired effects of the mobility agreements?

RQ3: What impact does on-street parking have on residential- mobility behaviour, car usage, parking cost and parking space vacancies?

RQ4: How can Göteborg Stads parking policy be revised to reach their goals regarding on-street parking?

Four complementary methods will be used to fulfill said purpose and answer the research questions. A brief literature analysis will be carried out to set the context of our scope. Survey data will be empirically analysed to find trends and patterns. In addition, interviews will be conducted with representatives of Göteborgs Stad and property owners in Gothenburg to gain a deeper understanding of the issue. Lastly, an analysis of six different areas will be conducted to identify patterns in areas with high usage of on-street parking.

Building on these results and previous studies on the subject conducted in other cities, the report will identify strengths, deficiencies and potential areas for improvement. Disability parking and loading areas present examples that present social, ethical and logistical aspects

that need to be taken into consideration. Therefore, the recommendations in the thesis will try to leave these exceptions unaffected.

By empirically investigating whether on-street parking allows car owners to bypass the desired effect of the mobility agreements, this thesis will contribute to academia by filling the knowledge gap concerning the relationship between pricing and availability of on-street parking and off-street residential parking. Additionally, this viewpoint evaluates the mobility agreements from a holistic perspective. Earlier reports have focused on the effect mobility agreements have on residential parking while this report aims to see how external parking usage, such as on-street parking, correlates to this and thereby widening the perspective.

2. Background & Previous Research

The background aims to provide the reader with an overview of the parking situation in Gothenburg as it exists today, the role filled by street parking in said situation, the history of how it developed into said system and subsequent comparisons to other cities.

2.1 Parking in Gothenburg: Overview and Definitions

Gothenburg has a large number of parking spaces, however, it is hard to estimate the exact total. The municipal parking company Parkering Göteborg manages 100,000 parking spots in Gothenburg, these are used by both residents and visitors and are located on streets, in parking garages and on parking lots (Göteborgs Stads Parkering AB, 2025). The number of private parking spots in Gothenburg is unknown, but one could estimate the total number by reviewing car ownership in the city. According to SCB (2026) vehicle statistics, there are 198,058 cars in Gothenburg 2025. Car ownership in the city has increased over the years 2020-2025 with approximately 5,000 cars, the development can be found in Table 2.1. Gothenburg which inhabits roughly 600,000 people (SCB, 2025) has a car ownership rate of about 0.32 cars per person in 2024.

Table 2.1. Cars and population in Gothenburg municipality during 2020-2025. (SCB, 2026), (SCB, 2025)

Year	2020	2021	2022	2023	2024	2025
Cars	193,724	197,598	197,828	197,528	196,176	198,058
Population	583,056	587,549	596,841	604,616	608,993	no data
Cars per person	0.33	0.34	0.33	0.33	0.32	-

Göteborgs Stad (2009) states in its parking policy that the city has four different categories for parking divided by time and purpose:

- Short time parking, for shorter errands
- Half-day parking, for visits or longer errands
- Whole-day parking, preferably for parking by workplace
- 24-hour parking, for parking by resident

In general, parking on-street is permitted for maximum 24 hours in a row on streets without signage (Göteborgs Stad, n. d.-d). However, in large parts of the city center parking on-street is regulated, 24-hour parking is only allowed if the car owner has a boendeparkeringstillstånd (residential parking permit) (Göteborgs Stad, 2009). This permit is mostly available for residents living in the central parts, and is an exception from the general parking rules. The permit does not guarantee a specific parking spot but allows the driver to park in a delimited area at a fixed monthly price and the permits are managed by Göteborgs Stad (Göteborgs Stad, n. d.-f). There are also general parking permits managed by Parkering Göteborg. These are similar to residential permits but do not require the applicant to live within the designated

area (Göteborgs Stads Parkering AB, n.d.-c). According to Göteborgs Stad's parking policy (2009), the available parking spots in the central parts of the city, both on-street and off-street, are often used by residents or people working in the area, which has created a lack of short time parking. In line with the Planning and Building Act (PBL), Göteborgs Stad states in its parking policy that street land in first hand should be used for short time parking instead of residential parking, in order to meet the demand for short time parking and create an attractive city. Even though the city has removed on-street parking spots in the central areas, the total number of on-street parkings has not decreased during the period 1990-2009 (Göteborgs Stad, 2009).

This study aims to explore issues related to on-street parking, and therefore a clear definition of on-street parking is needed. On-street parking is defined as parking located on public streets, the different types of on-street parking and their descriptions are summarized in Table 2.2. The streets in Gothenburg are publicly owned and therefore all on-street parking is located on municipal land. The on-street parking category includes all kinds of parking options mentioned by Göteborgs Stad, from short-time parking to 24-hour parking. On-street parking includes parking managed with residential and general parking permits, free public parking on streets and parking managed by Parkering Göteborg or other companies. The opposite category is off-street parking. This includes parking garages (both underground and larger buildings), outdoor parking lots and parking on private land. The off-street category includes both private residential and public alternatives.

Table 2.2. Overview of parking options and their classification as on-street or off-street on this report.

Type of parking	Description	Designation
Unregulated free on-street parking	Parking on public streets with no signage, allows for parking 24 consecutive hours.	On-street
Residential parking permit	Available for residents within a fixed area, allows 24-hour parking in the area at fixed monthly price.	On-street
General parking permit	Allows for 24-hour parking in a fixed area at a fixed monthly price.	On-street
On-street parking regulated by price or time	Parking placed on streets regulated by price or time.	On-street
Underground parking garage, Outdoor parking lot at apartment building	Parking managed by property owners for residential use.	Off-street
Above ground, stand-alone parking garage	Could be both managed by property owners for residential use or managed by an external entity open for the public.	Off-street
Outdoor parking lot not at apartment building	Managed by an external entity open for the public.	Off-street

2.2 Parking Policy History in Gothenburg

This section will highlight key events in the history of parking policies in Gothenburg to gain a better understanding of the current system. For an overview of policy changes throughout history, see Figure 2.1.

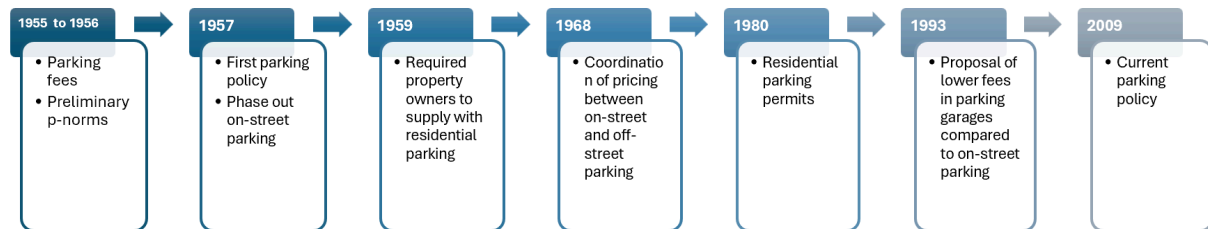


Figure 2.1. Significant changes in parking policies between the years 1955 to 2009. (Authors own figure).

The history of car park management in Gothenburg started 1955 when the first parking fees were introduced as means to cope with the growing car fleet in the city (Sundvall, 2006). In the following year, the first preliminary p-norms for various facilities were published (SOU 1968:18).

According to Göteborgs Stad (2018), the p-norm refers to the minimum number of parking spaces that a property developer is required to provide. This requirement is set by Göteborgs Stad in connection with detailed development plans and building permits. The standard is set either as the number of parking spaces per dwelling unit or per 1,000 square meters of gross floor area. The municipality uses the p-norm as an instrument to ensure compliance with the Planning and Building Act, which stipulates that a reasonable amount of parking provision must be arranged on, or in close proximity to, the property (SFS 210:900). While developers are obliged to meet the p-norm once it is applied, municipalities are not legally required to adopt such a norm; rather, it represents a local interpretation of the law (Holm och Ivansson, 2022). Details on how the p-norm is set can be found in the next section.

The first parking policy in Gothenburg was introduced in 1957, at a time when streets were increasingly used for parking (Sundvall, 2006). One of the main objectives was to adapt parking supply to demand in order to maintain accessibility. The policy further proposed charging for all parking in the city centre and constructing parking garages, with the long-term aim of gradually phasing out on-street parking in central areas (Göteborgs stadsfullmäktige, 1957).

In 1959, new legislation required property owners to provide residential parking within the property boundary, provided this could be done at a reasonable cost (Göteborgs stadsfullmäktige, 1962). An equivalent provision today can be found in the Planning and Building Act (SFS 210:900). However, this requirement was difficult to solve in older neighbourhoods that were built before the need for parking, forcing many residents to rely on on-street parking (Göteborgs stadsfullmäktige, 1962).

In 1968, the city began coordinating pricing between on-street parking and other parking alternatives (Göteborgs stadsfullmäktige, 1968). In the same policy, it allowed property owners to purchase residential parking spaces from the municipality if they could not provide them on their own property at a reasonable cost due to space limitations.

Residential parking regulations changed again in 1980 based on a new law from the previous year, allowing municipalities to charge residents for on-street parking (Göteborgs stadsfullmäktige, 1980). This enabled the introduction of residential parking permits, primarily given to people in older neighborhoods built before widespread car ownership. Since these areas lacked dedicated parking, residents relied on on-street parking. The policy also aimed to reduce unnecessary car use, as some residents using on-street parking had previously driven to work to avoid parking fees.

A new parking policy was adopted in 1993, which continued the strategy of gradually reducing on-street parking as parking garages were constructed (Göteborgs stadsfullmäktige, 1993). The policy also proposed lower fees in parking garages compared to adjacent on-street parking.

The current parking policy is from 2009 and reflects broader sustainability objectives, emphasising that cycling and public transport should be more attractive choices than private car use (Göteborgs Stad, 2009). The policy handles increasing parking demand alongside climate concerns. It proposes that on-street residential parking should gradually be relocated to off-street parking facilities and that on-street spaces should primarily serve short-term parking rather than long-term residential or employee use. Fees for on-street parking are intended to be set at levels equal to or higher than those for residential parking on private land. In urban planning, green spaces and public areas are meant to be prioritised over additional on-street parkings. Finally, the municipality seeks to revise p-norms and strengthen cooperation with private stakeholders in addressing parking-related challenges.

2.3 Mobility Agreements and Method to Determine P-norms

In 2018, Göteborgs Stad introduced mobility agreements, which property owners are free to adopt and allows them to reduce their p-norm if they implement various mobility measures (Göteborgs Stad, 2018). The mobility agreements aim to reduce car ownership and car use through increasing access to other modes of transport such as cycling and public transport. This is the fourth and final stage of the Mobility and Parking Study (MoP), which is done when constructing certain buildings. See Figure 2.2 for an illustration of the stages.

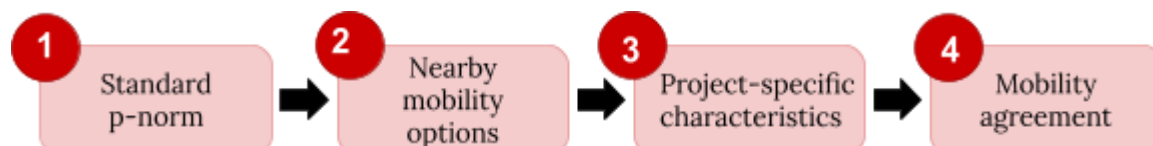


Figure 2.2. The four stages of the Mobility and Parking Study. (Own figure based on Göteborgs Stad (2018)).

The MoP assesses potential mobility solutions and identifies suitable provision for bicycle and car parking, with particular emphasis on measures that reduce car ownership and usage (Göteborgs Stad, 2018). The study results in project-specific mobility solutions and p-norms and the decision on whether a MoP is required is made during an early-stage mobility meeting between the municipality and the developer. This applies to both residential and non-residential developments, including multi-family dwellings, offices, retail premises, schools and more (Göteborgs Stad, 2021).

As mentioned earlier, this investigation consists of four stages where the three first are mandatory (Göteborgs Stad, 2018). In the first stage, the project is assigned a standard p-norm range based on the zone in which it is located, see Figure 2.3. The city is divided into five zones (A-E), extending outward from the city centre, with p-norms increasing with distance. The standard p-norm range quoted for the project also includes visitor parking.

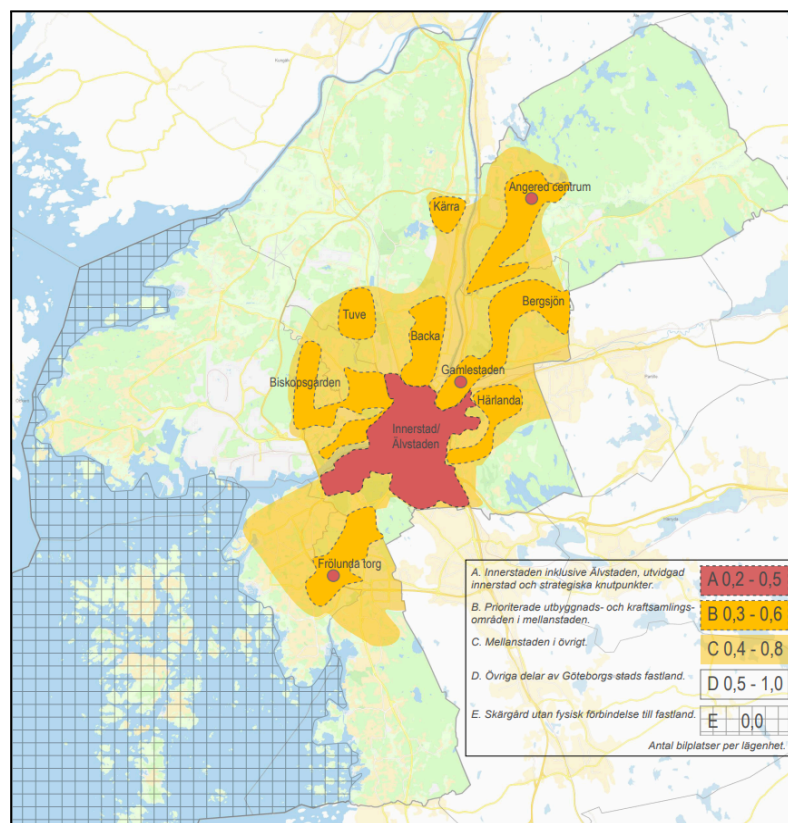


Figure 2.3. Gothenburgs' zones and its designated standard p-norm. (Göteborgs Stad, 2018). Reprinted with permission.

In the second stage, access to nearby mobility options (such as public transport and sufficient cycling infrastructure) and proximity to amenities (such as grocery stores and pharmacies) is assessed (Göteborgs Stad, 2018). For example, proximity to high-quality public transport services or well developed cycling infrastructure may justify a reduction in the p-norm.

In the third stage, further adjustments to the p-norm norm may be made based on project-specific characteristics (Göteborgs Stad, 2018). These factors include apartment size

distribution and potential for shared parking use (whereby the same parking space serves different users at different times of the day). A predominance of smaller dwellings combined with particularly strong opportunities for shared use may result in a lower p-norm; whereas the opposite conditions may justify an increase.

The fourth stage is voluntary and allows developers to introduce a mobility agreement to achieve additional reductions in the p-norm (Göteborgs Stad, 2018). In practice, this is achieved by property owners introducing various mobility measures that allow a reduction in the p-norm from 0.05 up to 0.2 parking spaces per dwelling, depending on the scope of the intervention.

Mobility measures refer to services that enhance residents' mobility while reducing reliance on private car ownership and use. As with parking provision, developers are responsible for the implementation and financing of these mobility measures. The measures most relevant to this project include restrictions on permanent parking allocations whereby no more than 50% of residential parking spaces may be reserved for specific individuals, thereby promoting more efficient use of existing parking spaces. Another key measure is the unbundling of parking costs. To ensure transparency and increase residents' awareness of the true cost of parking, parking fees must be unbundled from the tenancy agreement or lease.

In exceptional cases, parking requirements may be set to zero without a MoP assessment. These cases concern situations where a minor addition is made to an existing development, a change in the use of an existing building, or construction that does not affect the use of the building. However, accessible parking spaces for people with disabilities, as well as facilities for loading and unloading, must always be provided.

2.4 The GotPark project

The GotPark project is a collaboration between IVL Swedish Environmental Institute, Chalmers University of Technology and Göteborgs Stad and aims to evaluate the effects of the mobility agreements Göteborgs Stad signed between 2018 and 2023 (Holm et al., 2025). Through interviews with property owners, document reviews and a large survey, called the Gothenburg Mobility Survey, the project concluded the effects in a final report 2025. During 2018 to 2023 the city signed 106 agreements, which equals to 55% of the apartments built in the city during this period. The Gothenburg Mobility Survey was sent to roughly 11,000 residents both with and without mobility agreements and questioned them about mobility habits, parking and satisfaction with mobility solutions in their area.

GotPark concludes that the mobility agreements decreased the number of parking spaces by 25% compared with buildings without mobility agreements. This equals an area as big as 12 football fields. Residents from properties with mobility agreements were quite satisfied with their mobility measures, drove less and used public transport more compared with residents from properties without agreements.

The Gotpark report mentions some issues regarding on-street parking specifically. In parking zone A, the car ownership exceeds the p-norm for buildings with the mobility agreements,

shown in Figure 2.4. This implies that 25% of the residents use on-street parking or other parking alternatives. The outer zones, C and D had the reverse problem. Buildings with the mobility agreements reported a higher p-norm than the car ownership rates, 33% higher in zone C and 50% higher in zone D, which implies unused off-street parking spots. Property owners also stated that high supply of on-street parking in an area results in vacant parking spots in garages and problems to charge market-based prices.

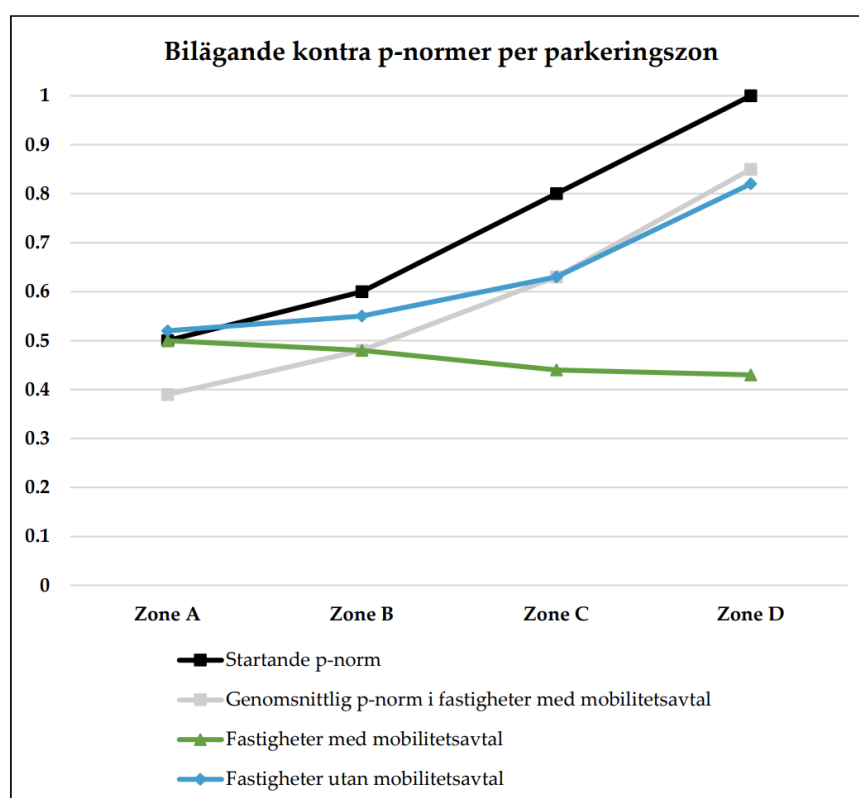


Figure 2.4. Car ownership and p-norm for different zones. (Holm et al., 2025) Reprinted with permission.

To improve the mobility agreements the GotPark report proposes recommendations for the municipality. Firstly, Göteborgs Stad should adjust the p-norm to reflect the car-ownership rates in each zone. Additionally, Göteborgs Stad needs to include the availability of on-street parking when planning residential parking spaces for a new project. There is a need for better coordination with public on-street parking when setting prices for parking spots built by property owners.

2.5 The Role of On-Street Parking: Opportunities and Challenges

This report partly aims to examine the relationship between on-street parking and off-street residential parking, and how policies can be designed to optimize this relationship. However, when revising on-street parking policies, it is important to consider factors beyond how parking spaces are used by residents. This section therefore summarizes previous research on the advantages and disadvantages of on-street parking, which should be taken into account when developing or revising parking policies.

Positive aspects

Regarding positive aspects of on-street parking, several studies indicate that access to on-street parking may generate positive economic effects for commercial activities (Biswas et al., 2017; Peprah, 2014). Biswas et al. (2017) argue that small retail businesses often lack the capacity to provide private parking facilities, making them dependent on nearby on-street parking to maintain customer accessibility. The study further suggests that most people are unwilling to park more than approximately 200 meters from their destination, which highlights the importance of nearby parking availability in attracting customers. Consequently, on-street parking may contribute to increased economic activity in urban commercial areas. In addition, on-street parking may provide municipalities with an opportunity to generate revenue through parking fees (Peprah, 2014).

Furthermore, on-street parking may enhance safety in certain contexts (Biswas et al., 2017). First the presence of maneuvering and parked vehicles can contribute to reduced driving speeds. Second, parked cars may act as a protective bugger, providing physical separation between moving traffic and pedestrians, and in some cases, cyclists.

Negative aspects

Despite the above mentioned benefits, the literature also identifies several drawbacks associated with on-street parking. Brooke et al. (2014) suggests that on-street parking may contribute to higher levels of pollutant emissions and increased noise.

Moreover, Biswas et al. (2017) identify several disadvantages related to both road capacity and traffic safety. From a capacity perspective, the study argues that on-street parking may increase the number of vehicles searching for available spaces, as well as frequency of parking maneuvers. This may contribute to traffic congestion, which in the long run reduces overall road efficiency and mobility. In terms of safety, Biswas et al. (2017) state that on-street parking can obstruct visibility for both drivers and pedestrians, which increases the risk of accidents. This issue is particularly critical for children, who are disproportionately affected by these traffic accidents. As a result, restrictions on on-street parking in the vicinity of schools and playgrounds is recommended.

More broadly, Biswas et al. (2017) suggests that many transport planners consider removal of on-street parking to be a relatively simple and cost-effective strategy for increasing urban street capacity while also improving traffic safety. This approach is particularly emphasized for major roads with higher speed limits. However, on lower-speed and less trafficked streets, on-street parking may still be considered acceptable, especially in cases where off-street parking supply is insufficient.

2.6 Off-Street Parking and P-norms in Other Cities

It is valuable to compare Gothenburg with similar cities that have implemented measures to reduce on-street parking usage and demand. Amsterdam is one such city similar to Gothenburg with regards to street layout, geography and population size. Both have historical

urban cores with limited space for expansion which can result in congestion. To combat the problems that arise when old cities meet modern car usage, the municipality of Amsterdam decided to increase the hourly cost of the city's on-street parking (Ostermeijer et al., 2022). The policy, which began in 2019, resulted in an average price increase of street parking from 2,55 euro to 4,22 euro, an increase of 66% . The highest hourly price is in the city center, which was increased to 7,5 euro per hour from the previous 5 euro per hour. The new policy resulted in a 17% reduction in demand for on-street parking, showing that parking price regulation has a measurable effect on street parking demand. The positive downstream effects of the price increase also included a 2-3% decrease in traffic volume and the possibility of revamping former on-street parking space to green areas, cycling lanes and restaurants.

Another measure to take in regards to parking policy and reducing on-street parking is introducing a maximum p-norm, instead of the current policy in Gothenburg where the p-norm defines a parking minimum. A new policy was enacted in London in 2004 that replaced minimum parking requirements with a maximum cap for parking spaces in all new development. While London and Gothenburg aren't comparable as a whole, there's still value in considering areas of the two cities where similar policies can be enacted. The parking reform decreased the average p-norm for new developments from 1.1, down to 0.63, a decrease of around 52% (Guo, 2016). The shift from minimum to maximum p-norm resulted in developers choosing more freely which type of development they wanted to build. About 67% of new developments after the reform provided less parking than the previous minimum level and about 25% of new developments provided no parking at all. Together, this resulted in an estimated 40% reduction in London's parking supply which contributes to lower car dependency.

2.7 Residents' Attitudes Toward Reducing On-street Parking

Public support is a crucial factor for the acceptance and long-term success of urban policy measures. Drawing on two empirical studies, one conducted in Copenhagen and one in Germany, this section examines residents' attitudes toward reductions in on-street parking availability. Insight from these studies can inform the design of policies that are more acceptable to the public.

In 2024, the City of Copenhagen removed approximately 600 of their 1,050 on-street parking spaces in the historic city centre (Mouratidis et al., 2026). Most of these spaces were relocated to underground parking facilities at the edge of the city centre. These were offered to residents who previously held on-street parking permits, at the same cost as before. The freed street space was repurposed for pedestrian areas, bicycle parking, public space, and greenery. A survey was conducted among residents to evaluate public attitudes toward these changes.

The study in Germany applied a factorial survey experiment, in which participants evaluated scenarios with varying characteristics related to parking policies (Goetting et al., 2025). Data was collected from 2,798 participants. Respondents assessed their acceptance of reallocating

parking spaces to green areas, public spaces, and improvements in walking and cycling infrastructure.

The Copenhagen study indicates a general acceptance of reduced on-street parking when the space was repurposed for alternative urban uses (Mouratidis et al., 2026). However, acceptance varies across different user groups. Lower levels of support are observed among frequent car users, car owners, and individuals who rely heavily on on-street parking. In contrast, individuals who use parking for purposes such as work, shopping, or leisure tend to show higher levels of support. The highest level of support is found among those who rarely or never use on-street parking.

According to the German study, acceptance follows a normal distribution, indicating no strong overall tendency either in favor of or against on-street parking reallocation (Goetting et al., 2025). The finding suggests that smaller changes are more widely accepted, supporting a step-by-step implementation approach. The study also shows that allocating remaining on-street parking spaces based on equality is more accepted than allocation based on fairness principles. Furthermore, so-called “pull-measures”, such as investments in sustainable mobility infrastructure, increase acceptance compared to removing parking without additional measures. In addition, converting on-street parking space into cycling infrastructure is generally more accepted than transforming it into public squares. According to the German study, acceptance is also higher when residents are given opportunities to participate in decision-making, for example through online platforms or citizen’s assemblies.

Both studies demonstrate that sociodemographic factors influence attitudes. The Copenhagen study finds lower support among older households, households with children, higher-income groups, and individuals with health limitations or disabilities (Mouratidis et al., 2026). Higher support is observed among women, individuals with higher education, and those living with a partner. It is important to note that parking spaces designed for people with disabilities were not affected by the policy.

The German study shows that acceptance varies with sociodemographic characteristics, mobility behaviour, and environmental concerns (Goetting et al., 2025). The study suggests that the relationship between age and acceptance follows a U-shape, with higher acceptance among younger and older individuals. Political orientation also plays a role, with individuals leaning to the left showing higher levels of acceptance.

Spatial context is another important factor. According to the Copenhagen study, acceptance is lower in central areas directly affected by the reduction, compared with surrounding neighbourhoods where car dependence is low and access to alternative modes of transport is high (Mouratidis et al., 2026). Similarly, the German study finds lower acceptance in areas with more than 100,000 inhabitants, possibly due to higher parking pressure in these areas according to the study.

In summary, the findings of the studies suggest that there is overall public acceptance of reducing on-street parking when such measures are combined with improvements in public spaces and alternative transport options.

3. Methods

This study employs both quantitative and qualitative research approaches, with the former including data collection methods with close-ended information emphasising on analysing quantifiable data to identify patterns where the researcher determines what is to be studied and how it is to be examined (Bryman et al., 2025; Creswell & Plano Clark, 2007). The latter approach includes open-ended information that focuses on the interpretation of textual data, with priority given to participants' perspectives and what they perceive as important. Creswell and Plano Clark (2007) suggest that a more meaningful distinction between the two methods is whether the data is open- or close-ended, rather than in the sources used when collecting data. Li

The quantitative component consists of an analysis of previously collected survey data and is included to identify statistically significant relationships between variables. The research design was developed by taking Bryman et al. (2025) characteristics of quantitative research into account, these being causality, generalizability and replicability. More detail about this process is provided in section 3.2. Additionally, building on the results from this analysis, an area-based parking analysis was conducted to see patterns in on-street usage in different areas of the city.

The qualitative research methods are employed in the form of a literature analysis and semi-structured interviews, this research strategy was selected to gain a deeper understanding of the issue and the results from the quantitative study. This approach is grounded in Bryman et al. (2025) emphasis on understanding participants' perspectives within their social context, including the specific relationships, networks and environments in which they operate. This analysis involves organizing collected information into categories that highlight differences in gathered perspectives, (Creswell & Plano Clark, 2007). The literature review provides contextual background for the study, while the interviews offer insights into how participants respond to and are influenced by this context. Further details are presented in section 3.3.

By combining the two, this study adopts a mixed-methods approach, in accordance with Creswell and Plano Clark (2007). Rather than using each dataset in isolation, this design provides a deeper understanding of the topic while also mitigating the inherent weaknesses of each method. However, Creswell and Plano Clark (2007) emphasizes that this benefit is only realised if the data is actually mixed, it is not sufficient to merely collect and analyse different forms of data separately. Within this framework, a convergent parallel design for the integration of data was selected (Creswell & Plano Clark, 2011). This design means that the datasets were collected separately but simultaneously, with equal importance given to each. This resulted in an analysis that merges the datasets seeking for similarities, differences, contradictions and connections.

3.1 Literature Analysis

The motivation for conducting this report originates from the GotPark project (Holm et al., 2025), which therefore accounts for a large part of this paper. As this report focuses on

Gothenburg, it was important to establish an understanding of the historical development and current versions of parking regulations in the city. Historical material was therefore collected from the regional archives of Gothenburg (Regionarkivet, n.d.). Current parking regulations and policy documents were found through the official municipal website of Göteborgs Stad (Göteborgs Stad, n.d.-h). These documents include the current parking policy that forms the starting point for this thesis (Göteborgs Stad, 2009) as well as complementary documents such as the guidelines for mobility agreements (Göteborgs Stad, 2018).

To compare Gothenburg's parking approach with those of other cities and to assess the credibility of the findings, additional literature and reports were reviewed. These sources were partly provided by the project supervisor and partly found through searches in Google Scholar. The searches used keywords such as “on-street parking”, “parking policy”, “residential parking”, “maximum parking requirement” and “Gothenburg parking” in both English and Swedish. This process identified examples from other cities that could either support Gothenburg’s approach or suggest alternative strategies. The review primarily focused on studies from European countries with comparable population sizes in order to ensure a more relevant comparison.

3.2 Gothenburg Mobility Survey Analysis

To further evaluate on-street parking according to the research questions, the answers from the Gothenburg mobility survey were analyzed. The answers provided information on mobility patterns and parking habits. The given data did not include any personal information such as names or apartment number, thus identities of the respondents were kept anonymous.

The survey was conducted within the GotPark project, sent by Chalmers to roughly 11,000 residents of properties both with and without mobility agreements. Within the survey, respondents are categorized into 24 different locations or blocks rather than a specific property. Many of these locations include multiple properties, hence all properties of the same address and owner will be referred to as a block of properties. This is the case for the subsequent parts within this report concerning the survey and its data.

A total of 1,394 responses were available for this project, which results in an average response rate of 13%. Out of these, 554 respondents answered that they owned a car (40%). For some questions in the survey only the respondents that owned a car were included. This is further specified within the results sections.

Certain survey questions in the survey were especially significant as these were deemed most relevant to answer research questions number 1, 2 and 3. Research question number 4 was not included since it did not have any direct connection to the survey-data. Each research question was given its own theme:

- RQ1 - determinants of parking choice
- RQ2 - car usage and ownership in relation to mobility agreements
- RQ3 - mobility patterns and attitudes toward parking costs

In total there were 14 selected survey questions. These were divided into one of the themes, resulting in three different groups based off of the research questions. These groups were then analyzed in different ways with specific comparisons that are mentioned below.

For RQ1 and RQ3 the answers were compared by car-owners who park off-street and those who park on-street. The question used to make this division was:

“How do you park your car at home? (If you have more than one car, choose the parking option used for your primary car).”

The division of which parking alternative that was defined as on-street or off-street is presented in Table 3.1. The alternatives were defined with the help of the project’s supervisor Devon Mc Aslan. The on-street category includes the following parking options: “Street parking (eg. without permit, free)”, “Residential parking permit” and “Parking permit/ tillståndsparkering”. Parking permit/ tillståndsparkering is similar to residential parking permit except one does not need to live in the area where the permit is valid (Göteborgs Stads Parkering AB, n.d.-c), this type of parking will be called general parking permit in this report, to clarify the difference from residential parking permit. The other category, off-street parking, includes the options: “Underground parking garage”, “Outdoor parking lot at apartment building”, “Above ground, stand-alone parking garage” and “Outdoor parking lot not at apartment building”. The alternative “Outdoor parking lot at apartment building” implies that the parking lot is owned by the residents’ property owner while the other alternative “Outdoor parking lot not at apartment building” indicates that the parking lot is owned by another provider/company.

Table 3.1. Alternatives for parking at home.

<i>On-Street Parking</i>	<i>Off-Street Parking</i>
<i>Street parking (e.g., without permit, free)</i>	<i>Underground parking garage</i>
<i>Residential parking permit, from Goteborgs stad</i>	<i>Outdoor parking lot at apartment building</i>
<i>Parking permit / Tillståndsparkering, from Goteborgs stad</i>	<i>Above ground, stand-alone parking garage</i>
	<i>Outdoor parking lot not at apartment building</i>

For RQ2 the aim was to investigate the effect on-street parking has on the mobility agreements, therefore the responses were divided by blocks with higher usage of on-street parking (HU) and blocks with lower usage (LU). To be classified as a high-usage block, at least three respondents who park on-street were required, representing a minimum of 5% of all responses for that block. The threshold of three responses was considered sufficient to ensure the reliability of the data, due to some blocks only having 20 responses in total.

Four different groups were compared by the requirements above. The comparison groups are blocks with (MA) or without mobility agreements (COMP) in combination with having either

higher or lower usage of street parking. In Table 3.2, the number of respondents and blocks of each comparison group is presented.

Table 3.2. Number of responses per category. Number of blocks in parentheses (num. blocks).

	MA	COMP
High-usage of on-street parking > (3 ppl : 5%)	279 (5)	112 (3)
Low-usage of on-street parking < (3 ppl : 5%)	583 (15)	372 (11)

3.2.1 Correlation Analysis

The survey analysis represents a quantitative approach, generating quantifiable data that allows for statistical analysis and generalization. The primary method used was correlation analysis, which aimed to examine whether a relationship exists between two variables. For example, the analysis explored whether the number of cars owned by a respondent is correlated with their parking type (on-street vs. off-street). A significant correlation would indicate that changes in one variable are associated with changes in the other (Greve, 2021).

The detailed process involved counting the number of responses for each answer alternative within each group, calculating the corresponding percentages, and then comparing these values to identify potential correlations. Thus, possible factors could be identified that may explain why some choose to park on-street instead of off-street. The survey responses being provided in an Excel file by the project supervisor made comparing different parameters easier and allowed the possibility of creating diagrams to present the results.

3.2.2 Data Visualisation

Data from the Gothenburg Mobility survey was further analysed using Python pandas on PyCharm IDE by JetBrains. The data sorted excel file was exported into a CSV format to more easily be read by the program, with the code for the process being generated with help from ChatGPT by OpenAI (OpenAI, 2023).

This analysis was done in a two phase process. First plotting answers from respondents individually in 2D and 3D scatter plots, followed by grouping respondents by property to compare the average value of properties. Datapoints in range values were assigned random values within the given range to allow for plotting on discrete axes. The plotted data was subsequently visually analysed to identify trends, clusters and other groupings as well as outliers (Unwin, 2020).

3.3 Interviews

Since the survey analysis provides quantifiable data, the focus of the interviews was to gain qualitative data through semi-structured interviews. Alvehus et al. (2025) defines semi-structured interviews as a balance between structure and flexibility. The interviews were conducted to address the research questions as well as to develop a deeper understanding of perceptions and the functioning of on-street parking in Gothenburg. Interviewees included property owners and municipal officials working with mobility and parking and were selected through a snowball sampling strategy, as described by Bryman et al. (2025). Initial participants were identified through recommendations from the projects' supervisor, after which interviewees suggested additional relevant actors.

Introductory emails were sent to contact the stakeholders, following guidelines from Bryman et al. (2025). The mails clearly outlined the purpose of the study, the reasons for selecting the informant and ensuring a polite and flexible approach.

Prior to the interviews, interview guides were developed in line with the definition proposed by Bryman et al. (2025), containing themes and guiding questions aligned with the research questions. In accordance with the ideas of Alvehus et al. (2025), particular emphasis was placed on designing these in a way that allowed informants to shape the discussion based on their knowledge, while enabling interviewers to adjust the order of questions, ask follow-up questions and explore emerging topics. The guides were iteratively adapted as the study progressed. While they differed slightly between groups, they maintained a similar thematic structure for property owners and municipal actors.

The interviews were then conducted both in person and via video calls. To preserve non-verbal cues important for trust and interpretation, video was used instead of only audio formats when physical meetings were not possible. All participants gave consent for their names to be used in this report. They were also given the opportunity to adjust the result prior to publication.

3.3.1 Göteborgs Stad

Göteborgs Stad is the central municipal decision maker when it comes to parking policy in Gothenburg. They were approached for interviews to gain knowledge of the underlying legislation and guidelines the city has in regards to parking and urban planning, and how the policy has changed since its adoption in 2009, as well as to gain their perspective on how it could be improved. The planned questions were designed to answer how their policies work towards the city's goal for sustainable mobility and how they use on-street parking as a regulating tool, with a focus on the role of on-street parking, the p-norm and mobility agreements for apartment buildings. The departments of Göteborg Stad most associated with parking questions are Explateringsförvaltningen and Stadsmiljöförvaltningen, and that's why they were approached for interviews.

Explateringsförvaltningen is responsible for managing the municipality's land and developing it sustainably and played an important role in the creation of the mobility

agreements, as well as working with Göteborg Stad's p-norm policies, connected to residential off-street parking (E. Backelin, personal communication, March 26, 2026). They strategically acquire or sell land to developers for infrastructure or housing developments. David works with questions regarding off-street residential parking and was therefore the one interviewed within this department.

Stadsmiljöförvaltningen is the department responsible for the city's public spaces and their day to day operation, including managing the municipality's parking (E. Lennartsson, personal communication, March 31, 2026). It acts as Gothenburg's traffic authority for movement via cars, bikes and by foot, as well as managing services like street cleaning, snow removal and other public services. Erika, who works mainly with parking policy and pricing, was interviewed within this department.

3.3.4 Property Owners

Out of all the property owners mentioned in GotPark, two were identified as particularly important to interview in order to better understand their perspectives regarding the mobility agreements and on-street parking. The selected organisations were Sverigehuset and Poseidon AB chosen as they enable a comparison between new and old buildings, as well as public and privately owned companies. Both organisations are involved in property development and management with a mix of properties with and without mobility agreements. The interviews with the property owners contributed to answer the central research questions and to see how they interacted and cooperated with the municipality regarding parking use and behaviour. They also provided perspectives from both the public and private sectors in relation to property development and management.

Poseidon AB is a municipally owned company that manages approximately 29,000 apartments and serves around 60,000 tenants, making them the largest property manager in Gothenburg and one of the largest housing providers in Sweden (I. Jonsson, personal communication, March 18, 2026). Poseidon is part of Framtidenkoncernen which is Göteborgs Stads property group (Framtiden, n.d.). Within Framtiden, there is an agreement stipulating that all new developments must include a mobility agreement (I. Jonsson, personal communication, March 18, 2026). Furthermore, in zone A and B, mobility measures are adopted at the highest level of ambition in order to make maximum reductions in the p-norm. Since the introduction of this agreement, Poseidon has signed mobility agreements for ten new developments.

In contrast, Sverigehuset is a privately owned company and manages approximately 750 rental properties (A. Henriksson, personal communication, March 10, 2026). All developments constructed over the past ten years have included mobility agreements.

3.4 Area-Based Parking Analysis

The objective of the area-based parking analysis is to examine specific areas with varying parking conditions. By comparing areas with high use of on-street parking and areas with low use, it becomes possible to identify trends and characteristics that contribute to answering

RQ1. These findings may also provide valuable insights into potential improvements for a more effective parking regulation, thereby providing a basis for RQ4 as well. The areas that were analysed were those surrounding specific blocks from the Gothenburg mobility survey. Two separate studies were made for each area: collecting comparable information about the blocks and mapping all on-street parking spaces in close proximity to it.

A list was made of all blocks with at least one on-street response. The reason for this was to only compare the blocks where residents had the option of on-street parking. For blocks with no on-street responses, it was possible that there was no on-street parking available. The sorting was conducted by using the same question as in the survey analysis for RQ2. The blocks listed were divided into two groups, high usage and low usage of on-street parking. The high usage group consisted of blocks with at least three on-street responses representing a minimum of 5% of the total responses for that block. The low usage group were the rest of the blocks from this list. For each group, the three blocks with the highest number of responses in total were selected for the analysis. A higher number of responses is desirable due to more data supporting the same outcomes, increasing the reliability of the analysis. The six blocks that were chosen are presented in Table 3.3 along with the corresponding percentage of on-street responses.

Table 3.3. Selected blocks for area-based parking analysis with total number of on-street responses with corresponding percentage.

Area	Kallebäcks Terrasser	Ekebäcks höjd	Munspels gatan	Rambergs staden	Fix fabriken	Mandolin gatan
Total	5	1	3	6	6	7
Percentage	3.1%	1.1%	4.2%	6.3%	9.5%	8.5%

3.4.1 Table of Property Information

A table was made with relevant information about each block. Since the responses of the Gothenburg mobility survey were from 2024, it was sought to find information also from the same period. The number of cars and the number of households were retrieved from the year 2024. Other information such as coverage rate of parking and specific costs of on- and off-street parking were only available from recent statistics.

The first step was finding the owner of all properties. To identify the property owner, the map and website of the Swedish mapping, cadastral and land registration authority was used (Lantmäteriet, n.d). Each property owner was then emailed requesting the number of residential parking spaces and the residential parking coverage rate.

For the data that was not provided by the property owner, it was obtained from the collection of reports provided by the project supervisor. Information regarding the number of households was provided by the project supervisor via email (D. Mc Aslan, personal communication, May 11, 2026). The number of residential parking spaces as well as the

property p-norm, were retrieved in the building permits of the properties which are sourced from Göteborgs Stad through the supervisor, the majority of these are not able to access online, but can be requested from Göteborgs Stad.

Other facts such as number of cars were found in the database Personbilar i trafik from the statistics bank of Göteborgs Stad (Statistikdatabas Göteborgs Stad, 2024). In order to identify the corresponding administrative area (basområde), the map of administrative areas from Göteborgs Stad was used (Göteborgs Stad, n.d.-a).

The paid parking costs, not managed with parking permits, were obtained from different maps which is further explained in Chapter 3.4.2. For on-street parking, the costs were stated as SEK/hour. The parking costs often differed during the day compared to the night where a majority of the blocks had a day-time price applicable during the hours 8-22, and a night-time price during 22-8. On average, a car is parked at the residence 73% of the time (Nagler, 2021), which is approximately equivalent to 17.5 hours. It was assumed that the average car is at home between the hours 14.30 to 8 in the morning, signifying 7.5 hours of day-time price and 10 hours of night-time price. The monthly cost for each area was calculated using the equation in Figure 3.1.

$$\left[7.5 \times \text{Day price} + 10 \times \text{Night price} \right] \times 30$$

Figure 3.1. Equation for calculating monthly costs for on-street parking.

3.4.2 Mapping of On-street Parking Spaces

All on-street parking spaces in the area of the blocks were mapped within a distance of 800 meters from the properties. The distance of 800 meters was chosen in accordance with the case study template of Stadsbyggnadsförvaltningen (2020). For some blocks where the properties were spread out, the distance of the radius was made longer or another circle was added. The circle around the block was made with the tool “Draw a circle” (Map developers, n.d.). The map of the specific area with the circle, was then exported to the editing software Paint (Microsoft, 2026). In Paint the streets with on-street parking were marked in different colors depending on the type of parking.

Each on-street parking space was classified into any of the following categories:

- Free parking (>12 hours)
- Paid parking
- General parking permit
- Residential parking permit

All free parking spaces were located using the parking application Parkopilot (Parkopilot, 2026). Some of the paid parking spaces were located using the parking application EasyPark (EasyPark, n.d.). Some were found using the filter Bilparkering using the map

Parkeringskartan (Göteborgs Stad, n.d.-e). The rest of the paid parking spaces were found with the filter Besöksparkering using the map “Hitta parkering” (Göteborgs Stads Parkering AB, n.d.-b).

The mapped parking spaces for general parking permits, were those that could be applied for by any citizen. These spaces were located with the filter Parkeringstillstånd using the map “Hitta parkering” (Göteborgs Stads Parkering AB, n.d.-b), and information regarding price for these permits were also collected through this map. If these also existed on the map Parkeringskartan (Göteborgs Stad, n.d.-e), they were counted as spaces that anyone could apply for. If they were not included, this signifies that the spaces are restricted to specific groups, such as healthcare and educational professionals etc.

The parking spaces for residential parking permits were only mapped if a property was eligible for it. This was determined through checking the address of the properties (Göteborgs Stad, n.d.-g).

To ensure that all parking spaces that were mapped were on-street, the application of Google Earth was used (Google, n.d.). The parking spaces that were relevant for the analysis were all spaces located on the public streets. Therefore all parking spaces located on streets with “Street view” available, were mapped as on-street parking in the analysis.

3.5 Use of Artificial Intelligence

Within this project, artificial intelligence (AI) was used carefully and cautiously during varied occasions. The information provided by AI was not used without thorough review with regards to the potentiality of its sometimes misleading and incorrect generated information. With AI as a support, the project was more effective due to the reduced time spent on time-consuming tasks. The specific areas that AI was used as an assistance for were questions regarding creativity, language, searching and generating.

For creativity, AI helped with brainstorming ideas during the early planning phase of the project. It was also used for inventing names for themes and titles in the report such as “Area-based parking analysis”. With language, AI was used for translation of words from Swedish to English, rewording and rephrasing shorter sentences and finding synonyms. Further AI was applied when searching for specific data such as words or numbers in big documents. For example finding the p-norm in the documents of the building permits. Lastly AI supported in generating code for Python. By prompting pseudocode for analysing survey data csv (see Appendix D).

The AI tool that was used was ChatGPT from OpenAI.

4. Results

This chapter presents the results from the interviews, survey analysis and area-based parking analysis. The results are organised according to the research questions and focus on parking behaviour, mobility patterns and the relationship between on-street and off-street parking in Gothenburg.

4.1 Gothenburg Mobility Survey Analysis

The results from the survey analysis of the Gothenburg Mobility Survey will be presented in this section, divided into three sections corresponding to research questions 1, 2 and 3 respectively: determinants of parking choice, car usage and ownership in relation to mobility agreements and finally, mobility patterns and attitudes toward parking costs. In order to present the most interesting findings, only a selection of the analysis is presented. The remaining parts, not showing any clear results or trends, can be found in Appendix B.

One important note when reading this section, when comparing responses from the different groups in section 4.1.1- 4.1.4, the proportions within each group is compared. To clarify, the percentage within each group is used to compare the different groups, not the number of respondents. This method makes it possible to compare groups with different sizes, which is the case for this analysis.

4.1.1 Determinants of Parking Choice (RQ1)

This section presents the respondents' answers to survey questions linked to determinants of parking choice, to give a general overview of how on-street parking is represented in the Gothenburg Mobility Survey. Topics such as parking options, price and access to parking are addressed. The groups compared in this section are respondents parking on-street (61) and respondents parking off-street (493), respondents without cars (840) are not included in the analysis.

Figure 4.1 illustrates the type of parking that respondents in the Gothenburg Mobility Survey normally use at home. 11%, 61 out of 554, reported using on-street parking options, such as free on-street parking or with general and residential parking permits. The remaining 89%, 493 out of 554, use off-street options when parking at home, including different types of parking garages and parking lots.

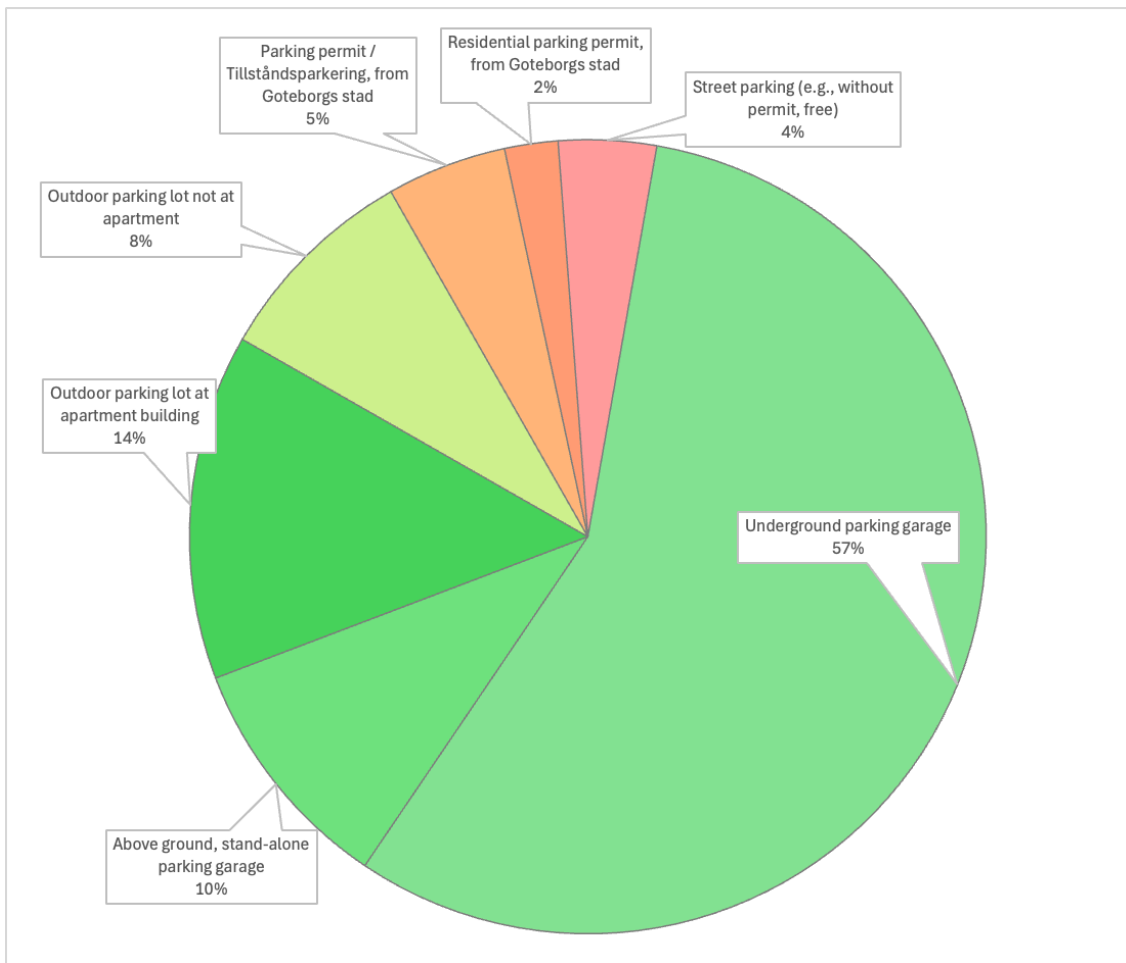


Figure 4.1. Parking options used by residents for primary cars, on-street parking options are colored red and off-street options are colored green.

Most respondents using on-street parking live in zone A, as displayed in Figure 4.2. In the survey, 51% of the respondents using on-street parking live in zone A, representing the majority of that group. Among respondents using off-street parking options, the largest group also lives in zone A, however representing just 39% of the total, meaning the distribution across the different zones is more even compared to the on-street group. Note that the number of respondents living in each zone is not displayed in Figure 4.2, the figure shows the percentage of the on-street respectively off-street group. The number within each zone can be found in Appendix B. In summary, the results indicate that the largest group of respondents using on-street parking live, and park their car, in zone A.



Figure 4.2. Percentage of on- vs off-street groups by parking zone, grouped by respondents parking on-street and off-street.

Regarding the distance between the respondents' homes and their usual parking spot, the two groups respond quite differently, shown in Figure 4.3. Among respondents using off-street parking, 69% responded that their parking spot is within a distance of 100 meters, the corresponding number for the on-street parking group is 11%. Overall, people using on-street parking usually have a longer distance to their parking spot than people using off-street parking.

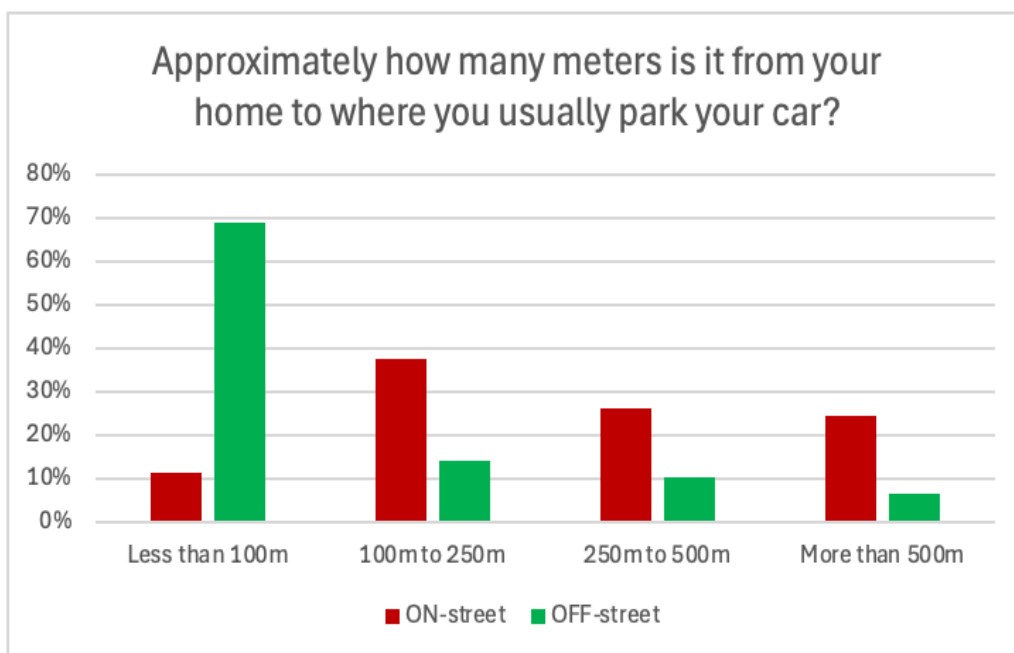


Figure 4.3. Respondents' home to parking distance, grouped by respondents parking on-street and off-street.

On average, the on-street parking group pays less for parking than the off-street group, which is shown in Figure 4.4. The largest proportion of people using on-street parking (44%) report a monthly parking cost of 501 to 1,000 SEK. Among the off-street group, the most common (41%) parking cost is within the span of 1,001 to 1,500 SEK per month.

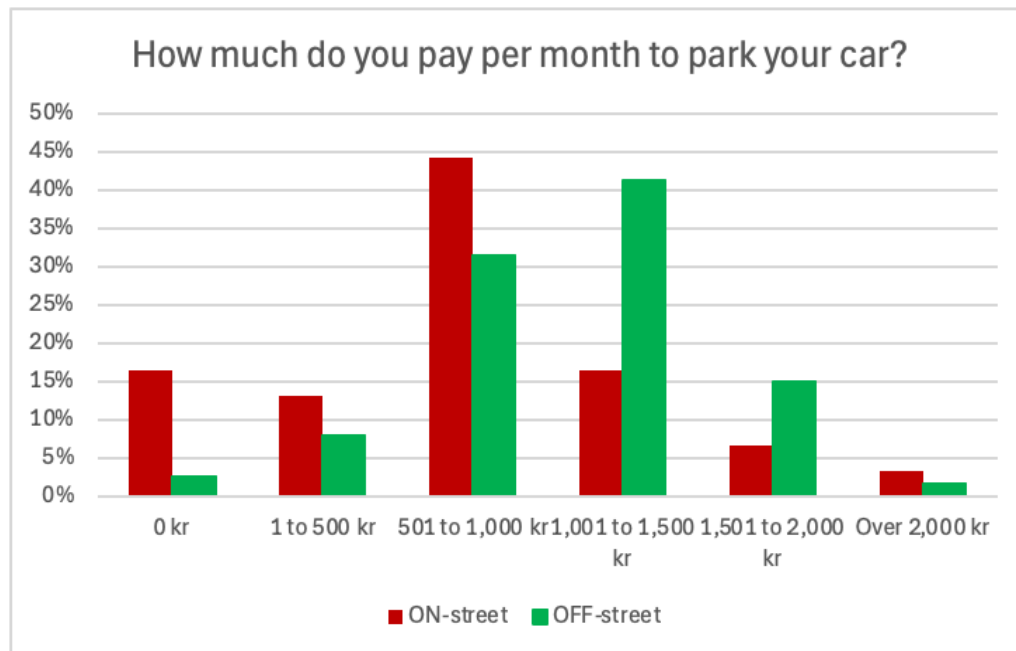


Figure 4.4. Respondents parking costs per month, grouped by respondents parking on-street and off-street.

Figure 4.5 plots all the responses from the survey by distance from home to parking, parking cost and car use time (per month). Observations in the diagram support findings from previous diagrams: the off-street parking (at building) cluster is almost entirely more than 100 m along the x axis representing parking-home distance, while the on-street parking groups are more spread along said axis, which correlates with diagram 4.3. Similarly observing the spread along the y axis representing parking cost shows most of the on-street parking groups lie within the 500-1,000 kr range with just a few outliers paying less than 1,500 kr per month, matching Figure 4.4. The correlation between diagrams of the off-street parking group is not as clear, but the increase in density within the 500-1,500 kr range is still visible.

Park. Home Distance - Park. Cost - Car Use Scatterplot

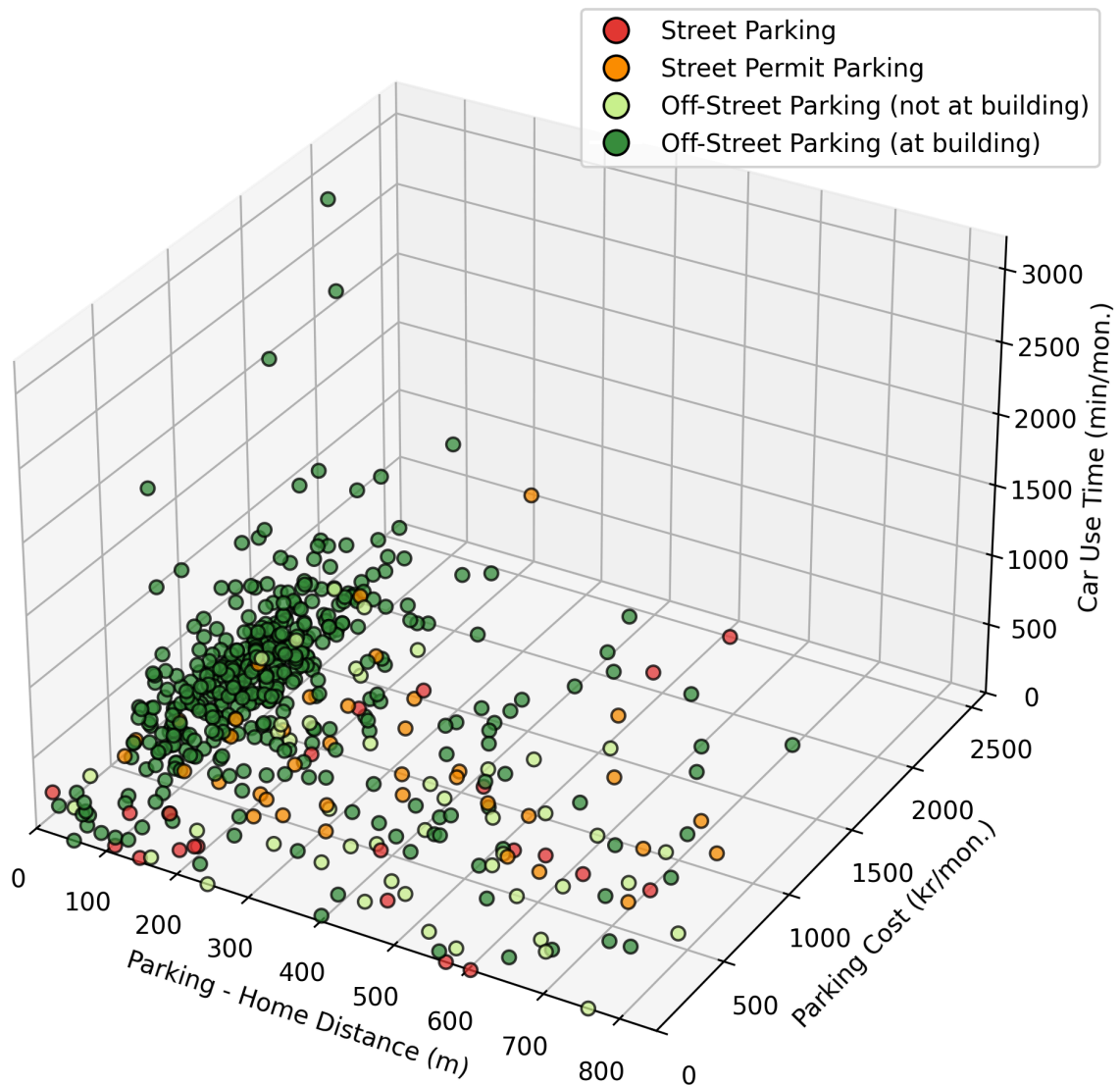


Figure 4.5. 3D scatterplot of respondents distance from home to parking, monthly parking cost and car use time, colouring based on parking type.

In response to the statement regarding whether there are enough parking spaces for residents in the building, the two groups show a similar distribution of responses, as illustrated in Figure 4.6. A larger proportion of respondents using on-street parking report “disagree very much” (41%) compared to those using off-street parking (34%). However, the majority of respondents in both groups believe that there is insufficient car parking available for residents in the building.

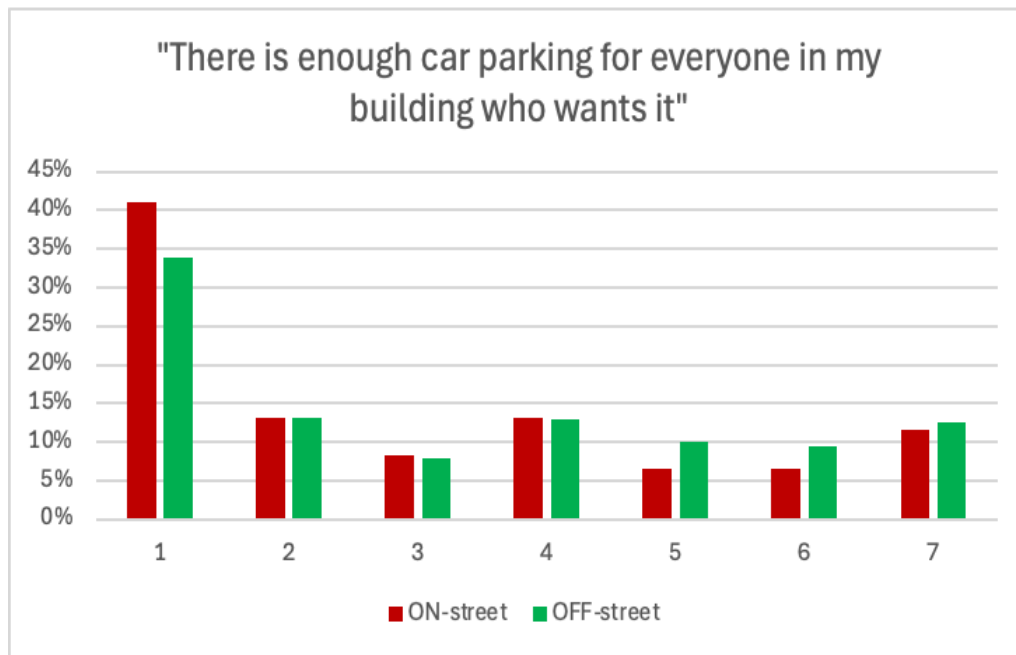


Figure 4.6. Respondents' attitude towards the statement that there is enough car parking in their building, grouped by respondents parking on-street and off-street. 1=disagree very much, 7=agree very much.

4.1.2 Car Usage and Ownership in Relation to Mobility Agreements (RQ2)

This section presents the respondents' answers to survey questions linked to car usage and ownership in relation to the mobility agreements. For this theme the residents were divided by which block they belong to, either a block with more people using on-street parking or a block with none to few people using it.

The groups compared in this section are respondents from blocks with mobility agreements in combination with either high use of street parking (279) or low usage (583), as well as the respondents from blocks without agreements in combination with high usage (112) or low usage (372).

Blocks with high usage of on-street parking are those with at least three residents responding they park on-street, representing a minimum of 5% of all responses from that block. Low usage are the rest of the answers. The colors chosen for each of the comparison groups are presented in table 4.1.

Table 4.1. Comparison groups for RQ2.

	Mobility agreement (MA)	No agreement (COMP)
High usage (HU)	MA + HU	COMP + HU
Low usage (LU)	MA + LU	COMP + LU

As shown in Figure 4.7, a majority of the responses within the survey are from those who live in blocks with mobility agreements (64%) and those who live in blocks with low/no usage of on-street parking (71%).

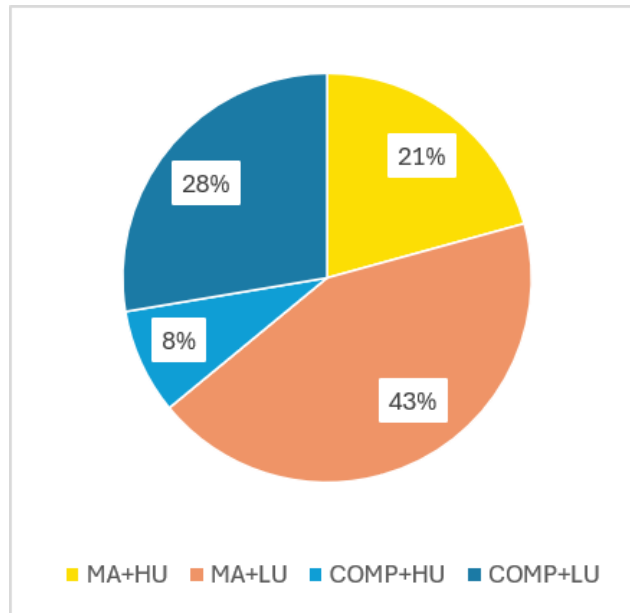


Figure 4.7. Percent of answers for each comparison group.

Figure 4.8, shows that the amount of cars per household (car ownership) falls within the range of 0.45 to 0.6 cars for all groups. At the same time there are noticeable differences between the groups. Both of the COMP groups have more cars per household compared to both of the MA groups, indicating a higher car ownership at blocks without mobility agreements.

When comparing the MA groups with each other and the COMP groups with each other, there are slightly more cars per household in the HU group than the LU one. Which indicates that there is a marginally higher car ownership at blocks with high usage of on-street parking than at the blocks with low usage.

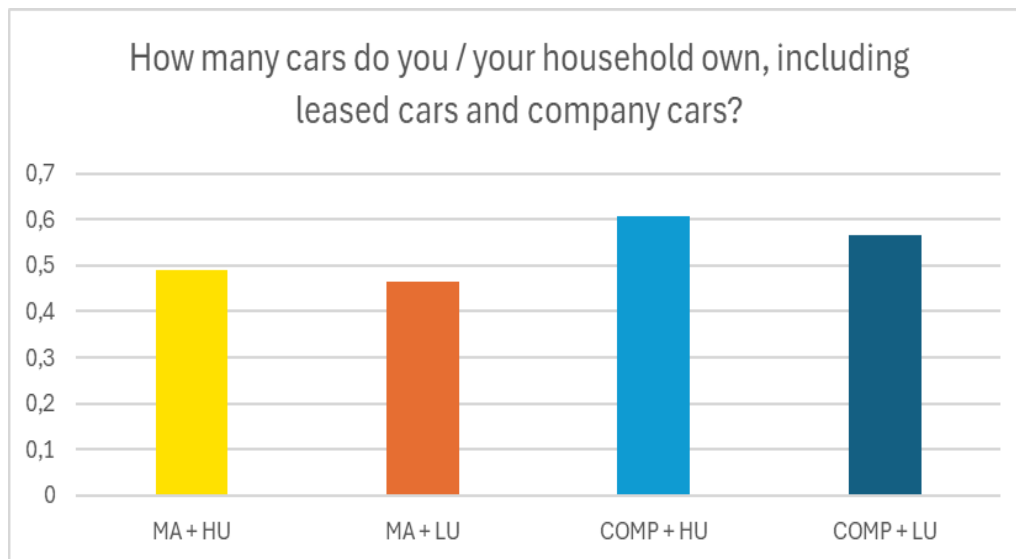


Figure 4.8. Cars per household (Total cars/number of respondents), by comparison group.

In Figure 4.9 the responses of the two MA groups are presented for the question of whether not owning a car is influenced by the availability of parking. A larger proportion (25%) of the HU group answered number 1 (very little), depicting that the availability of parking spaces is not a factor for not owning a car for the residents at blocks with higher on-street usage. Meanwhile a larger proportion (20%) of the LU group answered number 7 (very much), suggesting that residents at blocks with low usage are not owning a car partly because of the amount of parking spaces available. This could indicate that the residents at blocks with lower usage might not own a car because of a lower availability of on-street parking.

The responses of the COMP groups were also analyzed for this specific question but without any noticeable trends (see Appendix B).

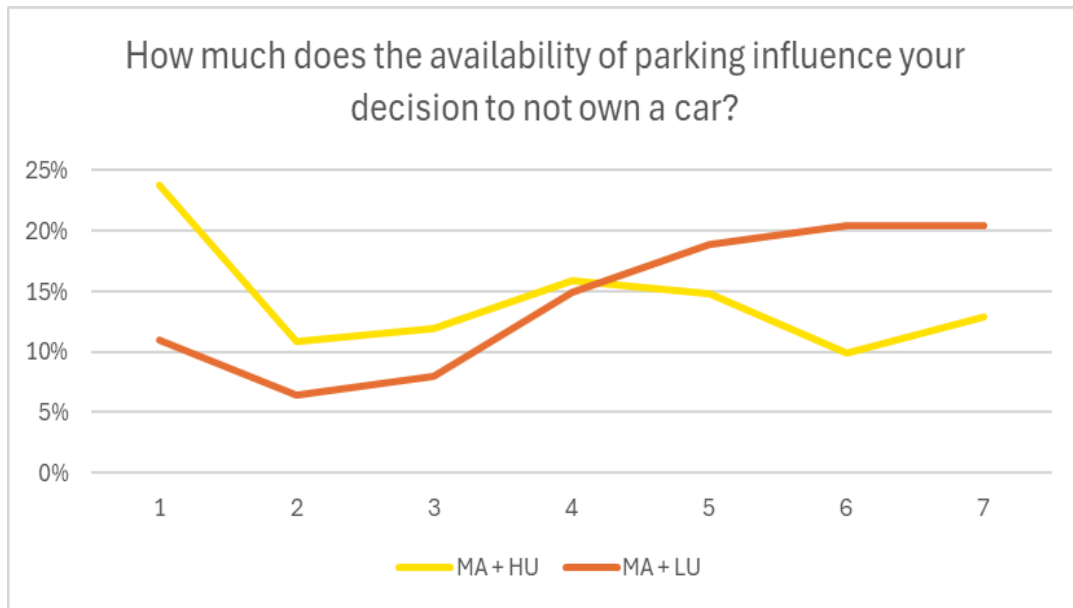


Figure 4.9. Respondents attitude to if availability of parking influences their decision to not own a car. 1=very little, 7=very much.

As shown in Figure 4.10, a large proportion (35-40%) within each group answered number 1 (not very much) to whether availability or cost of parking influence their decision to live in their current residence. There are no significant differences between the groups within this question. A majority of all residents appear not to be affected by parking availability when choosing where to live.

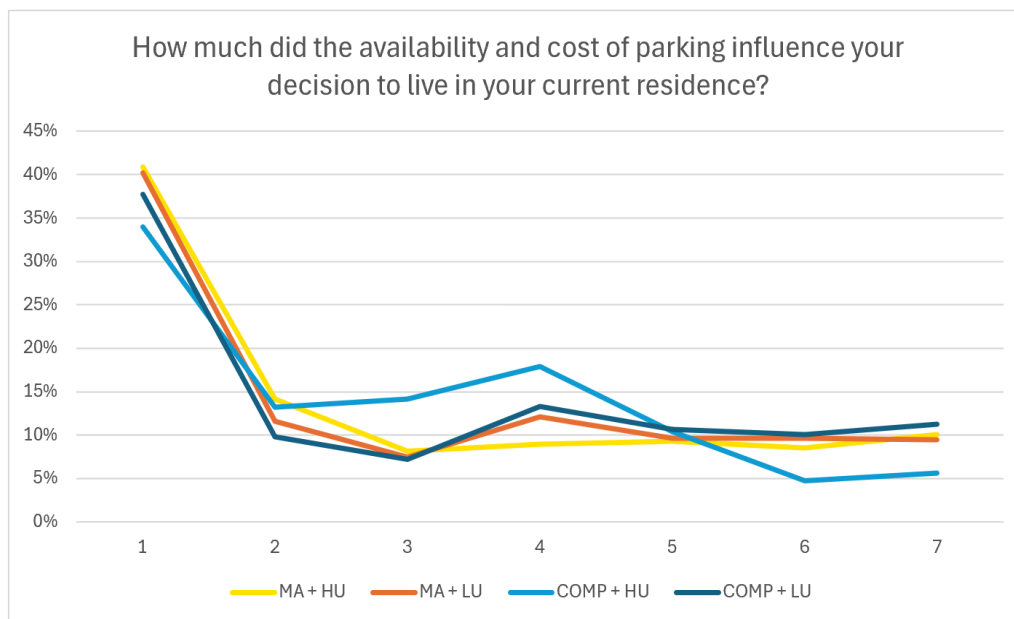


Figure 4.10. Respondents attitude to if availability or cost of parking influence their decision to live in their current residence. 1=not very much, 7=very much.

According to Figure 4.11, the largest proportion of all groups have not changed their travel habits after moving to their current residence. When responding to the statement of driving more or less, nearly 40% of the respondents in each comparison group answered number 4 (no change). Although there were approximately 25% of each group answering number 1 (driving less). It seems like there are no patterns differentiating the comparison groups for this analysis.

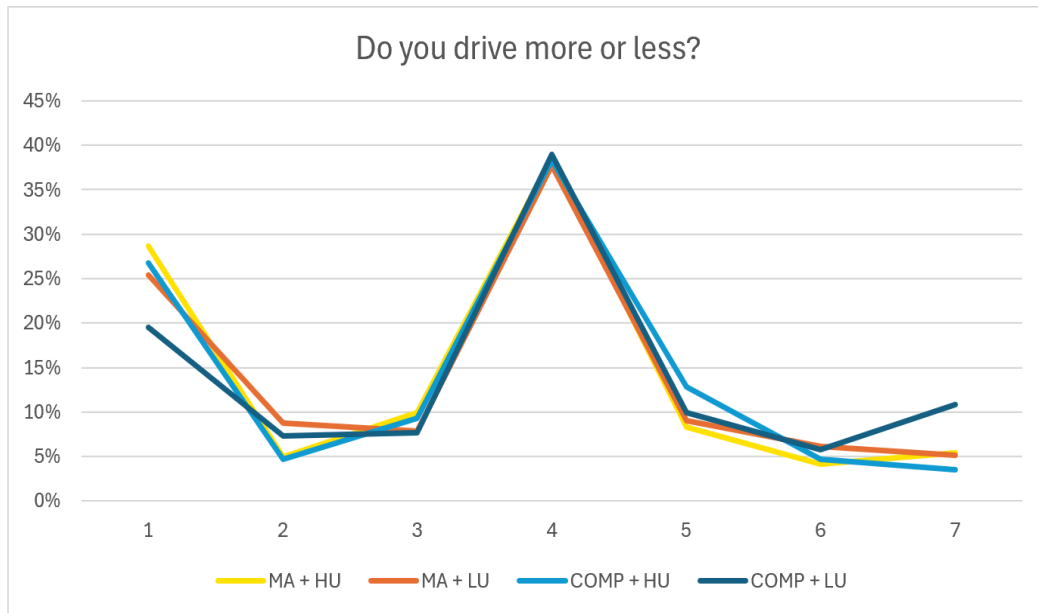


Figure 4.11. Responses to the question, “Compared to your previous residence, how have your travel habits changed? - Do you drive more or less?”. 1=drive much less, 7=drive much more.

Additionally, the statement “Mobility measures allow me to drive less” was analyzed for the MA groups (see Appendix B). For this statement a predominantly proportion of both groups answered numbers 4-7 where 7 represents: agree very much. Since there were no differences or trends between the groups, the specific analysis was not included for this chapter.

Plotting average property values for car use frequency and car use time shows a clear positive correlation trend, as seen in Figure 4.12. We also observe the clustering of properties into two major clusters with some outliers. The first cluster (closer to origo) contains most properties from both MA groups, denoting these properties as using cars for a smaller amount of time and less frequently. The second cluster contains most COMP properties, despite these generally being more spread out. This, in turn, denotes these properties as using cars for a larger amount of time and more frequently. The size of the circle being proportional to the number of respondents per property helps highlight how the majority of responses lie within the major clusters with the outliers representing a minority while still following the trendline. This trend and distribution of property types (MA/COMP) shows mobility agreements succeeding in their purpose of reducing car utilisation.

Car Use Frequency - Car Use Time Scatterplot

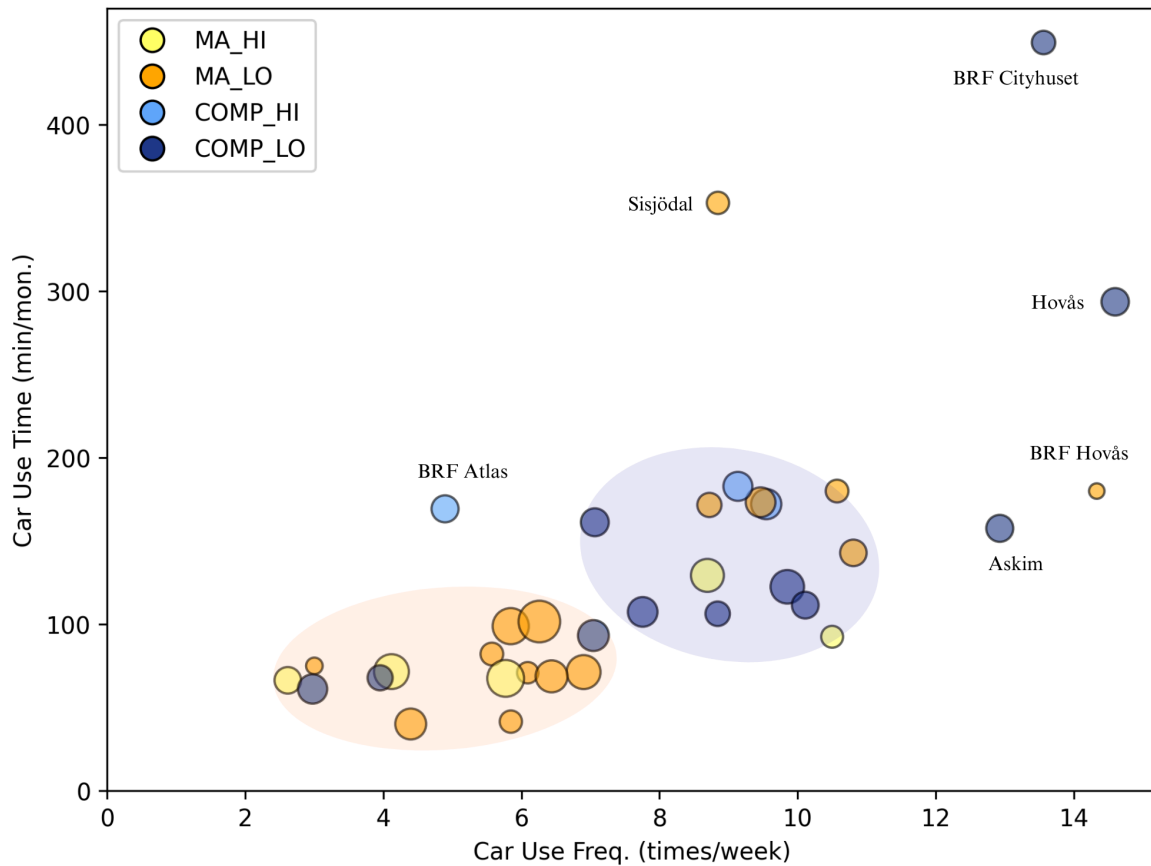


Figure 4.12. 2D scatterplot of respondents car use time over car use frequency, grouped by block. Colouring based on block category.

Figure 4.13 shows the distribution of properties over the same axes as 4.5 (which plotted individual respondents). We observe weaker groupings of the weighted majority of COMP properties, with MA properties being more spread out in this case. We also observe properties with more responses (larger circles) trending toward the middle of the graph. Conclusively, no major noticeable difference can be observed between the groups.

Park. Home Distance - Park. Cost - Car Use Scatterplot

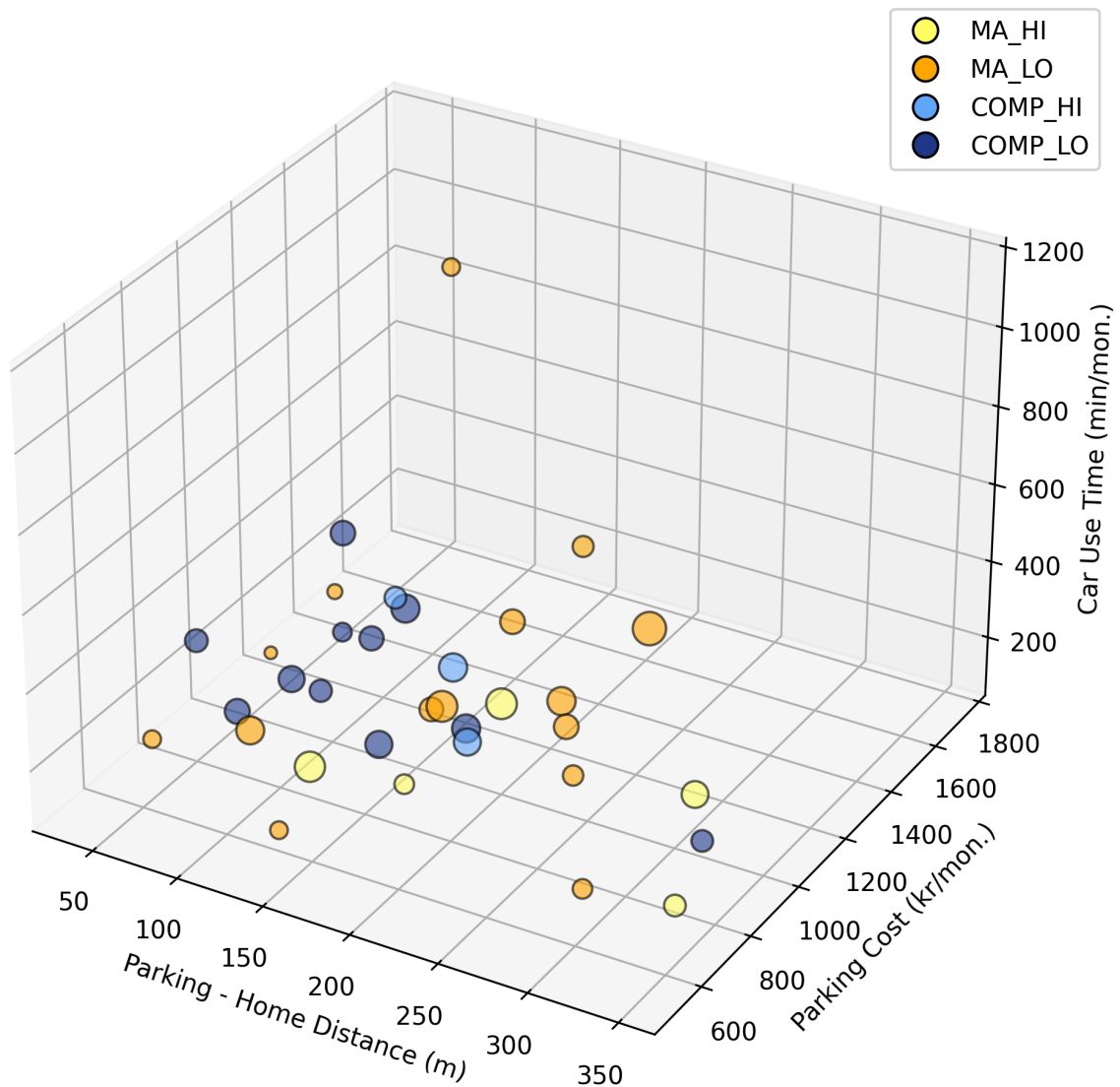


Figure 4.13. 3D scatterplot of respondents distance from home to parking, monthly parking cost and car use time, grouped by block. Colouring based on block category.

4.1.3 Mobility Patterns and Attitudes Toward Parking Costs (RQ3)

This section presents the respondents' answers to survey questions linked to mobility patterns and attitudes toward parking costs. The groups compared in this section are respondents parking on-street (61) and respondents parking off-street (493), respondents without cars (840) are not included in the analysis.

Figure 4.14 presents the distribution of car ownership, in absolute numbers, per household. The options given (x axis): 1, 2 and 3+ most households that do own a car in a metropolitan city like Gothenburg own just one. 85-90% of households fall in this category, varying slightly between households that park their primary car on- versus off-street. This level falls dramatically to 10% for households with two cars, and falls further for households with three

or more. The difference between on- and off-street can be considered negligible in all cases.

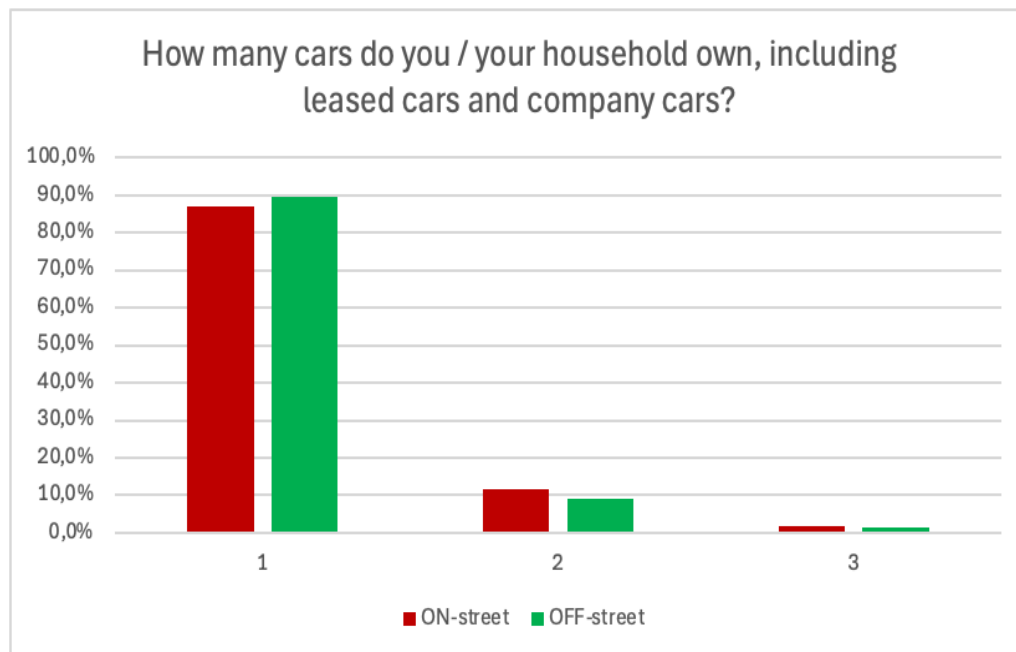


Figure 4.14. Bar graph of average number of cars per household, grouped by respondents parking on-street and off-street.

Figure 4.15 presents the distribution in hours per week spent travelling in a personal car. On- and off-street groups match closely in their distribution with the on-street group skewing slightly more toward 4-6 hours against the off-street group having a more distinct peak at 1-3 hours. Overall, most respondents in both groups drive the same amount of time, 1-3 hours per week.

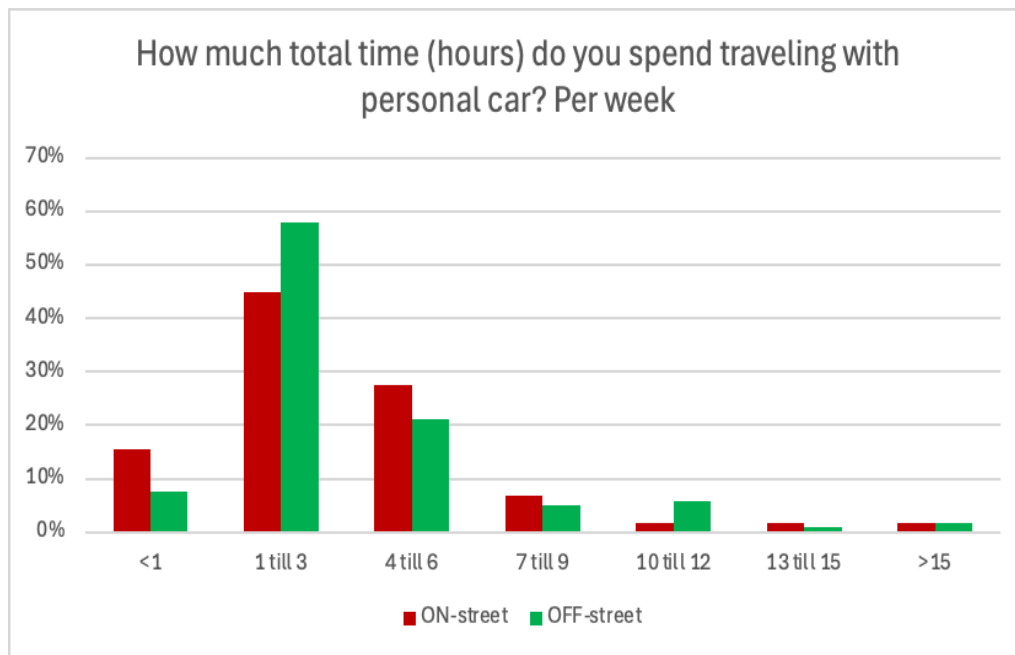


Figure 4.15. Distribution of respondents car use per week, grouped by respondents parking on-street and off-street.

Plotting car use time over parking-home distance shows most respondents use their cars <500 min per month, with the off-street supercluster also parking <100 m from home. Figure 4.16 shows a vague negative correlation between the two factors.

Park. Home Distance - Car Use Scatterplot

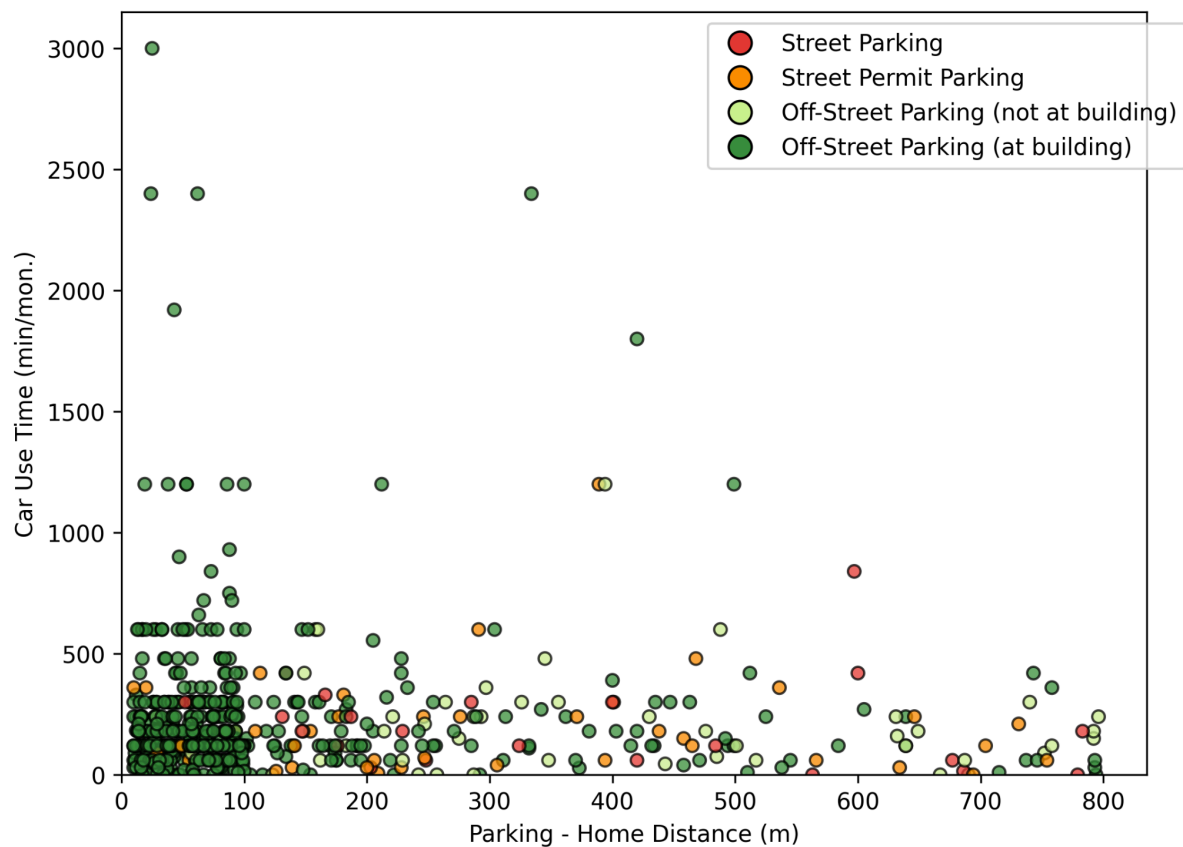


Figure 4.16. 2D scatterplot of respondents' cars use time over distance from home to parking, colouring based on parking type.

Figure 4.17 presents the distribution in percentage of answers given regarding the main mode of transportation used to commute to work or school. Once again both groups match closely with people parking on-street notably being lower in car-using categories. The low sample size of people using on-street parking is likely a reason for the absence of data for options 2 and 5.

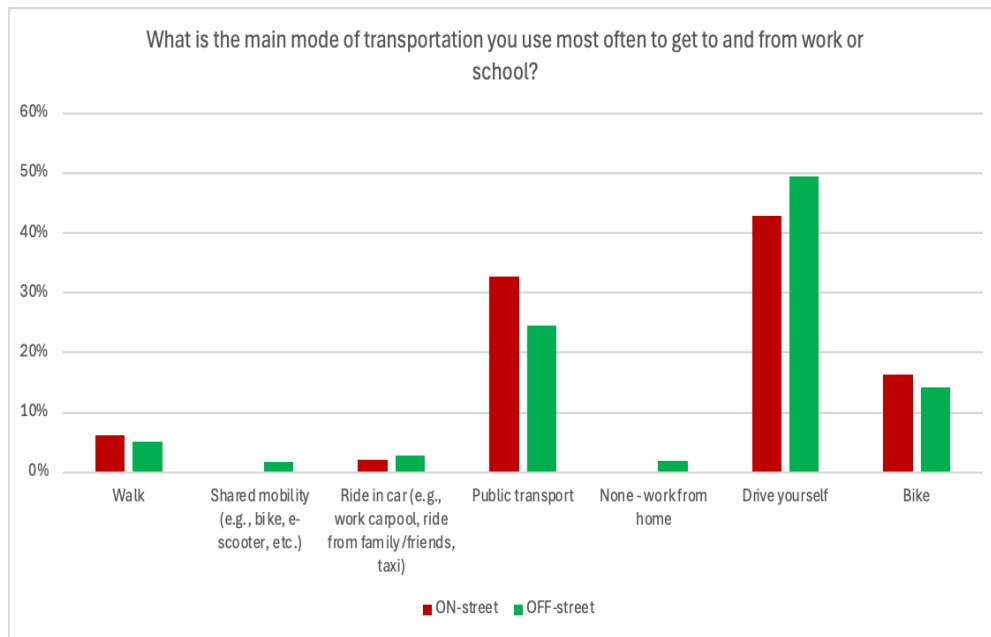


Figure 4.17. Bar graph of distribution between main modes of transportation, grouped by respondents parking on-street and off-street.

Figure 4.18 presents the distribution in percentage on the attitude towards the price of residential parking. The distribution of answers from both groups follows a similar trend skewing heavily towards 7 (agree very much), believing parking at their apartment building is expensive. Notably, the skew is much more prominent among people parking on-street with a 20 point difference showing at 7, showing this group to be much more price sensitive.

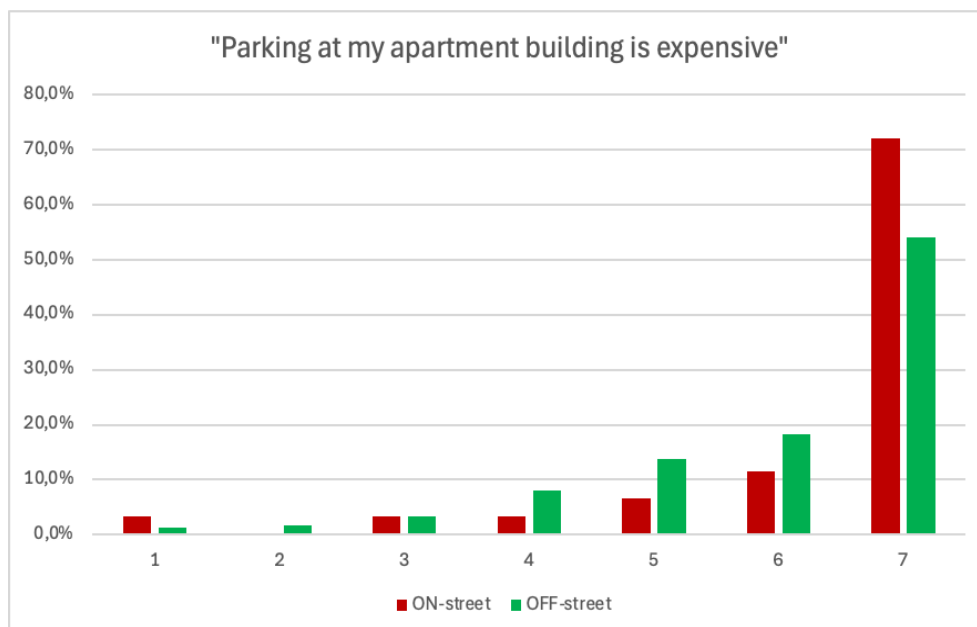


Figure 4.18. Bar graph of opinions regarding parking price at property, grouped by respondents parking on-street and off-street. 1=disagree very much, 7=agree very much.

Figure 4.19 presents the distribution in percentage of the respondents' opinion toward selling their car in the hypothetical doubling of their residential parking fee. The on-street group visibly disagrees (1) more than the off-street counterpart. This is likely due to the on-street group reasoning they are not affected by changes in price of off-street parking. The off-street group chose options 3 and 4 (indifference) much more prominently and the on-street group answering 5 points higher for strongly agreeing (7). The off-street group having a much more consistently spread over the spectrum shows lower price sensitivity toward the cost of parking. On-street parking answering 5 points higher at strongly agreeing (7) may represent the subset of this group who interpreted the question to mean all sorts of parking in and around the apartment including on-street parking.

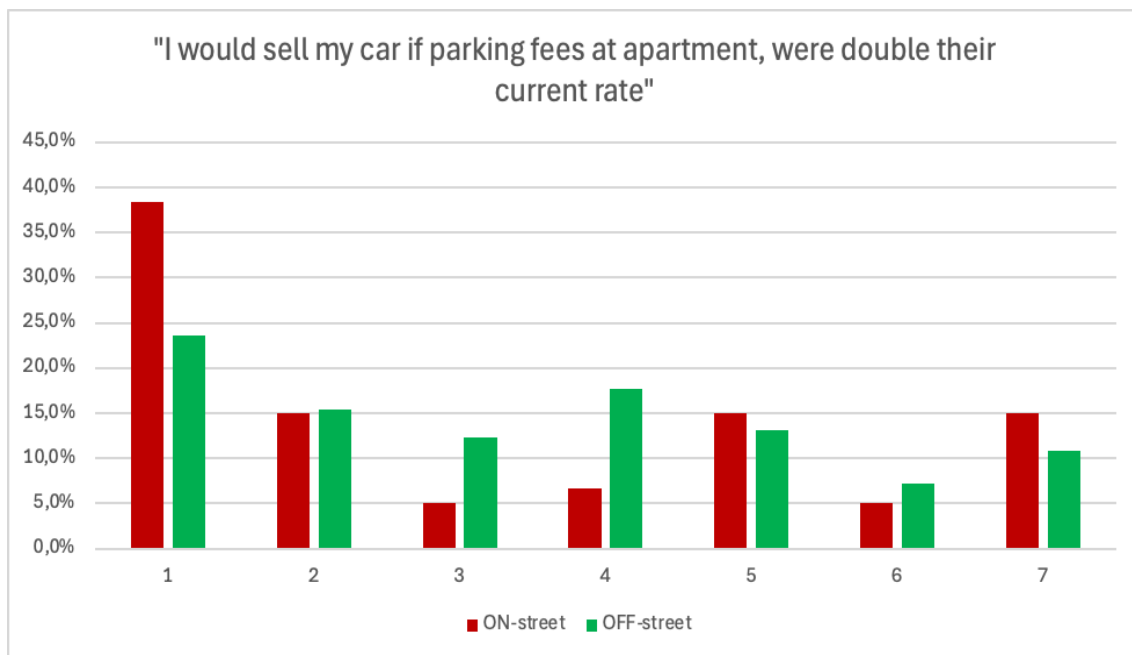


Figure 4.19. Bar graph of opinions regarding moving if doubled residential parking fees, grouped by respondents parking on-street and off-street. 1=disagree very much, 7=agree very much.

4.1.4 Summary of the Gothenburg Mobility Survey Analysis

The analysis of the Gothenburg Mobility Survey shows that 11% of respondents use on-street parking, with the majority of this group living in zone A. Respondents using on-street parking generally walk longer distances to their usual parking spot and pay less for parking compared to the off-street group.

When comparing blocks with high and low usage of on-street parking, separated into buildings with or without mobility agreements, there are few or no noticeable differences. One of these is that car ownership is lower in blocks with mobility agreements, compared to the comparison group. However, a more interesting aspect is that car ownership is lower in the low usage group compared to the high usage group in both the MA and the COMP groups. Another notable result is that respondents in the MA+LU group without cars believe that the parking availability influenced their decision not to own a car more strongly than respondents in the MA+HU group. This suggests that parking availability plays a larger role

in the decision to not own a car among residents in blocks with lower usage, compared to blocks with high usage. However, this pattern was not identified within the COMP groups. The analysis did not reveal any clear trends regarding whether respondents drove more or less compared to their previous residence, or how the availability and cost of parking impacted their decision to live at their current residence. The cluster analysis did not show any clear differences between the groups.

The final part of the analysis shows that the largest differences between respondents using on-street and off-street parking relate to attitudes towards costs rather than mobility patterns. Regarding car ownership and time spent travelling with their personal car, both the on-street and off-street group gave similar responses. The same applies to the main mode of transportation, although respondents using on-street parking reported using car-based options slightly less. A significant difference between the groups emerges in attitudes towards parking costs. The on-street group believes that the off-street residential parking is more expensive than the off-street group. The on-street group also indicates they are less sensitive to cost increases of residential parking, while the off-street group report to a greater extent they would sell their car if residential parking prices were doubled.

4.2 Interviews

The following chapter presents the results from interviews with David from Exploateringsförvaltningen, Anna from Sverigehuset, Erika from Stadsmiljöförvaltningen, and Ida from Poseidon. The results are divided into four themes that aim to answer the research questions of the report.

4.2.1 Observed Patterns and Scale of On-street vs. Off-street Residential Parking (RQ1)

David - Exploateringsförvaltningen

David observes that when on-street parking is priced lower than off-street residential parking, residents tend to make the economically rational choice to park on the street. According to David, this is seen as a barrier to achieving the municipality's 2009 parking policy, which states that residential on-street parking should be moved from public streets to private land. However, this issue is not considered universal. David goes on to mention that this is primarily associated with newly developed areas and other properties where on-street parking is not priced at market levels. In such cases, property owners may experience difficulties in renting out off-street residential parking spaces, leading to vacancy issues.

Erika - Stadsmiljöförvaltningen

Erika at Stadsmiljöförvaltningen observes that residents choosing on-street alternatives instead of their off-street residential parking is a problem and contradicts their goal of moving parking away from the streets and onto private off-street parking. She says that the gratisområdesutredning (free parking assessment) is a useful means to reach this aim and

over time will contribute to combat on-street parking. She also says that other tools, such as pricing, can be used to lower the demand for on-street parking over time.

Ida - Poseidon

Ida considers that free on-street parking is a challenge in areas where they are building new properties, especially when building facilities on existing parking spaces. In order for the investment in a new off-street residential parking facility to pay for itself and not have to burden residential rents, they need to charge a certain level of rent for parking, but it is difficult if there is free on-street parking in the area.

In one area where they have built several hundreds of new apartments during the last years, Poseidon has received reports from neighbouring property owners indicating that their residents make use of free on-street parking in, for example, detached house areas. By analysing statistics on car ownership within their properties in relation to the number of rented parking spaces, they have observed that approximately twenty residents in one of their properties choose to park elsewhere.

Anna - Sverigehuset

According to Anna at Sverigehuset, the relative price difference between off-street residential parking and on-street parking is a key determinant of parking behaviour. Specifically, larger price disparities appear to increase the likelihood that residents opt for on-street parking over off-street residential parking, as residents are more willing to spend time searching for on-street parking when the financial savings are substantial.

However, Anna explains that price alone is not sufficient to explain this behavior, accessibility of on-street parking also plays a critical role. According to the respondent, residents are unlikely to consistently choose on-street parking unless it is both low-cost and relatively easy to access. Even limited difficulties in finding available spaces may shift preferences toward off-street residential parking. Anna further suggests that this behaviour varies across demographic groups. Younger residents are perceived to be more willing to walk longer in exchange for free or cheaper parking, whereas older residents tend to prioritize convenience and therefore prefer parking within the property.

Anna notes that residents' preference for on-street parking over off-street residential parking depends on the area. Where free on-street parking is available, some vacancy in off-street residential parking is unavoidable, whereas limited on-street parking supply increases demand for off-street residential parking and reduces vacancy rates.

4.2.2 Consequences of Residents Choosing On-street Parking Over Off-street Residential Parking (RQ3)

David - Exploateringsförvaltningen

According to David, property owners may face challenges in leasing off-street residential parking spaces when residents opt for on-street parking. This can result in insufficient cost

recovery for parking investments, which, according to David, is a concern raised by property owners.

Furthermore, David explains that residents choosing on-street parking over off-street residential parking may result in planned parking situations for the area not being realised as intended. For example, unregulated streets in detached house areas near newly constructed developments may experience increased parking pressure as residents choose these streets over their off-street residential parking lots. This increased traffic presents safety concerns, particularly on streets where children are present.

Erika - Stadsmiljöförvaltningen

An important consequence of residents choosing on-street alternatives instead of private property parking is that property owners are left with underutilized parking facilities, which can become a big cost. Thus creating tension between them and the municipality, as they perceive that they are required to build more parking than will actually be used. Erika explains that residents choosing on-street parking also complicates the municipality's mission of shifting parking to private property. One reason for this is because residents parking on cheap or free on-street parking makes measures affecting pricing and supply reduction less effective to regulate. She also goes into on-street parking's effect on the allocation of public space. One of Stadsmiljöförvaltningens future goals is to replace on-street parking with other things such as bike lanes, green areas or other things that positively impact the shared public space. Persistent demand for on-street parking limits Stadsmiljöförvaltningens ability to implement these changes.

Ida - Poseidon

Ida argues that vacant parking spaces in general result in a significant loss of revenue. She further contends that street space is highly valuable and could, instead of being used for parking purposes, could serve other purposes, such as urban green areas, bicycle parking or recycling centres. Many neighbourhoods face severe lack of space, which makes it all the more important to use the land we have more efficiently.

Anna - Sverigehuset

The primary consequence identified by Anna is economic, particularly in the form of income losses caused by vacancies in off-street residential parking facilities. This is illustrated by the case of Lundby Park in Rambergsstaden, an area characterized by strong public transport accessibility and high availability of low-cost on-street parking, where Sverigehuset developed residential properties. Under these conditions, Sverigehuset experienced high vacancy rates in its off-street residential parking facilities. In response, Sverigehuset introduced a requirement stating that, when vacancies exist in the off-street residential parking facilities, tenants must rent a parking space in order to be offered an apartment. While Anna explains that this measure reduces financial risk for the property owner, she also notes that it may lead to social consequences. For example, such requirements may exclude

certain demographic groups from the housing market, particularly younger individuals who are less likely to own a car.

4.2.3 Experiences of the City's Current Parking Policies, Including Pricing Strategy and Availability of On-street Parking (RQ2 & RQ4)

David - Exploateringsförvaltningen

David highlights that the current overall parking supply in Gothenburg is extensive, which limits property owners' ability to charge prices that reflect the true cost of providing parking. Ongoing dialogue between Exploateringsförvaltningen and Framtiden, which is the Göteborg Stad's municipal real estate group, also suggests that an oversupply of low-cost parking is a concern.

To address parking displacement, a gratisområdesutredning (free parking assessment) is sometimes required during the planning process in order to evaluate the risk of residents choosing nearby free or low-cost parking alternatives. However, David explains that such assessments rarely result in new parking regulations. According to him, the city interprets existing legislation to mean that on-street parking may only be regulated after traffic-related problems have already occurred, rather than as a preventive measure. David notes, however, that the city of Örebro has interpreted the legislation differently, thereby creating opportunities to regulate streets proactively. He suggests that this interpretation could provide Göteborgs Stad with grounds to reconsider its current approach to the legislation.

As noted by David, a broader issue relates to insufficient coordination between property developers within a fragmented planning process. He further explains that development plans are treated separately, which can lead to suboptimal system-level outcomes. Although there is an ambition to promote shared parking solutions among property owners, implementation remains difficult. Developers often prioritise control and project timelines, leading to independent parking solutions rather than coordinated ones.

According to David, a revised ersättningsutredning (parking offset assessment) has been released to enable the use of vacant parking capacity in existing properties for new developments. This includes applying price elasticity analyses to estimate how utilization rates would change if parking fees were increased to market levels. The purpose is to avoid misleading conclusions based on currently underpriced parking. However, David notes that higher parking fees for off-street residential parking may encourage a shift toward on-street parking, although this risk varies by location.

Regarding the mobility agreements, David notes that the requirement for parking fees to be billed separately from rent may encourage residents to consider other parking options, including on-street parking. At the same time, the respondent argues that unbundling is positive for future flexibility, as it means parking spaces are not tied to specific apartments.

David notes that the current parking policy is under revision. As the new parking policy is a political mandate, politicians will only include elements that they consider appropriate. David

explains that the proposed revision aims to eliminate subsidies for on-street parking and instead move towards market-based pricing. However, he also points to political reluctance to approve increases in on-street parking fees, particularly in light of the upcoming election in September 2026.

Erika - Stadsmiljöförvaltningen

Erika explains that Stadsmiljöförvaltningen has a clear mission from the municipality to move parking away from the streets and onto private parking. This is currently regulated with pricing, time regulation and supply. Hourly parking prices have remained relatively unchanged over time which means that the effective cost of parking has gone down when accounting for inflation, but the pricing for city owned residential parking has been increased yearly. They are, however, still far below market prices. She also explains that Stadsmiljöförvaltningen have a limited ability to set higher parking prices by themselves, which makes the effect of the pricing limited. Stadsmiljöförvaltningen applies parking pricing as a tool to support the politically established goal of shifting parking from public streets to private facilities. However, pricing levels are mainly determined by the politicians. For example, a proposal to allow parking fees up to 65 SEK per hour was ultimately set at a maximum of 40 SEK per hour through political decision, which affects the department's ability to make certain adjustments.

The supply of on-street parking is sometimes reduced when part of urban development projects, like expansion of the bicycle lane network or more local development projects. Erika explains that changes like these often get implemented in broader urban projects, rather than standalone parking policy measures.

Ida - Poseidon

Ida does not believe that the city's pricing of on-street parking complies with the policy. The policy states that on-street parking should cost the same as, or more than, surrounding parking facilities, including off-street residential parking. Ida points out that currently, the price of on-street parking is lower than their residential off-street parking, making it difficult for them to set competitive prices without seeing an increased number of vacancies. She says that the city is well aware of the need for stricter regulation of on-street parking, but that reducing parking availability is a challenge. She notes that this is due to political obstacles, and the upcoming election in September 2026 is thought to have an impact. In summary, Ida argues that there is a lack of coordination in pricing between public on-street parking and private off-street residential parking.

Concerning the city's p-norm, Ida considers the current levels to be reasonable when constructing on undeveloped land. However, this was not the case when building on land that had already been developed. Before the new ersättningsutredning (parking offset assessment), property owners had to fully compensate for any parking spaces removed as a result of new construction. Ida points out that this is yet another contributing factor to vacant residential parking spaces within their facilities, rather than merely access to on-street parking. When having to replace 100% of the displaced parking capacity, without any flexibility to adjust the

supply based on actual demand, this sometimes led to significant overprovision. Due to this policy, Posiedon experienced, in some areas, up to 50% vacancies in their residential parking facilities, despite maximum reductions in p-norms through mobility agreements. Ida therefore welcomes the new ersättningsutredning which allows property owners greater flexibility in replacing parking based on demonstrated demand through area-specific studies.

Ida is also positive about a new political decision from last year, aiming to reduce residential parking permits and instead refer users to parking facilities provided by Framtiden and Göteborgs Parkering.

Anna - Sverigehuset

Anna considers current municipal parking policies outdated and insufficiently adaptable to local conditions. The respondent argues that existing frameworks, including mobility measures, are too general and standardized, which limits their applicability in specific contexts. A key concern is that policies are too rigid. According to Anna, municipal actors often treat recommendations (bör) as requirements (ska), which reduces flexibility in the planning process. This makes it harder to adapt parking solutions to specific site conditions.

Furthermore, Anna suggests that current policies promote higher p-norm, and in extension car ownership, than necessary. Developers are described as seeking to build fewer parking spaces than permitted, indicating a mismatch between regulatory requirements and actual demand. The Lundby Park case, in Rambergsstaden, is again cited as an example where an excessively high p-norm contributed to significant vacancy levels.

Anna also highlights challenges related to mobility agreements requiring parking costs to be unbundled and more accurately reflect actual construction costs. Sverigehuset argues that this is not feasible, as such pricing would make parking spaces prohibitively expensive and unattractive to tenants.

Sverigehuset also identifies a lack of coordination in pricing between different parking options. There is no collaboration with the municipality regarding adjustments to on-street parking prices to counteract incentives for residents to choose on-street parking over off-street residential parking. According to Sverigehuset, this issue stems from the municipality, as it does not operate on a commercial basis. The respondent argues that other commercial actors managing on-street parking respond to increased demand by raising prices or restricting access. Since property owners must set prices based on production costs, it becomes difficult to compete with cheaper on-street parking in the surrounding area.

4.2.4: Opinions on Potential Policy Changes to Address the Parking Issue (RQ4)

David - Exploateringsförvaltningen

David identifies potential in adopting more holistic and coordinated parking solutions in new developments, as well as improving the utilization of existing parking facilities. More efficient use of unutilized parking spaces could reduce the need for constructing new parking.

According to Exploateringsförvaltningen, raising on-street parking fees is identified as a key measure to encourage the use of off-street residential parking. At the same time, the respondent emphasizes equity considerations, as different population groups have varying abilities to pay. Higher prices may risk social exclusion, although it is noted that current systems are also inequitable, as parking costs are often embedded in housing rents regardless of usage.

Regarding the p-norm for property developers, David explains that Exploateringsförvaltningen is currently developing more flexible and context-sensitive standards. Compared with the previous framework, the new model will also involve adjustments to p-norms based on proximity to key destinations by different modes of transport, including cycling and public transport. Although such approaches still rely on zonal systems, they aim to better reflect local conditions.

Furthermore, David partially indicates support for allowing developers greater flexibility in determining p-norms, for example through the introduction of maximum parking standards. However, it is noted that the municipality currently considers such measures to lack clear legal support from the Planning and Building Act. In contrast, other Swedish cities, such as Malmö and Stockholm, are perceived to have adopted alternative interpretations of the legal framework, enabling the implementation of such approaches.

Erika - Stadsmiljöförvaltningen

Stadsmiljöförvaltningen are working on being able to more independently regulate parking prices but since this can be a sensitive issue it can be difficult to implement. On matters such as these it is ultimately politics that decide what policies will be implemented, which can result in changes coming slower. Increasing parking prices is a very sensitive subject politically and results in a slow and drawn out process.

Erika states that as long as it's cheaper to park on the street there will be many people who will and she wants Göteborgs Stad's parking policy to become more proactive than it is today to make policy implementation better. Parking fees were historically only increased after high occupancy levels created visible problems, but today there is an ambition to intervene earlier.

Ida - Poseidon

Ida would like to see greater coordination of parking prices within the municipality. She supports a strategy that increases the price of on-street parking to narrow the gap between on-street parking and off-street residential parking fees. According to Ida, this would encourage more residents to use off-street residential parking facilities instead, which could in turn create room for Poseidon to lower the cost of their parkings.

Ida shares that they have raised parking prices across Framtiden, resulting in a 63% increase at Poseidon's car parks. This has widened the gap between on-street parking prices and their own, which according to Ida, has led to an increase in vacant parking spaces.

Another request from Ida is for property owners to be allowed to set parking norms more independently. Given their professional experience and access to area-specific data, she would appreciate greater flexibility in this matter. Based on this, she is positive to a suggestion to implement a maximum parking requirement rather than the current minimum requirement, allowing property owners to determine their own levels below this maximum. Ida does not believe this would result in under-provision of parking, as she states that there is a general concern within the industry that too few parking spaces reduce a property's attractiveness. At the same time, this could enable more progressive firms, aiming for a p-norm of zero, to refer residents to vacant parking spaces at neighbouring properties, says Ida.

Poseidon is part of a research project application, SOMS 2, where they, if the project is approved for funding, plan to collaborate with other property owners to develop a model for sharing vacant parking spaces. They hope that by demonstrating to the city that they have a functioning system, with tools that facilitate directing residents to available parking at other properties, they will be able to further reduce p-norm levels.

Anna - Sverigehuset

Anna expresses support for a more flexible and case-specific approach to p-norms. By placing greater emphasis on factors such as access to public transport, proximity to urban services, and existing parking infrastructure, more accurate p-norms could be established. Rather than relying on standardized policy frameworks, the respondent suggests that property owners should be allowed to present project-specific assessments of parking demand, which the municipality can then evaluate. Anna considers little risk that self-regulated p-norms would result in insufficient parking supply, as property owners are assumed to have strong incentives to align parking supply with market demand. For this reason, Anna advocates for a maximum p-norm rather than the current minimum requirement.

Regarding increases in on-street parking prices aimed to reduce vacancies in off-street residential parking facilities, Anna argues that the appropriateness of such measures depends on the specific area. She concerns about imposing higher prices solely to reduce vacancies in newly developed properties, as this may create dissatisfaction among residents in existing housing stock. However, Anna sees greater benefits in addressing the issue during the planning phase by evaluating the availability of on-street parking and revising parking provisions at that stage, rather than relying on pricing adjustments after construction.

Anna argues that improved coordination is necessary. According to her, this coordination should be established early in the planning process, particularly during the planning development stage. As an example, she refers to a project in Masthugget, where Sverigehuset addressed its p-norm by leasing spaces in an existing adjacent garage. Anna considers this a successful example of coordination achieved already during the planning phase, largely driven by the developer itself. She therefore concludes that effective solutions can be found when the issue is addressed early.

4.2.5 Summary Interviews

The interviews show a clear agreement among all respondents that residents tend to use on-street parking when it is cheaper and sufficiently accessible compared to off-street options, which all see as a problem. This is something they all have observed and regard as a problem. This observation suggests that Göteborg Stad's parking policy is not being effectively implemented in practice, despite the goal of shifting residential parking from public streets to private land and ensuring that on-street parking fees are equal to, or higher than off-street alternatives.

Municipal actors acknowledge that this limits opportunities to reallocate street space for functions such as bicycle lanes or green areas, while also increasing traffic in certain parts of the city. Property owners identify a direct relationship between low on-street parking fees and vacancies in residential parking facilities, resulting in significant financial losses. Some properties have therefore implemented various strategies to manage income loss due to vacant spaces, although these measures have also created additional challenges.

However, the issue is not merely related to pricing. The results also show that institutional and political factors play an important role. To address the problem, several measures are proposed. Most respondents are positive towards implementing a maximum p-norm which could provide property owners greater flexibility and possibly result in fewer vacant parking spaces. Higher on-street parking fees are considered the most effective measure. Better coordination of existing parking and shared parking solutions early in the planning process could also reduce the number of unnecessary new parking spaces. In addition, giving Stadsmiljöförvaltningen greater independence from municipal politicians to regulate on-street parking could help reduce the pricing gap.

4.3 Area-Based Parking Analysis

This section aims to present the results from the area-based parking analysis of six different areas selected from the Gothenburg Mobility Survey. Three of these are designated as having high usage of on-street parking: Rambergsstaden, Fixfabriken and Mandolingatan. The other three are designated as low usage of on-street parking being: Kallebäcks Terrasser, Ekebackshöjd and Munspelsgatan. Table 4.2 shows percentage of on-street parking usage, distribution among on-street parking alternatives and on-street parking costs for the different areas, among respondents in the Gothenburg Mobility Survey.

Among the low usage areas, for Ekebackshöjd and Munspelsgatan, the people using on-street parking use solely general parking permits, while people using on-street parking at Kallebäcks Terrasser use all three types of options: free on-street parking, general parking permit and residential parking permit.

The high usage areas have mixed patterns regarding parking options and costs. At Fixfabriken, exclusively general parking permits are used, while Rambergsstaden reports the highest usage of free on-street parking. The cost of parking varies more in the high usage

group than the low usage group. Further information about the different areas, like property designations (fastighetsbeteckning) and base area codes, can be found in Appendix C.

Table 4.2. Usage and costs of on-street parking for different blocks, data collected from the Gothenburg Mobility Survey.

Area	Kallebäcks Terrasser	Ekebäcks höjd	Munspels gatan	Rambergs staden	Fix fabriken	Mandolin gatan
Number of respondents in property per type of on-street parking used.						
Free on-street parking	2	0	0	4	0	1
Residential permit parking	1	0	0	1	0	3
General permit parking	2	1	3	1	6	3
Total	5	1	3	6	6	7
Percentage	3.1%	1.1%	4.2%	6.3%	9.5%	8.5%
Median price range on-street parking [SEK]	501- 1,000	501- 1,000	1,501- 2,000	0	501- 1,000	1,001- 1,500
Average price for on-street parking [SEK]	800	750	1,416	166	833	1,035

Further, this section will share the various data collected related to parking and costs for the six different areas. Topics such as car ownership, p-norm, parking costs and availability of different types of on-street parking have been compiled, see Table 4.3 for a summary of the results.

Table 4.3. Summary of results from the area-based parking analysis

Area	Kallebäcks Terrasser	Ekebäcks höjd	Munspels gatan	Rambergs staden	Fix fabriken	Mandolin gatan
Street Park. Use	Low	Low	Low	High	High	High
Parking zone	C	C	A	B	A	A
Households [nr]	963	1147	836	776	269	1303
Cars in area [nr]	244	380	288	233	192	378
Cars / household	0.25	0.33	0.34	0.30	0.71	0.29
Property p-norm	0.60	0.44	0.51	0.40	0.38	0.62
Car-parking ratio [cars per household / p-norm]	42%	75%	67%	75%	187%	47%
Residential park. spaces [nr]	587	351	475	231	99	621
Residential park. price (mon.) [SEK]	1550	1300	1493	500-1500	1500	1200
Residential park. coverage rate	-	95-100%	Parking available	-	100%	47%
<i>Residential Street Park. Permit available?</i>	No	No	No	No	No	No
<i>General Street Park. permit cost (mon.) [SEK]</i>	-	700	-	800- 900	460-960	-
Street park. cost (17.5 h) [SEK]	2175	1800- 2700	2175- 4650	1200- 2700	2175	1950- 4770
Free on-street park. access?	None	5-6 large streets	None	15 large streets	3 small streets	5 small streets

4.3.1 Areas With High Usage of On-street Parking

Fixfabriken

Fixfabriken has 9.5 % of the residents using on-street parking and these exclusively use general parking permit. Fixfabriken is located in Sandarna which was built in the 1930s, before the implementation of the p-norm, and is located in zone A (Familjebostäder, n.d; D. Mc Aslan, personal communication, March 2, 2026). The construction of the properties began in 2019 (Göteborgs Stad, n.d.-b). The properties are covered by the mobility agreements and the p-norm had a reduction of 15% (Göteborgs Stad dnr. BN 2018-002995, 2026-05-12). The area includes two buildings with a total of 269 households. The residents in the properties hold a number of 192 cars, which results in a number of 0.71 cars per household. The average p-norm of the two buildings is 0.38 (Göteborgs Stad dnr. BN 2018-002995, 2026-05-1; Göteborgs Stad dnr. BN 2018-004252, 2026-05-1), note that the number of cars exceeds the p-norm.

The off-street residential parking for both properties is provided in underground garages. However, detailed data through the condominium association is only available for one of the properties. According to them, the monthly parking fee is 1,500 SEK and the coverage rate is 100% with 50 residents waiting in line (C. Jonsson, personal communication, 10 April, 2026). The association points out that there is a shortage of off-street residential parking. In this area, it is not possible to obtain residential parking permits, however general parking permits are available in the area with a price of 460 SEK - 960 SEK per month. Figure 4.20 shows a mapping of on-street parking, in which it can be seen that Fixfabriken has a relatively high availability of paid on-street parking in the area. These cost 7 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise (Göteborgs Stads Parkering AB, n.d.-a), which result in a monthly cost of 2175 SEK. Free on-street parking alternatives are limited to three smaller streets in the area, including two on the outskirts of the area.



Figure 4.20. Mapping of on-street parking within a radius of 800 m of Fixfabriken. Colouring based on parking type.

Rambersstaden

Rambersstaden has 6.3% of the residents using on-street parking and the majority of these uses free on-street parking. Rambersstaden is located in zone B and the properties are covered by the mobility agreements with a reduction of the p-norm from 0.6 to 0.4 (Göteborgs Stad dnr. BN 2018-010504, 2026-05-12). The area includes four buildings with a total of 776 households. The residents in the properties own 233 cars, which results in a number of 0.3 cars per household. The p-norm of the building is 0.4, which exceeds the number of cars per household.

The monthly price for residential parking is reported to be 1500 SEK for a parking spot inside a garage, and 500 SEK for a parking spot placed outdoors (Göteborgs Stad dnr. BN 2017-004329, 2026-05-12). Residential parking permits are not available for the residents, but general parking permits are available in the area with a price of 800 SEK - 900 SEK per month. There is some paid on-street parking in the area. These cost at minimum 40 SEK per day, and at maximum 10 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise (Göteborg Stad Parkeringskartan, n.d), which result in a monthly cost of 1200 SEK - 2700

SEK. Figure 4.21 shows a mapping of on-street parking. Rambergsstaden is the area with the highest availability of free on-street parking among the six areas. Free parking is accessible at 15 larger streets around Rambergsstaden.

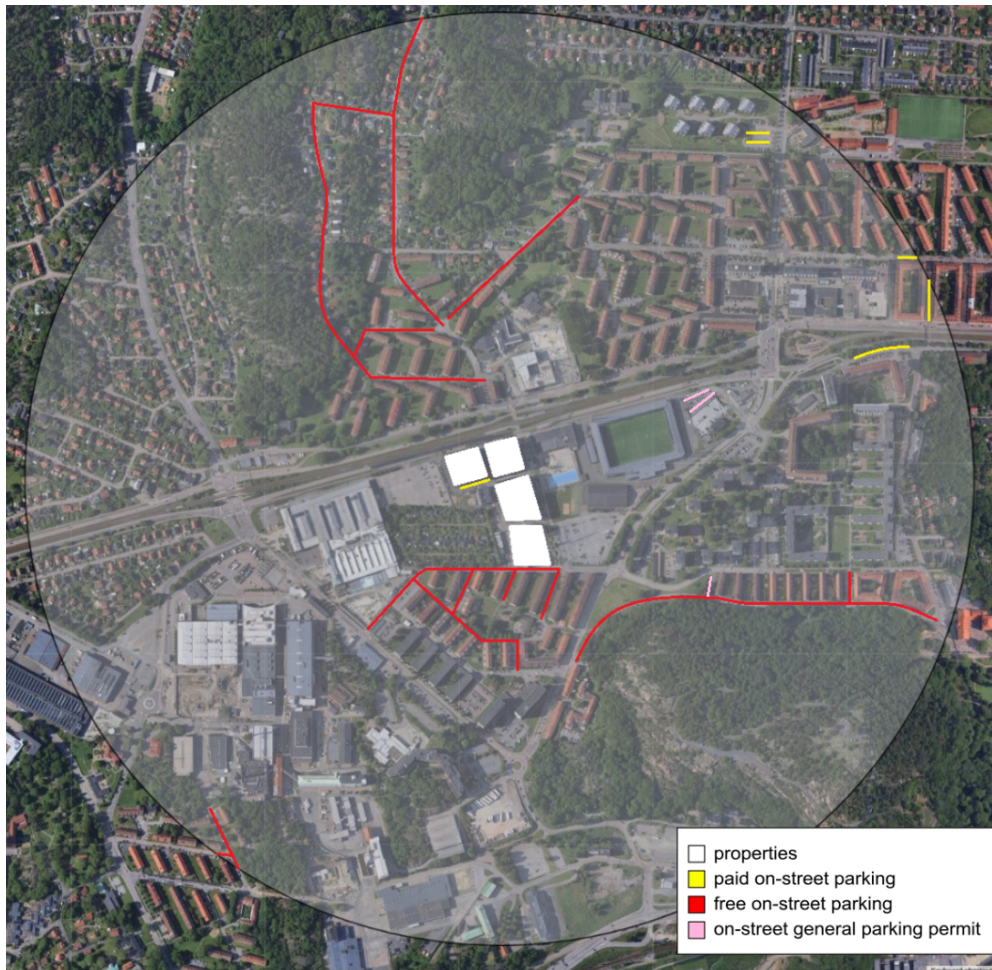


Figure 4.21. Mapping of on-street parking within a radius of 800 m of Rambergsstaden. Colouring based on parking type.

Mandolingatan

Mandolingatan has 8.5% of the residents using on-street parking, where all three options of on-street parking are used, mainly residential parking permit and general parking permit. The area includes 9 buildings placed in zone A, half were built before 1962 (Lantmäteriet, 1962) and half of which are newly built. Some of the newly built ones were part of the project BoStad2021 which was completed in 2021 (Göteborgs Stad, n.d.-c). The properties are covered by the mobility agreements and include a total of 1303 households. The residents in the properties hold a number of 378 cars, which results in a number of 0.29 cars per household. The p-norm of the buildings is 0.62 (Göteborgs Stad dnr. BN 2019-005467, 2026-05-12). Note that the p-norm is higher than the number of cars per household.

The price for residential parking is reported to be 1200 SEK per month and the coverage rate among residential parking spots is 47% (I. Jonsson, personal communication, 15 april, 2026). Residential parking permits are not available for the residents. Six respondents in the

Gothenburg Mobility Survey reported they use general parking permits. No on-street general parking permits are issued in the area; only off-street general permits are available, in a garage close to Mandolingatan. Therefore, these respondents are likely referring to off-street general parking permits.

Figure 4.22 shows a mapping of on-street parking, Mandolingatan has some paid on-street parking in the nearby area. These cost at minimum 6 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise, and at maximum 18 SEK per hour from 07:00 to 18:00 and 6 SEK per hour otherwise (EasyPark, n.d.), which result in a monthly cost of 1950 SEK - 4770 SEK. There are also multiple parking garages and parking lots which are not mapped out in the figure. The availability of free on-street parking is limited to 5 smaller streets approximately 650 - 700 meters from Mandolingatan.

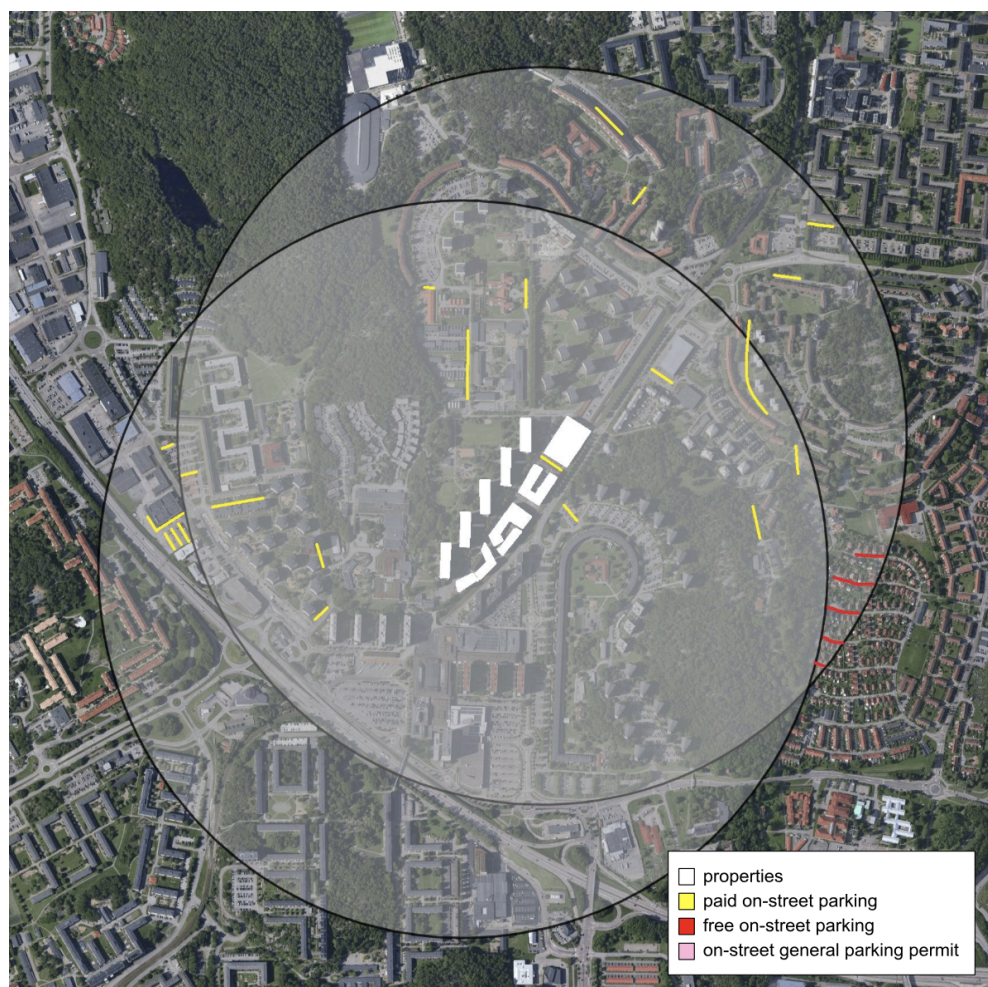


Figure 4.22. Mapping of on-street parking within a radius of 800 m of Mandolingatan. There are two circles since the properties are located on a 200 m long line. Colouring based on parking type.

4.3.2 Areas With Low Usage of On-street Parking

Ekebäckshöjd

Ekebäckshöjd has 1.1% percent of the residents using on-street parking, which is represented by one resident using a general parking permit. Ekebäckshöjd includes the neighbourhood Pennygången, which was built in the 1960s (Stena Fastigheter AB. n.d.), but also some newly built properties raised in 2020 (Forsberg & Koucky, 2020). Ekebäckshöjd includes both rental apartments managed by Stena Fastigheter and two condominium associations. The area is located in zone C, and the properties are covered by the mobility agreements. The area includes six buildings with a total of 1147 households. The residents in the properties hold a number of 380 cars, which results in a number of 0.33 cars per household. The p-norm of the buildings is 0.44 (Forsberg & Koucky, 2020). Note that the p-norm is higher than the number of cars per household.

The price for residential parking is reported to be 1300 SEK (ePARK, n.d.) for Stena Fastigheters parkings in the shared parking garage. The coverage rate among residential parking spots is 100% for one of the buildings in Ekebäckshöjd called BRF Höjden, according to the Board of Directors of the condominium association (S. Ciyako, personal communication, 17 april, 2026). The coverage rate for the rental apartments is approximately 95-97%, estimated based on the number of parking spots, according to ePARK (n.d.), in relation to the number of parking spaces in the garage estimated by the p-norm. Residential parking permits are not available for the residents, but there is one spot with general parking permits available in the area with a price of 700 SEK per month.

Figure 4.23 shows a mapping of on-street parking, Ekebäckshöjd is surrounded by 5-6 larger streets with free on-street parking. During the planning phase of the new properties, the parking study noted that there was a risk that residents might park on these streets located on the north west side of Pennygången, but that this risk was low because the streets are narrow and placed on hilly terrain (Forsberg & Koucky, 2020). There are several paid on-street parking alternatives in the area. These cost at minimum 60 SEK per day, and at maximum 10 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise (EasyPark, n.d.), which result in a monthly cost of 1800 SEK - 2700 SEK.

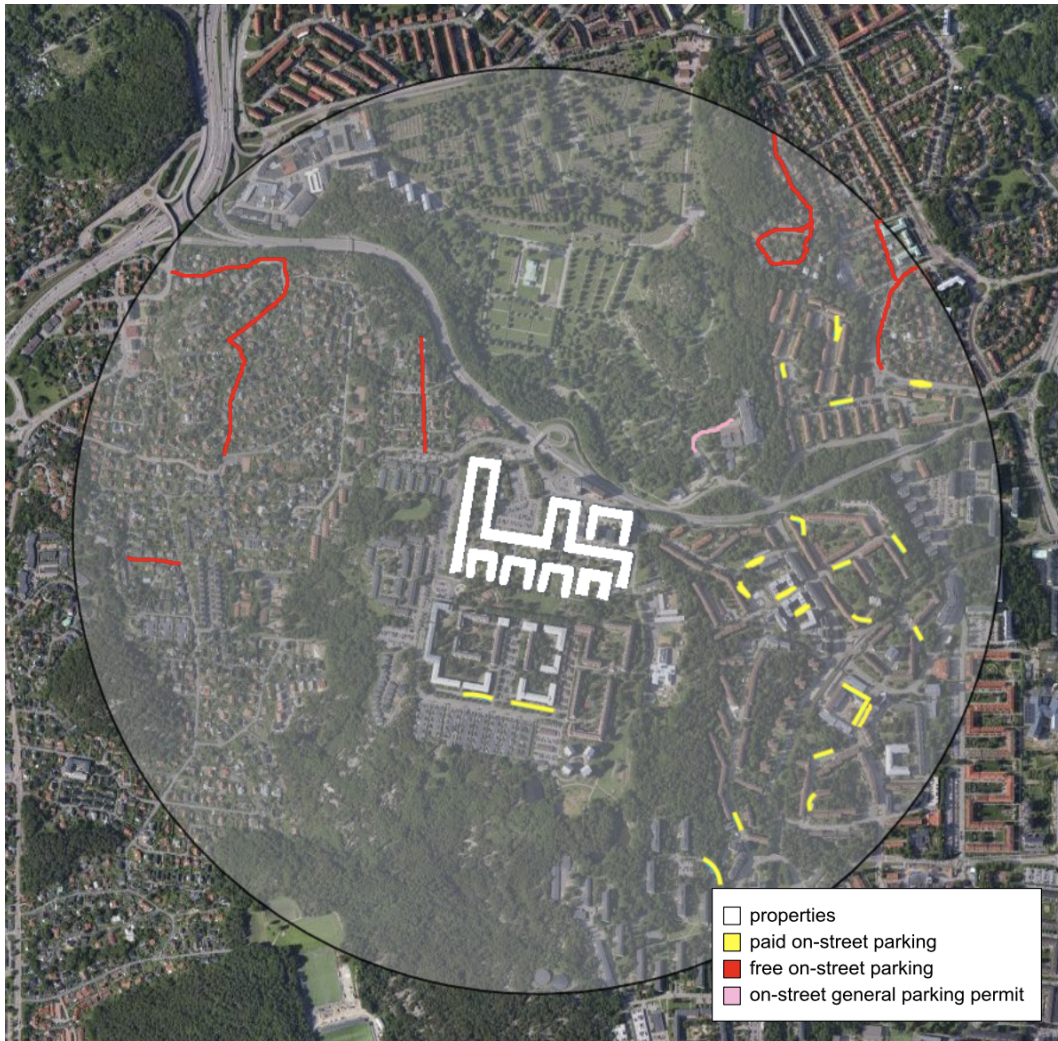


Figure 4.23. Mapping of on-street parking within a radius of 1000 m of Ekebäckshöjd. Colouring based on parking type.

Munspelsgatan

Munspelsgatan has 4.2% of the residents using on-street parking and these exclusively use general parking permits. Munspelsgatan consists of 16 buildings, 14 built in the 1960s (Riksantikvarieämbetet, n.d.) and 2 newly built during 2018-2022 (Google Earth, 2018, 2020). The buildings are located in zone A and covered by the mobility agreements. Munspelsgatan includes a total of 836 households. The residents in the area own 288 cars, which results in a number of 0.34 cars per household. The average p-norm of the buildings is 0.51 (D. Mc Aslan, personal communication, April 29, 2026). Note that the p-norm is higher than the number of cars per household.

The price for residential parking in the shared underground parking garage is reported to be 1493 SEK (Balder, personal communication, May 5, 2026). There are vacant parking spaces in the garage (D. Mc Aslan, personal communication, April 29, 2026), which indicates the residential parking coverage rate is not full. Residential on-street parking permits are not available to residents and there are no on-street general parking permits available, despite that three respondents in the Gothenburg Mobility Survey reported they use general parking

permits. Some off-street general permits are available in the area, therefore, these respondents are likely referring to off-street general parking permits.

Figure 4.24 shows a mapping of on-street parking and Munspelsgatan has some paid on-street parking in the area. These cost at minimum 7 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise, and at maximum 18 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise (EasyPark, n.d.), which result in a monthly cost of 2175 SEK - 4650 SEK. There is no free on-street parking alternatives.

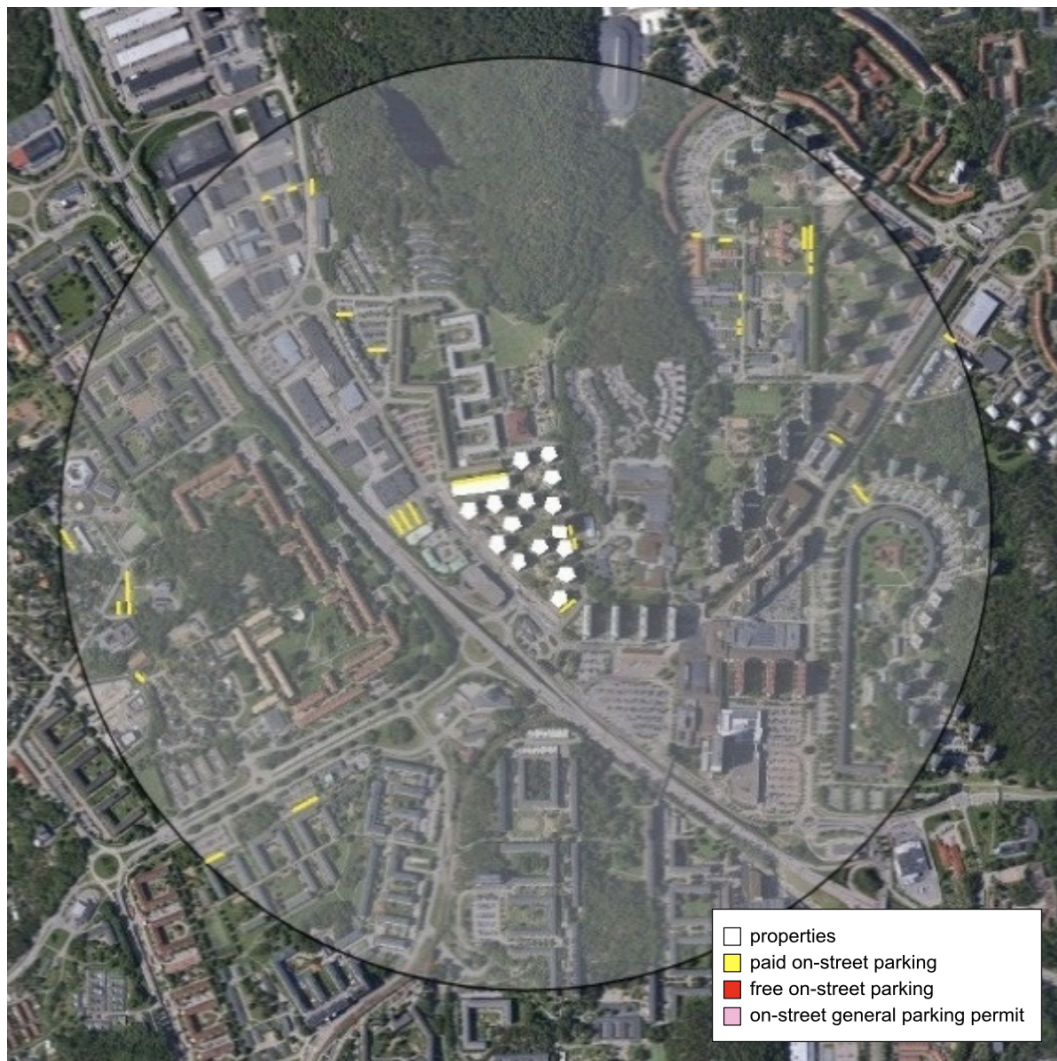


Figure 4.24. Mapping of on-street parking within a radius of 900 m of Munspelsgatan. Colouring based on parking type.

Kallebäcks Terrasser

Kallebäcks Terrasser has 3.1% of the residents using on-street parking, relatively evenly distributed across the on-street parking options. Kallebäcks terrasser is located in zone C and the properties are covered by the mobility agreements. The area includes five buildings with a total of 963 households. The residents in the properties hold a number of 244 cars, which results in a number of 0.25 cars per household. The p-norm of the building is 0.60 (Göteborgs

Stad dnr. BN 2018-007112, 2026-05-12). Note that the p-norm is more than double the number of cars per household.

The price for residential parking is reported to be 1550 SEK (Wallenstam, n.d.). Neither residential parking permits or general parking permits are available in the area. Figure 4.25 shows a mapping of on-street parking, Kallebäcks terrasser has a small amount of paid on-street parking in the area. These cost 7 SEK per hour from 08:00 to 22:00 and 2 SEK per hour otherwise (Göteborgs Stads Parkering AB, n.d.-a), which results in a monthly cost of 2175 SEK. There is no free on-street parking within the radius.

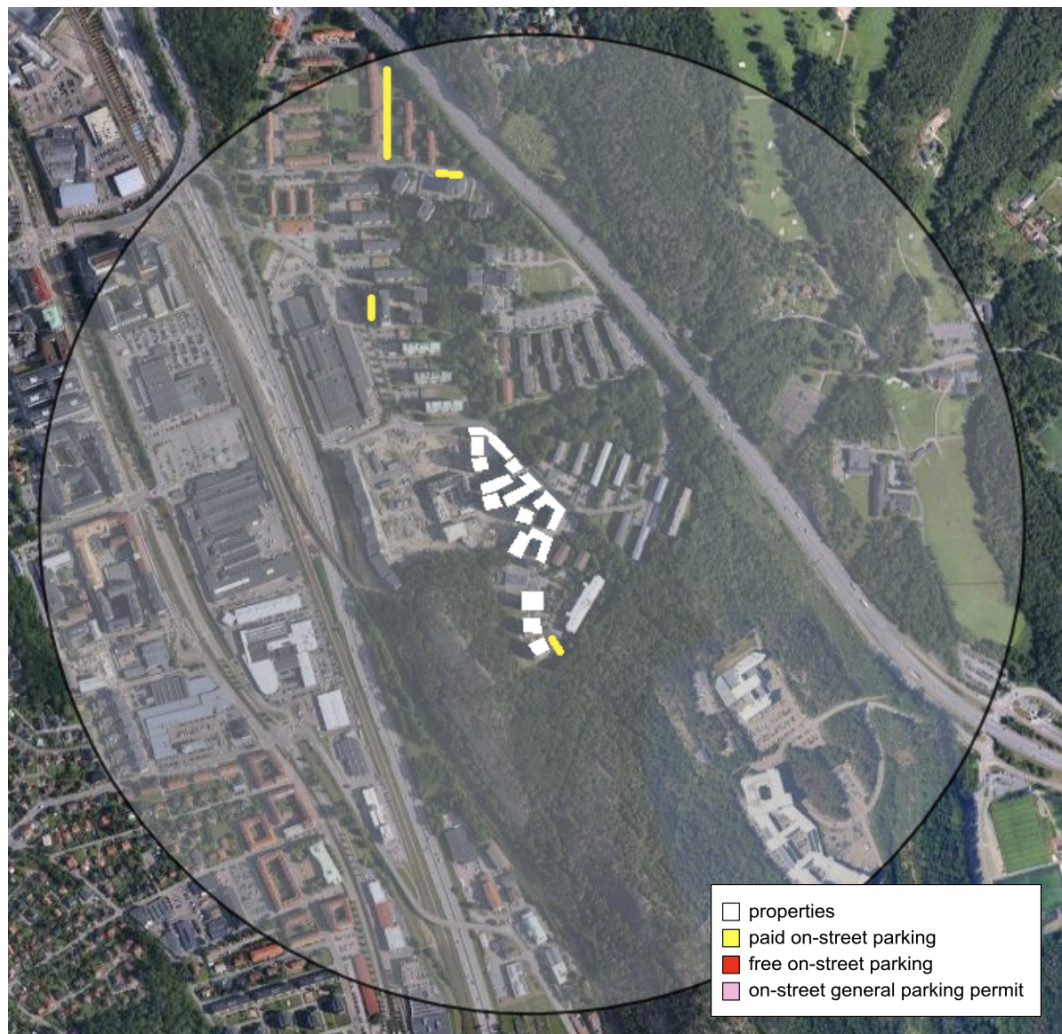


Figure 4.25. Mapping of on-street parking within a radius of 800 m of Kallebäcks terrasser. Colouring based on parking type.

4.3.3 Summary Area-Based Parking Analysis

The area-based parking analysis highlights some differences between areas with high and low usage of on-street parking. First, in the low usage group, the number of cars per household does not exceed the building's p-norm, in other words, there are enough parking spaces for all cars in the buildings. Within the high usage group, however, the figures vary. In one area,

Fixfabriken, the car-parking ratio reaches 187%. In the other two high usage areas the p-norm was higher than the number of cars per household.

The biggest difference observed between the groups is the availability of free on-street parking and general parking permits within the area. Regarding general parking permits, one out of three areas in the low usage group has access within the specified radius. The corresponding number for the high usage group is two out of three areas. Free on-street parking is available for all three areas within the high usage group, although the amount varies. In Rambergsstaden, there are 15 larger streets available for free parking, while for Fixfabriken and Mandolingatan, the available quantity is smaller. The low usage group has a more restricted access to free on-street parking, with two areas having none at all. Ekebäckshöjd does have some available free on-street parking, at the same time, the parking study notes these streets are hard to reach, meaning the actual availability is more limited than the map suggests. Regarding paid on-street parking, both groups have varied results, with some areas offering more paid on-street options than others. In conclusion, there is a more distinct difference regarding free on-street parking and general parking permits, where the high usage group generally has greater access to these two options.

Regarding costs, the low usage group consistently has lower residential parking costs compared to the available paid on-street parking options. This also applies to the high usage group, with the exception of Rambergsstaden. Apart from this, the results show no clear distinction between the high and low usage groups regarding residential parking costs, coverage rate in residential parking, p-norm, accessibility to residential parking permits or paid on-street parking costs. One aspect, that's worth mentioning regarding costs, is that the average monthly price for parking paid by the on-street group is constantly lower than the residential parking cost, for all areas.

5. Discussion

This chapter discusses the results of the study in relation to the research questions, previous research and to a limited degree; Göteborgs Stad's parking policy objectives. By combining findings from the survey analysis, interviews and area-based parking analysis, the discussion aims to identify broader patterns and implications regarding the relationship between on-street parking, residential parking behaviour and mobility agreements. The chapter also examines limitations and uncertainties connected to the study and its results.

5.1 Gothenburg Mobility Survey Analysis Discussion

The aim of the survey analysis was to investigate potential factors influencing the choice of on-street parking over off-street parking. The mobility patterns and parking habits were reviewed for the residents of the 24 blocks included in the Gothenburg mobility survey. Although the blocks do not represent all areas of Gothenburg, it still provides a deeper understanding of on-street parking conditions.

5.1.1 RQ1: Is the use of on-street parking instead of off-street parking common, and in which types of areas does this occur?

To identify any determinants or possible trends, it is useful to first look at to what extent on-street parking occurs. Figure 4.1 demonstrates that 11% of all respondents choose to park their car on-street normally at home, with or without permits. Which emphasizes that on-street parking used as residential parking is not a negligible occurrence. This is not complying with the current parking policy which strives that on-street spaces should primarily serve as short-term parking rather than long-term residential (Göteborgs Stad, 2009).

The first possible determinant observed is availability of parking. In Figure 4.6, the residents seem to express a limitation in the supply of parking spaces at the property. The results show that a majority of the respondents of both the on-street and the off-street group believe that there is not enough car parking in their building. However, this is the combined result of residents in all zones in the survey. According to the GotPark project report, there is a higher car ownership than p-norm in zone A. Because of this excess, 25% of all residents in this zone use on-street parking or other alternatives as residential parking instead. This aligns with the results of this project's analysis of the survey. In Figure 4.2, half of those responding that they park on-street are indeed located in zone A. Contrarily, zones C and D are reported in the GotPark project report to have a higher p-norm than the car ownership, implying there would be more available off-street residential parking spaces than cars. Yet, Figure 4.2 indicates that there are residents from these zones that are parking on-street. As a matter of fact, 20% of those parking on-street are located in either zone C or D. This suggests that limited parking supply in the building is likely not the only factor influencing the decision to park on-street.

Furthermore, data in Figure 4.3 suggests a clear distinction between the two comparison groups. When asked the approximate distance between their home and their usual parking spot, 69% of those who park off-street have a distance of less than 100 meters. Meanwhile only 11% of those parking on-street park within 100 meters to their home. As many as 25% of this group actually park at a distance of 500 meters or further. In parallel, Figure 4.4 reveals the monthly parking costs, where the largest group (41%) of the off-street group pays 1,001 to 1,500 SEK while the largest group (44%) of the on-street group pays 500 to 1,000 SEK. By integrating these results, it is revealed that some residents are likely willing to walk further to park their car at a lower cost. That cost could be a determining factor for choosing to park on-street is also shown in studies from other cities. When the pricing for on-street parking in Amsterdam was increased by 66%, it resulted in a 17% reduction of the demand for on-street parking (Ostermeijer et al., 2022). This indicates that parking prices do affect residents' decision of choosing where to park.

The analysis of RQ1 shows that most residents that are parking on-street are not only located in the central parts but also in outer parts of the city. Some might choose on-street as an alternative due to limitation of spaces at the property. While others are assumed to park on-street because of the lower prices compared to the off-street residential spaces. It seems like the on-street group are willing to compromise the comfort of parking close to home for cheaper costs.

5.1.2 RQ2: Does access to on-street parking influence the desired effects of the mobility agreements?

When analyzing the survey for RQ2, the comparison groups were formed after whole blocks rather than the residents parking on-street vs off-street. The blocks were divided by having mobility agreements or not and if there were many residents using on-street parking. For example, if the block had many responses parking on-street it was considered a high-usage block (HU) while the rest were considered low-usage blocks (LU).

Since one of the desired effects of the mobility agreements is to reduce the total car usage, it is interesting to evaluate whether car ownership differs between the comparison groups. Figure 4.8 demonstrates the average number of cars per household, showing that blocks with mobility agreements (MA) have approximately 0.5 cars per household, compared to about 0.6 in blocks without agreements (COMP). A lower level of car ownership in blocks with mobility agreements, complies with the intended effects of the agreements. To evaluate whether on-street parking influences the effects or not, the HU and LU groups are compared. A slightly higher number of cars per household is also observed for the HU groups compared to LU. The differences are only marginal, still they do imply a relationship between higher usage of on-street parking and higher car ownership levels.

In a study made in the New York City region, it was shown that even for households with access to off-street parking, the availability of on-street parking mattered in their decision to own a car. The results from the study demonstrated that free and available on-street parking encouraged private car ownership (Guo, 2013b). Figure 4.9 provides further evidence of this

relationship. The respondents in both groups with mobility agreements (MA+HU and MA+LU) were asked if availability of parking influenced their decision to not own a car. The results indicate that a majority of the LU group are influenced by parking availability, whereas most respondents in the HU group are not. Based on this, residents at blocks with lower usage choose to not own a car because of the amount of parking spaces available or perhaps the lack of them. A possible correlation may exist between low usage and low availability of on-street parking. Perhaps then the lower level of car ownership in the LU group is partly related to a lower availability of on-street parking in these areas. Simultaneously, the availability of parking is not a contributing factor for the HU group when deciding to not own a car. Potentially the availability is not a concern because of a high supply of on-street parking existing in the areas of the HU blocks. Thus, areas with high availability of on-street parking may contribute to a higher car ownership.

For a further analysis of the mobility agreements effect at the properties, questions directly related to the respondent's residence were analyzed. Regarding, no clear variations can be observed between the comparison groups. Figure 4.10 shows that the majority of respondents across all comparison groups were not influenced by parking availability or costs when deciding to live at their current residence. Overall, parking does not appear to be a decisive factor in residential choice. Similarly, a majority within all groups in Figure 4.11 reported that they either drive the same amount or less than they did at their last residence. Implying that the mobility agreements may have some effect regarding car usage, as some respondents report reduced car use. Otherwise, the HU group, with a possibly greater supply of on-street parking, does not seem to drive more or less than the LU group. Hence, the availability of on-street parking available does not seem to significantly influence the intended effects of the mobility agreements.

5.1.3 RQ3: What impacts does on-street parking have on residential- mobility behaviour, car usage, parking cost and parking space vacancies?

On-street and off-street parking users serve as the two comparison groups for the theme of mobility patterns and attitudes towards costs. This theme is especially relevant to explore for a deeper understanding of resident's parking habits and usage.

Figure 4.17 illustrates the main mode of transportation used to get to and from work/school. Most of the respondents in both groups answered that they either drive themselves, use public transport or bike. It is noticeable that the on-street group in comparison with the off-street group, uses public transport and bikes slightly more than they drive. Simultaneously, Figure 4.15 shows that both groups drive the same amount per week time-wise (1-3 hours). This is also presented in Figure 4.16, where both groups drive the same amount of minutes (0-500 minutes) regardless of the distance to their parked car. Thus, there is no evidence that the on-street group drives less despite parking further away. The on-street group might have a greater travel activity though since they are using other modes of transportation to a larger extent.

As presented in Chapter 5.1.1, the on-street group pays lower monthly parking costs. This raises the question of whether on-street parking is chosen due to lower costs. In Figure 4.19 residents were asked whether they would sell their car if parking fees at their apartment were doubled. Nearly 40% of the on-street group strongly disagreed, while the responses of the off-street group were more evenly distributed. It may seem like the on-street group is less affected by parking prices considering that they would keep their car even if the parking costs increased. A more plausible explanation of the results though, would be that this group is parking at spaces that are not located at the apartment. As long as this group is choosing to park on-street, they won't be affected by increases of cost at the property.

It has previously been shown that costs of parking do contribute to the decision of choosing where to park. In 2014, a study was conducted in the city of Nanning to examine how parking is affected by increases in costs. It was found that when on-street parking became more expensive than off-street parking, drivers rarely chose to park on-street (Wang et Al., 2020). This indicates that those who usually park on-street are influenced by costs when choosing where to park. The results presented in Figure 4.18, also indicate a possible price sensitivity within the groups. When residents were asked whether parking at their building is expensive, approximately 70% of the on-street group strongly agreed, compared to around 50% of the off-street group. It is evident that parking at the property is perceived as expensive by both groups, particularly among those parking on-street. Consequently, lower costs are likely one factor influencing the choice of parking on-street instead of off-street.

5.2 Interviews Discussion

This section aims to discuss all research questions based on the interview findings. The section is structured according to each research question. For each question, the responses from the different interviews are compared and discussed. To broaden and further support the discussion, previous studies in the field are connected to the reasoning presented.

5.2.1 RQ1: Is the use of on-street parking instead of off-street parking common, and in which types of areas does this occur?

The interviews reveal a general agreement among all actors regarding the relationship between the price and availability of on-street parking and the use of off-street residential parking facilities. The findings indicate that when on-street parking is free or low-priced and highly accessible, residents are more likely to choose it over parking provided within the property. This reasoning is supported by a study conducted by Antonson et al. (2017) in the Porslinsfabriken area in Gothenburg, which found that reduced parking requirements did not necessarily lead to lower car ownership levels. The study suggests that this outcome was partly explained by the availability of inexpensive and accessible parking options in surrounding areas, which encouraged residents to park outside the off-street residential parking property.

However, the extent of this phenomenon appears to vary depending on the type of area. Exploateringsförvaltningen highlights that the issue is more pronounced in newly developed

areas where on-street parking is still low-priced and not yet regulated. The challenge of implementing regulations reactively rather than proactively is also supported by Stadsmiljöförvaltningen. However, Stadsmiljöförvaltningen describes the issue as more widespread in older areas, where on-street parking is historically more common than parking on private property.

5.2.2 RQ2: Does access to on-street parking influence the desired effects of the mobility agreements?

The interviews indicate that the availability of low-cost on-street parking, in several cases, counteracts the intended effects of mobility agreements. Exploateringsförvaltningen explains that when off-street residential parking costs are separated from residential rent, residents may consider alternative parking options, such as on-street parking. All interviewees confirm that residents sometimes avoid off-street residential parking facilities for economic reasons. This can be illustrated by the case of Poseidon, where vacancies emerged after the company raised their off-street residential parking prices to better reflect the actual cost of providing parking. These findings suggest that the parking solutions planned within the mobility agreements do not always function as intended when low-cost on-street parking is available. This interpretation is supported by a study (Guo, 2013b) from New York, which found that easily accessible free on-street parking can contribute to higher levels of car ownership, even among households that already have access to off-street parking facilities. Consequently, access to free or inexpensive on-street parking may contribute to higher levels of car ownership, thereby counteracting the objectives of the mobility agreements.

The interviews further show that Sverigehuset has developed strategies to manage vacancies, which partly arise when residents choose available and low-cost on-street parking instead of off-street parking. One such strategy is requiring tenants to rent an off-street residential parking space when vacant spaces are available. However, such measures may create conflicts with the objectives of the mobility agreements. While the agreements are intended to reduce car dependency and promote more flexible parking solutions through unbundling of parking and house costs, requirements to rent parking spaces may instead maintain or reinforce car ownership by linking parking to the dwelling. This highlights a tension between policy design and practical implementation, where external factors such as the availability of low-cost on-street parking influence the outcomes of the mobility agreements. In addition, both Sverigehuset and Exploateringsförvaltningen point out that such requirements may exclude certain social groups from the housing market, particularly younger individuals who may not own a car or prioritize paying for expensive off-street residential parking when cheaper alternatives are available nearby.

5.2.3 RQ3: What impacts does on-street parking have on residential- mobility behaviour, car usage, parking cost and parking space vacancies?

In terms of travel behaviour, the interviews, and particularly the one with Exploateringsförvaltningen, indicate that the availability of attractive on-street parking influences where and how residents choose to park, which may lead to redistribution of

traffic. For example, Exploateringsförvaltningen notes that traffic pressure may increase in nearby residential areas with cheap or unregulated parking, as residents from newly developed properties seek out these alternatives.

A similar conclusion is presented by Antonson et al. (2017), whose study was discussed in the previous section. The study shows that lower p-norms do not achieve their intended effects, such as reduced car use and car ownership, unless parking opportunities in the surrounding area, such as on-street parking, are also restricted. Antonson and colleagues (2017) explain that residents otherwise continue to seek parking in nearby areas, which increases traffic, parking pressure and noise in those areas. Furthermore, this cruising for inexpensive and easily accessible on-street parking may create traffic safety risks in the surrounding area. For example, Biswas et al. (2017) argue that on-street parking can increase the risk of traffic accidents, particularly accidents involving children.

Although the interviews do not explicitly address the impact of on-street parking on car use, their responses can be interpreted as suggesting that the current regulation of on-street parking contributes to higher levels of car ownership, and thereby higher level of car usage. As previously mentioned, Guo (2013b) argues that easily accessible free on-street parking can encourage higher levels of car ownership. Since the interviews indicate that free and extensive on-street parking is currently available, this study suggests the conclusion that the present regulation of on-street parking may contribute to higher levels of car ownership.

As mentioned above, a consistent finding across the interviews is that the availability of on-street parking contributes to vacancies in off-street residential parking facilities. This relationship was found to have several consequences. For example, Exploateringsförvaltningen, Poseidon, and Sverigehuset confirm that this relationship leads to economic consequences for property owners in the form of lost revenue and difficulties in recovering costs of parking investments. Poseidon, for instance, explains that in one of its properties, approximately 20 residents choose alternative parking options, including on-street parking, instead of the garage spaces provided for residents. According to Poseidon, a garage parking space should cost residents approximately 1,500 SEK per month, meaning that 20 vacant spaces corresponds to a monthly revenue loss of around 30,000 SEK. To avoid financial losses, these costs are often distributed among all residents through the housing rent, regardless of whether they rent a parking space or not, although the fairness of such an arrangement may be debated. In the long term, additional housing costs of this kind may exclude lower-income groups from the housing market.

Furthermore, these vacancies create tension between property owners and the municipality, as property owners argue that they are required to provide more parking spaces than actually demanded. This can be illustrated by the interview with Sverigehuset, which emphasizes that the problem partly stems from the municipality not applying market-based pricing to its on-street parking in the same way as other actors.

A distinction can be observed in how different actors interpret the issue of residents choosing on-street parking instead of off-street residential parking facilities. Municipal actors tend to

frame it as a structural policy issue, linked to the objective of shifting parking from public streets to private land, as well as concerns about inefficient land use when valuable street space is occupied by parking while off-street residential parking facilities remain underutilized. In contrast, property owners, and particularly Sverigehuset, primarily describe the issue as an economic problem related to vacancies in off-street residential parking facilities. However, Poseidon also highlights consequences similar to those emphasized by the municipality, arguing that street space should not be used for parking when it is not necessary, and that such land could instead be allocated to urban public spaces or cycling infrastructure. Based on this, it can be argued that Poseidon's reasoning is more closely aligned with the perspective of Göteborgs Stad than that of Sverigehuset, which may be related to the fact that Poseidon is municipally owned. Overall, the findings presented in this paragraph suggests that although the problem is widely recognized, the underlying reasons why it is considered problematic differ between public and private actors.

5.2.4 RQ4: How can Göteborg Stads parking policy be revised to reach their goals regarding on-street parking?

A recurring theme in the interviews is the need for increased coordination between different actors and parking solutions. Both Exploateringsförvaltningen and the property owners emphasize the importance of considering the total parking supply in an area at an early stage of the planning process. This includes the possibility of utilizing existing excess capacity through shared parking solutions, which could reduce the need for new construction.

Sverigehuset explains that this approach was implemented in a development project in Masthugget and that the outcome was highly successful. Furthermore, Poseidon explains that the company is part of a research project application where they will, if the project is approved for funding, collaborate with other property owners to develop a model for how properties can share vacant parking spaces. The importance of coordination is also emphasized in previous research, for example Pojani et al. (2019) argue that cities need to develop more effective ways of reusing underutilized parking areas and using parking supply as a tool to influence travel behaviour. According to Pojani and colleagues (2019), such strategies may also contribute to reduced carbon emissions and reduced investments in parking infrastructure.

There is also a broad agreement among the interviewees that on-street parking prices play a central role in the current challenges. All actors highlight that on-street parking is often underpriced in relation to off-street residential parking, thereby creating distorted incentives for residents' parking choices. Based on this, all interviewees advocate a more market-based pricing approach for on-street parking and describe it as an important tool for shifting parking from public streets to off-street residential parking facilities. The idea of higher on-street prices is also consistent with the objectives of Göteborgs Stads presented in Chapter 2.3, where fees for on-street parking are intended to be set at levels equal to or higher than those for residential parking on private land.

The concept of market-based on-street parking prices is supported by previous research. Calthrop and Proost, and Soup (2006; 2019) conclude that the optimal on-street parking price corresponds to the marginal cost of off-street parking. Furthermore, a study from Amsterdam by Ostermeijer et al. (2022) shows that increased on-street parking costs reduce demand for on-street parking and traffic volume, while also increasing opportunities to transform former parking areas into green spaces and cycling lines.

At the same time, Exploateringsförvaltningen and Stadsmiljöförvaltningen explain that the ability to adjust parking prices and parking supply is constrained by political decision-making, making it a sensitive and difficult issue to address. This is explained by political concerns that increasing prices and reducing supply of on-street parking too extensively may create dissatisfaction among residents that ultimately can result in fewer votes in upcoming elections. However, studies from Copenhagen and Germany show that there is a public acceptance for reducing the amount of on-street parking when this is combined with investments in sustainable mobility infrastructure, public space, and greenery (Mouratidis et al., 2026; Goetting et al., 2025).

Regarding increased prices and reduced supply of on-street parking, Stadsmiljöförvaltningen and Exploateringsförvaltningen also point to institutional constraints, where current interpretation of legislation limits the ability to implement proactive measures. However, Exploateringsförvaltningen notes that other municipalities, such as Örebro, apply alternative interpretations, suggesting that there is some room for maneuver, although this is not fully utilized in Gothenburg.

However, both Sverigehuset and Exploateringsförvaltningen also highlight social concerns related to increased on-street parking fees. Exploateringsförvaltningen explains that equity considerations must be taken into account when raising prices, while Sverigehuset points out that residents may become dissatisfied or frustrated when parking fees increase. These social concerns are also highlighted in previous research, which shows that acceptance is lower among groups with health limitations or disabilities, lower levels of education, and older residents (Mouratidis et al., 2026).

Regarding p-norms, different perspectives emerge. Property owners advocate increased flexibility, including greater opportunities to adapt parking requirements to local conditions. Both Sverigehuset and Poseidon see few risks in allowing property owners to determine p-norms themselves, arguing that they possess extensive knowledge of their customer groups, professional experience, and access to area-specific data. Based on this, both property owners are positive to a suggestion for implementing maximum parking limits instead of the current minimum one. Poseidon further argues that p-norms of zero should be permitted if new residents can instead be referred to existing off-street residential parking facilities with vacant spaces.

The argument for maximum p-norms instead of minimum requirements is supported by several studies in the field. Shoup (2019) argues that minimum parking requirements contribute to parking-oriented urban development, increase development costs, and generate

more traffic, while maximum parking limits can reduce the subsidization of car use. Furthermore, Guo (2013a) found in a study from New York City that maximum parking limits may reduce car dependency, congestion, and greenhouse gas emissions. Similar findings are presented in a study from London (Guo, 2016), which concludes that the shift from minimum to maximum parking requirements led to an estimated 40% reduction in parking supply and contributed to lower car dependency.

In contrast, Exploateringsförvaltningen expresses some caution, as measures such as maximum parking limits may lack legal support. This highlights the trade-off between flexibility and regulatory constraints, where different actors assess risks and opportunities differently. However, Exploateringsförvaltningen notes that municipalities such as Stockholm and Malmö have interpreted the legislation differently, resulting in some use of maximum parking limits. These interpretations may create opportunities for Göteborgs Stad to adopt a different interpretation in the future.

To summarize RQ4, all interviewees identify potential benefits in improved coordination, stricter regulation of on-street parking in terms of pricing and supply and greater flexibility for property owners to assess appropriate p-norms themselves. Overall, the findings suggest that reduced off-street residential parking provision is unlikely to function effectively unless it is combined with broader measures that also address parking conditions in the surrounding area. This aligns with Antonson et al. (2016), who emphasizes the importance of coordinating lowering numbers with wider parking regulation strategies.

5.3 Area-Based Parking Analysis Discussion

This section aims to analyse the results from the area-based analysis. The chapter isn't divided by each research question since its purpose was to conduct an in-depth analysis on a few of the areas from the survey with the most responses, which all fall broadly under RQ1 and RQ3.

The results of the area-based analysis indicate that availability of parking seems to be a stronger indicator than pricing alone when people decide if they will park on-street or off-street. As shown in Table 4.3, the areas designated as low on-street parking generally have lower or around the same cars per household than the buildings p-norm, while the areas with high on-street parking had more mixed results. This is not a pattern observed in all of the studied areas however, as some areas could show characteristics that deviate from the others when looking at the relationship between parking supply and the prevalence of on-street parking. One area that deviates is Ekebackshöjd, which has a relatively high supply of on-street parking and is designated as low on-street parking usage. This could be due to the terrain in the area being mostly steep hills or other environmental factors and therefore making it less attractive for drivers to find cheaper parking further away, as seen in 4.3.2. Ekebackshöjd is situated on top of a plateau, while the free on-street parking is located in detached housing areas with narrow streets and a hilly landscape nearby (Figure 4.23). Compared to Rambergsgården (Figure 4.21), where there is a similar but higher amount of available on-street parking but where the accessibility to said parking is much higher, this

might explain Rambergsstaden's high amount of residents choosing on-street parking over residential parking.

Availability of parking being a strong indicator can also be seen when comparing Mandolingatan (high on-street) and Kallebäcks Terrasser (low on-street). Both areas have a low coverage for off-street residential parking, much lower than their buildings p-norms. One difference between these areas is that Mandolingatan has a much higher share of on-street parking usage compared to Kallebäcks Terrasser despite it being slightly cheaper to park around Kallebäck. The share of people who answered that they park on-street in Mandolingatan is 8.5%, while Kallebäcks Terrasser only had 3.1%. A similar pattern is observed in the Munspelsgatan area, where a lot of paid on-street parking is available but no free on-street parking (Figure 4.24). This may explain why Munspelsgatan has low usage of on-street (4.2%) and not Mandolingatan, which is located very close geographically but has some access to free on-street parking.

Where these two areas differ the most is in the amount of free and paid on-street within 800 meters, where Mandolingatan has both much more paid on-street parking as well as some access to free on-street parking in nearby detached housing areas. None of the two areas had general parking permits available within 800m. When compared to Kallebäcks Terrasser it is a clear difference in the amount of paid on-street parking, as well as having no free on-street parking whatsoever. Comparing the cost for paid on-street parking in the areas show that the parking in Kallebäcks Terrasser is cheaper, costing 2175 SEK per month, whereas Mandolingatan's parking prices are higher, costing between 1950 and 4770 SEK per month, with a majority of Mandolingatans parking spaces being similar or more expensive than 2175 SEK. This pattern is also observed when examining the survey data from the area's residents. Kallebäcks Terrasser's residents reported an average spending of 800 SEK per month on on-street parking compared to Mandolingatan with 1035 SEK per month. This again shows that the supply of parking is likely to be a stronger indicator for on-street parking use than pricing, since Mandolingatan, despite being more expensive, still has a higher share of residents parking on-street.

The area-based analysis points to a mismatch between the planned parking supply and actual parking behaviour. Several of the analyzed areas, with the exceptions of Fixfabriken and Ekebackshöjd, have underutilized residential parking, which indicates that the current parking system does not function as intended. It can be observed that residents are choosing on-street parking over off-street alternatives in the areas with higher accessibility of on-street parking. This leads to lower coverage of the building's parking, which contradicts the property developers as well as the municipality's goal to move parking off the streets so that they can be used for other purposes. This suggests that the issue is not only how much parking is provided, but how the interaction between on-street and off-street parking.

The results from the area-based study also reinforce the previous research done on the area of parking analysis. Earlier cited research states that a higher availability of on-street parking is correlated to an increase of car use and ownership (Holm et al., 2025). This pattern is observed in all the analysed areas classified as low usage of street parking, which have a cars

per household number lower than the buildings p-norm. Areas classified as high usage gave more inconclusive results, with lower, similar or higher cars per household number than the p-norm. Fixfabriken, for example, has a car per household value that is 87% higher than the property p-norm, 0.71 compared to 0.38. Fixfabriken is an area designated as high usage of streetparking which is very clear when analysing the results from the area-based analysis.

5.4 Discussion Synthesis

Through the mixed methods approach combining survey data, interviews, and area-based analysis, several consistent patterns emerge. The current system leaves room for inefficient land use, where residential off-street parking spaces remain vacant while public on-street parking space is occupied long-term. Left unaddressed, this interaction between on-street parking and mobility agreements risks undermining Göteborg Stad's broader ambition to promote sustainable mobility.

5.4.1 RQ1: Is the use of on-street parking instead of off-street parking common, and in which types of areas does this occur?

The survey results show that the use of on-street parking instead of off-street parking exists with approximately 11% of respondents reporting that they normally use on-street parking options. This may appear as a present but not overwhelming problem, but is better contextualised if one considers the implication that one out of ten car owners park on the street. This sentiment is shared by private and public actors that were interviewed. The results also show that the phenomenon is spatially dependent rather than evenly distributed across Gothenburg. Around half of the respondents using on-street parking were located in zone A, the most central parking zone in the city. This aligns with findings from the GotPark project presented in the literature review, where car ownership in zone A exceeded the p-norm in properties with mobility agreements, indicating reliance on alternative parking solutions such as on-street parking (Holm et al., 2025). A finding supported by the area-based analysis. Among the areas looked into, Fixfabriken and Mandolingatan lay in zone A. Fixfabriken lay in the city centre and car ownership here was nearly double the number of off-street residential parking spaces available. Mandolingatan was in the zone A enclave around Frölunda Torg and had a car ownership at approximately half the p-norm. Despite this fact both areas showing high utilisation of on-street parking

At the same time, approximately 50% of respondents using on-street parking live outside zone A, suggesting that the issue is not isolated to the central parts and urban hubs of the city. The area-based parking analysis and discussion further indicate that the availability of street parking plays an important role in explaining where on-street parking occurs. The maps for all three areas with high utilisation of on-street parking also show high availability of on-street parking. Fixfabriken has a mix of permit and paid on-street parking while Mandolingatan has a high number of paid on-street parkings in the area. Rambergsstaden shows a large number of free on-street parkings in its vicinity, while this may also appear to be the case for Ekebackshöjd (low use category) one must observe the on-street parkings in the latter example appear in the peripheries of the designated area being smaller streets in

adjacent detached housing areas. Interviews with both public and private actors also suggest that the severity of the issue depends on local conditions such as parking supply, pricing structures and urban form.

Overall, the findings suggest that on-street parking is relatively common in certain parts of the city, particularly in central and high on-street parking-available areas, but that the extent of the issue varies significantly depending on local spatial conditions.

5.4.2 RQ2: Does access to on-street parking influence the desired effects of the mobility agreements?

Mobility agreements are intended to reduce private car dependence in residential developments by providing alternative transport solutions in place of, or alongside, traditional parking provision. Typically including measures such as subsidized public transport, car-sharing services, bicycle infrastructure, and mobility information for residents. In the context of increasing urban density and sustainability goals, mobility agreements are a planning tool to manage parking demand, lower traffic generation, and encourage more space-efficient travel behaviour.

A central finding across all methods is that parking behaviour appears to be strongly influenced by economic rationality. Both the survey analysis and interviews indicate that on-street parking is often cheaper than residential parking, while the area based analysis concludes the average price for on-street parking is consistently lower than the price for off-street residential parking. Thus encouraging residents to choose on-street alternatives even when this means longer walking distances or lower convenience. These findings are reinforced by the interviews, where both municipal actors and property owners identified pricing differences as one of the main drivers behind parking behaviour.

The comparison between buildings with and without mobility agreements and varying levels of on-street parking usage suggests that on-street parking usage may weaken some of the intended effects of the mobility agreements. Car ownership was generally lower in properties with mobility agreements, supporting previous findings from the GotPark project. However, within both categories, properties with higher on-street parking usage also showed proportionally higher car ownership levels compared to properties with lower on-street usage.

At the same time, the relationship is not fully conclusive, as several comparisons between the four MA/COMP and HU/LU matrix categories show relatively small differences. Another limitation is that respondents may partly choose on-street parking due to limited access to residential parking rather than solely because of price differences.

Discussions from the interviews indicate increased parking vacancies attributed to on-street parking among property owners. In response to this, Sverigehuset reportedly prioritizes renting apartments to tenants willing to also lease a parking space. This practice reflects an economic practicality to maintain parking occupancy, but contradicts the intended purpose of mobility agreements, namely to reduce private car ownership and encourage lower levels of car use through alternative mobility solutions.

The literature review further supports the idea that pricing can influence parking behaviour and thereby the effectiveness of mobility agreements in reaching their intended goals (Holm et al., 2025). Examples from Amsterdam show that increased on-street parking prices can reduce demand for street parking. While price increases and stronger regulation may be seen as politically unpopular and practically difficult to implement, this is however directly opposed by the results of the studies in Germany and Copenhagen. These studies showed a general acceptance for removing street parking provided alternatives for transportation, in the form of walking and cycling infrastructure in conjunction with alternative use for the land as green areas and public spaces (Goetting et al., 2025) (Mouratidis et al., 2026).

5.4.3 RQ3: What impacts does on-street parking have on residential- mobility behaviour, car usage, parking cost and parking space vacancies?

The findings indicate that on-street parking affects several aspects of residential mobility behaviour, particularly parking behaviour, parking costs and parking space utilisation. Survey respondents using on-street parking generally park further away from their residence compared to respondents using off-street parking, suggesting that lower parking costs may be prioritised over convenience. This additionally has the side effect of traffic spilling over into adjacent areas, when residents park further away. From the property owners perspective, this makes competitive market based pricing for off-street residential parking infeasible due to the construction cost differential, as indicated in the interviews. At the same time, respondents using on-street parking reported slightly lower car usage frequency but similar driving times compared to the off-street group. The transport mode distribution also suggests that the on-street group is not necessarily more car dependent than their off-street counterpart.

This study therefore does not provide concrete evidence directly linking on-street parking to increased car usage, the literature review suggests otherwise referring to the New York study that shows a clear correlation (Guo, 2013b). However, the results suggest that the availability of on-street parking may reduce the effectiveness of measures intended to discourage car ownership by providing alternative parking opportunities outside the residential property.

One of the clearest findings from the interviews concerns the relationship between on-street parking and residential parking vacancies. All interviewed stakeholders described situations where residents choose cheaper or more accessible on-street parking instead of residential parking spaces within the property. Poseidon notably mentioned an increase in off-street residential price saw a rise in parking spot vacancies as a direct result. Hence, besides availability, the price mismatch between off- and on-street parkings also contributes to vacant parking spaces in residential garages, creating inefficient land use and exacerbating economic challenges for property owners, as even returns on filled out parking-spaces do not cover the costs of construction.

Overall, the results suggest that the primary impact of on-street parking is not necessarily increased car use itself, but rather economic and planning-related consequences that weaken the intended function of residential parking provision and mobility agreements.

5.4.4 RQ4: How can Göteborg Stads parking policy be revised to reach their goals regarding on-street parking?

The findings reveal a mismatch between Gothenburg's parking policy goals and the actual parking conditions observed in several areas of the city. According to Göteborgs Stad's parking policy, on-street parking should primarily serve short-term parking needs, while residential parking should gradually be relocated to off-street facilities. The policy also states that on-street parking prices should be equal to or higher than residential parking prices (Göteborgs Stad, 2009).

However, all methods used in this study indicate that this is not consistently the case in practice. In several areas, on-street parking remains cheaper or more accessible, exemplified in the case of Fixfabriken where a majority of the on-street parking group use permit parking which is significantly cheaper than off-street residential parking as seen in the area-based analysis. Hence creating incentives for residents to choose on-street parking over residential off-parking. This contradicts the intended function of the parking policy and contributes to underutilised residential parking spaces.

A recurring theme in the interviews is the need for improved coordination between public on-street parking and privately provided residential parking. Both municipal actors and property owners described the issue as partly systemic, where the total parking availability within an area is not sufficiently considered when determining parking requirements for new developments. Therefore creating an over supply of parking in total, and being detrimental towards Göteborg Stads sustainability policy goals. The interviewees go on to mention that such coordination would need to be implemented in the planning phase for property development.

The literature review also supports the idea that revised parking regulation can influence parking behaviour. Examples from Amsterdam and London show that pricing regulation and reduced parking supply can contribute to reduced on-street parking demand and lower car dependency. This also manifests in Göteborg Stad's conservative interpretation of the PBL where on-street parking is not regulated proactively, rather diagnostically to solve traffic issues after they arise. This lies in contrast to Örebro where the law is interpreted in a more proactive manner and therefore presents the opportunity for Göteborg Stad to do the same. Together with the findings of this study, this suggests that Göteborgs Stad may need to further coordinate pricing, supply and parking regulation between on-street and off-street parking to better achieve its sustainable mobility goals.

5.5 Discussion Limitations

While this study provides valuable insights into parking behaviour and policy effectiveness in Gothenburg, the following limitations should be considered when interpreting the results.

5.5.1 Survey Analysis

A limitation of the survey analysis is the response rate of 13%. While practically workable and satisfactory, statistically this limits the degree of certainty conclusions drawn from the data has. Respondents with a stronger interest in parking or mobility issues may have been more likely to participate, potentially introducing selection bias. In addition, the study relies on self-reported data, meaning that respondents themselves estimated and described their parking behaviour, travel habits and attitudes. This may result in inaccuracies or subjective interpretations, particularly regarding car usage frequency, parking costs and behavioural changes.

Another limitation concerns the categorisation of parking types. In the area-based parking analysis, the study used its own definition of what constitutes on-street parking. However, this categorisation may not fully correspond to how respondents interpreted the parking alternatives in the survey. Some respondents may therefore have misunderstood or inconsistently interpreted what should be considered on-street or off-street parking when answering the questionnaire. Additionally, different forms of on-street parking, such as free parking, residential permits and time-regulated parking, were grouped together in several parts of the analysis despite potentially affecting behaviour differently.

The threshold used to define “high usage” of on-street parking at the property level also introduces uncertainty. A relatively low threshold of at least three respondents and 5% on-street usage was chosen in order to distribute the properties more evenly between categories. However, this increases the risk of misclassification, especially for properties with few survey responses, and may reduce the robustness of comparisons between the different property groups in RQ2.

Another limitation is the lack of longitudinal data. The study captures parking behaviour and attitudes at a single point in time and therefore cannot fully assess how mobility agreements and parking behaviour evolve over longer periods. This is particularly relevant since the long-term effects of mobility agreements on car ownership and travel behaviour may differ from short-term observations.

5.5.2 Interviews

The interview component is limited by both the number and selection of participants. Although key stakeholders from both public and private sectors were included, the number of interviews remains relatively small and may not represent the full range of perspectives related to parking policy and mobility agreements. The responses may also have been influenced by the respondents’ professional roles and organisational interests, potentially creating bias toward institutional or economic viewpoints.

5.5.3 Area-Based Parking Analysis

Several limitations are also connected to the area-based parking analysis. The delimitations for the area analysis built on certain assumptions and had to work with a lack of data. Data

regarding car ownership was collected from Göteborgs Statistikbank, where parts of the dataset had undergone confidentiality adjustments. According to the database description, certain values had been replaced with “0” during the confidentiality review process, which may affect totals and reduce the precision of the data used in the analysis. The car ownership figures should therefore be regarded as approximate rather than exact values.

The calculation of parking costs also includes several assumptions that may affect the results. The estimated monthly cost of on-street parking was based on an assumed average parking duration of 17.5 hours per day together with predefined day and night pricing intervals. Although these assumptions were based on previous studies, they may not accurately reflect actual parking behaviour for all residents. This mismatch may be magnified by the fact that the study deriving these numbers was based in England, which has a different work culture to Sweden.

Identification of free parking areas and permit parking availability relied on external databases and mapping tools, which may not always be fully complete or updated. This was supplemented by subjective categorisation of parkings seen on satellite imagery on Google Maps. The working definition denoted any pathway with streetview available as a public street and therefore any adjacent parking as on-street parking. This had two effects; parkings matching definitions given in the background may not have been included if the street was not considered publicly accessible and other variants such as parking lots may have been pressed into the category of on-street parking.

The reliability of the area analysis is also affected by the fact that the study combines information originating from different years and sources. Parking data, car ownership statistics and property-related information were not always collected during the same time period, which may reduce comparability between datasets. In addition, information provided by property owners may differ from data available through property codes or municipal databases, creating additional uncertainty regarding the exact number of parking spaces.

Finally, some parts of the area analysis rely on estimates of residential parking supply and interpretations of spatial data. Since exact parking counts were not always available, several conclusions are partly based on approximations and visual assessments. This may reduce the precision of certain comparisons and spatial interpretations.

Taken together, these limitations mean that while the study identifies several clear patterns and relationships, the results should be interpreted with some caution. Future research could strengthen the findings by using larger and more representative datasets, improved parking classifications and more longitudinal analyses of parking behaviour and mobility agreements. This study could have achieved a higher degree of quality with additional data being gathered through field visits to the areas of interest. This was, however, not possible due to time constraints.

6. Conclusion

The overall aim of this thesis is to analyse the state of parking in Gothenburg in regard to the relation between on-street parking and residential off-street parking and explore how it relates to the city's current parking policy and the mobility agreements. Through a combination of survey analysis, interviews and area-based parking analysis, the results show that on-street parking can influence both parking behaviour and, to a lesser degree, the intended purposes of mobility agreements.

The findings indicate that the use of on-street parking instead of residential off-street parking is common in certain parts of the city, particularly in central areas and locations with high accessibility to low-cost on-street parking. However, the issue is spatially dependent and varies between different urban areas depending on parking supply and pricing structures.

A central conclusion of the study is that parking behaviour is strongly influenced by economic factors. Residents often choose on-street parking when it is cheaper than residential parking, even when this results in longer walking distances or reduced convenience. The results also suggest that access to on-street parking may weaken some of the intended effects of mobility agreements by allowing residents to compensate for reduced residential parking supply through alternative parking options.

The interviews and previous literature further suggest that on-street parking contributes to underutilised residential parking spaces and economic challenges for property owners. Both public and private actors described situations where cheaper or more accessible street parking can lead residents to avoid residential garages, potentially reducing the effectiveness of planned parking provision. However, this relationship was primarily identified through interviews and supporting literature as no part of the survey directly quantified the issue, the distribution of parkings used coming closest.

At the same time, this study did not identify any major behavioural differences between residents in buildings with mobility agreements and comparison buildings, regardless of whether the areas had high or low usage of on-street parking. Some subtle trends could be observed, such as slightly lower car ownership in buildings with mobility agreements, and higher car ownership in areas with high on-street parking use. Comparisons between the MA+HI, MA+LO, COMP+HI and COMP+LO groups showed relatively small differences. This suggests that the effects of mobility agreements may be weaker, more context dependent, or more difficult to isolate than expected.

At the policy level, the results reveal a mismatch between Gothenburg's parking policy goals and actual parking conditions in several areas. Although the policy states that on-street parking should mainly serve short-term use and be priced at or above residential parking levels, the study shows that this is not always achieved in practice. Parking policy history noted the identification of such coordination as a priority in 1968, showing this as a long-standing problem with a non-trivial solution. Improved coordination between public on-street parking and privately provided residential parking therefore appears necessary in

order to better support the city's goals regarding sustainable mobility and reduced car dependency. Such a policy would also be politically feasible as seen in the Germany and Copenhagen studies.

Overall, the study suggests that the interaction between on-street parking, off-street residential parking and mobility agreements plays an important role in shaping parking behaviour in Gothenburg. Greater coordination of on-street parking pricing and availability, will be an important step in preventing on-street parking from undermining the intended effects of mobility agreements and current parking policy objectives.

Further studies could explore:

- The relationship between on-street residential parking and other forms of off-street parking, such as privately operated outdoor parking lots not connected to residential buildings, which accounted for 8% of the survey responses.
- How pricing and availability between off-street residential parking and on-street parking interact, which this study addresses to a very limited extent.
- The structural and organisational challenges associated with coordinating parking policy across actors, including municipal authorities, private parking operators, and political decision-makers.
- How to reduce residential spillover parking onto streets, while preserving the benefits of on-street parking for visitors, tourism and local commerce.

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Appendices

Appendix A

Permission to use figures

During mid-term meeting 30/3 - 26 the group got permission from Examiner Frances Sprei to reprint figures from the GotPark report. Frances Sprei is one of the authors of the report. The figure 2.4 is used from the report.

Verbal consent to use figure 2.3 from the GotPark report was granted 7/5 - 26 by the supervisor Devon McAslan.

Appendix B

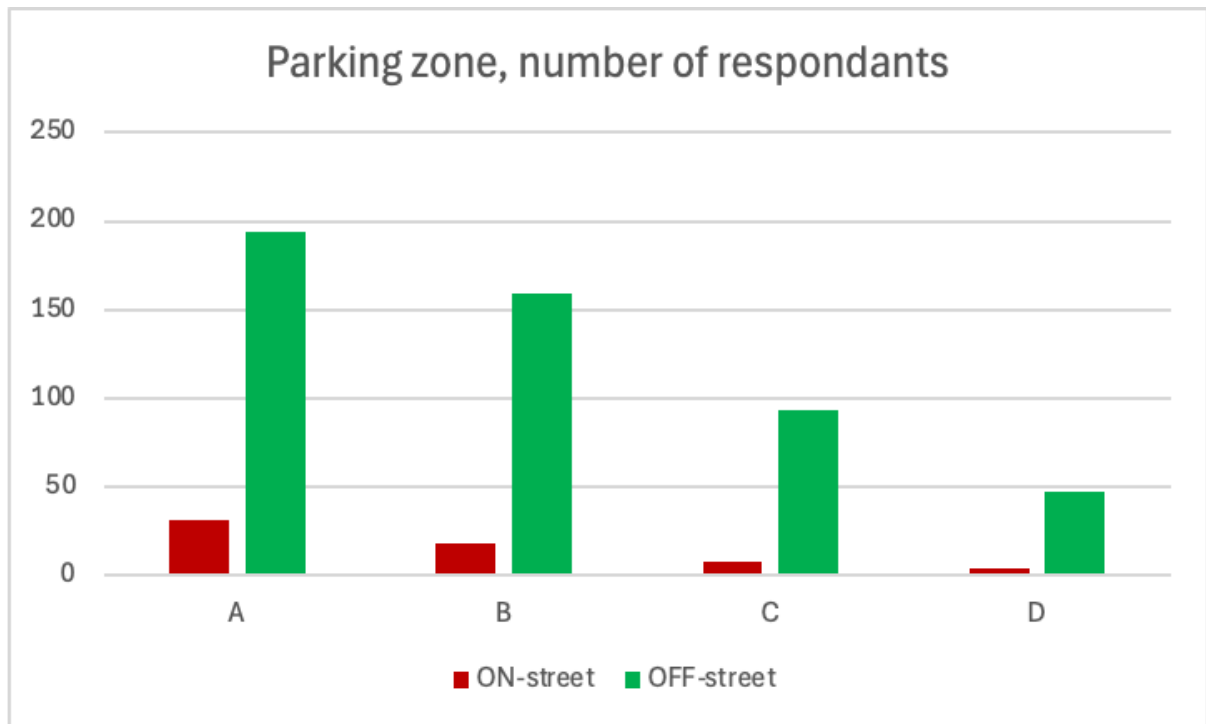


Figure B.1

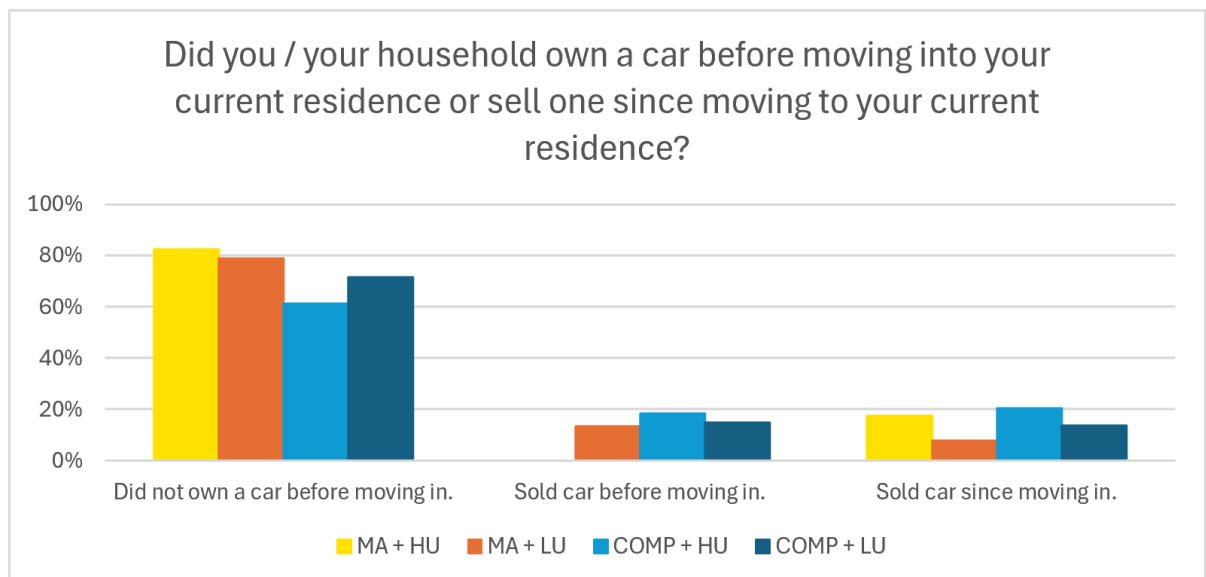


Figure B.2.

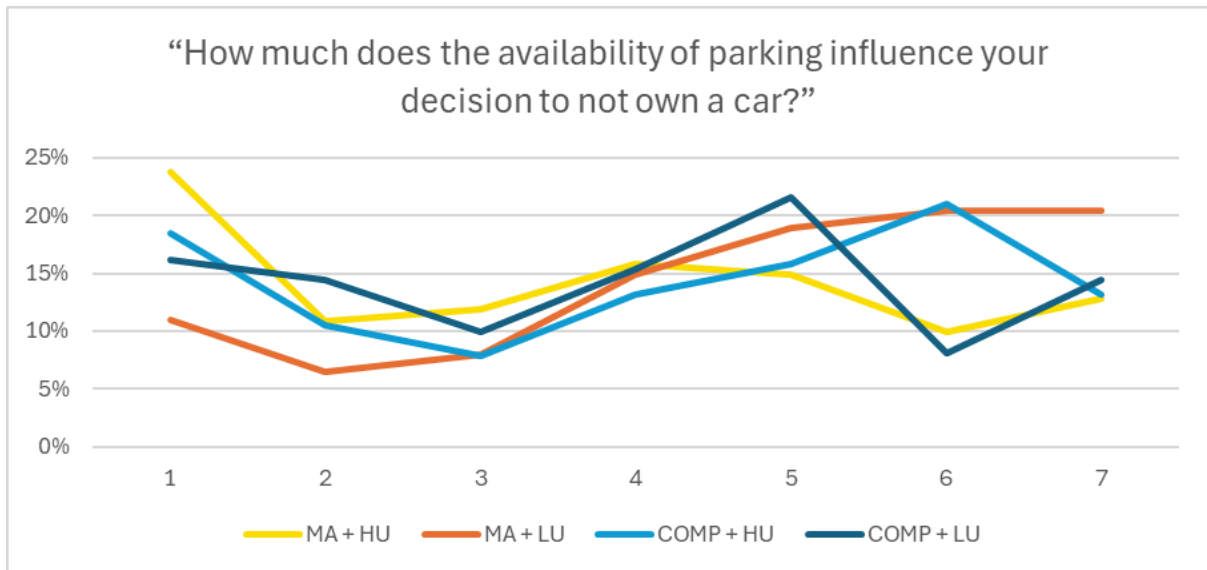


Figure B.3.

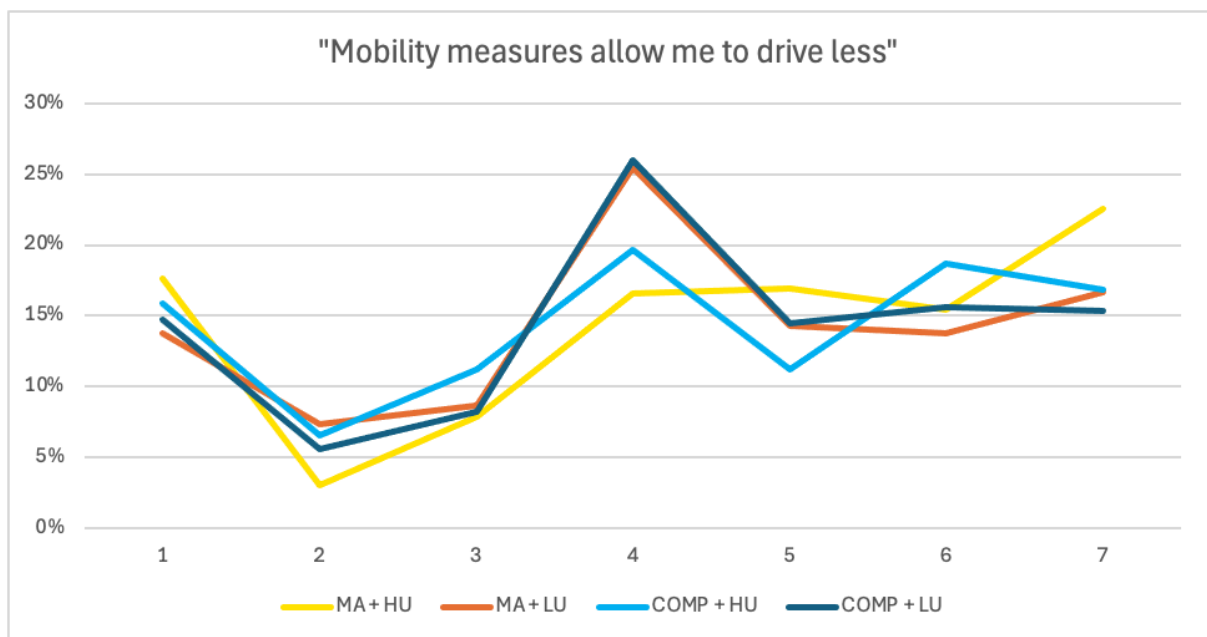


Figure B.4.

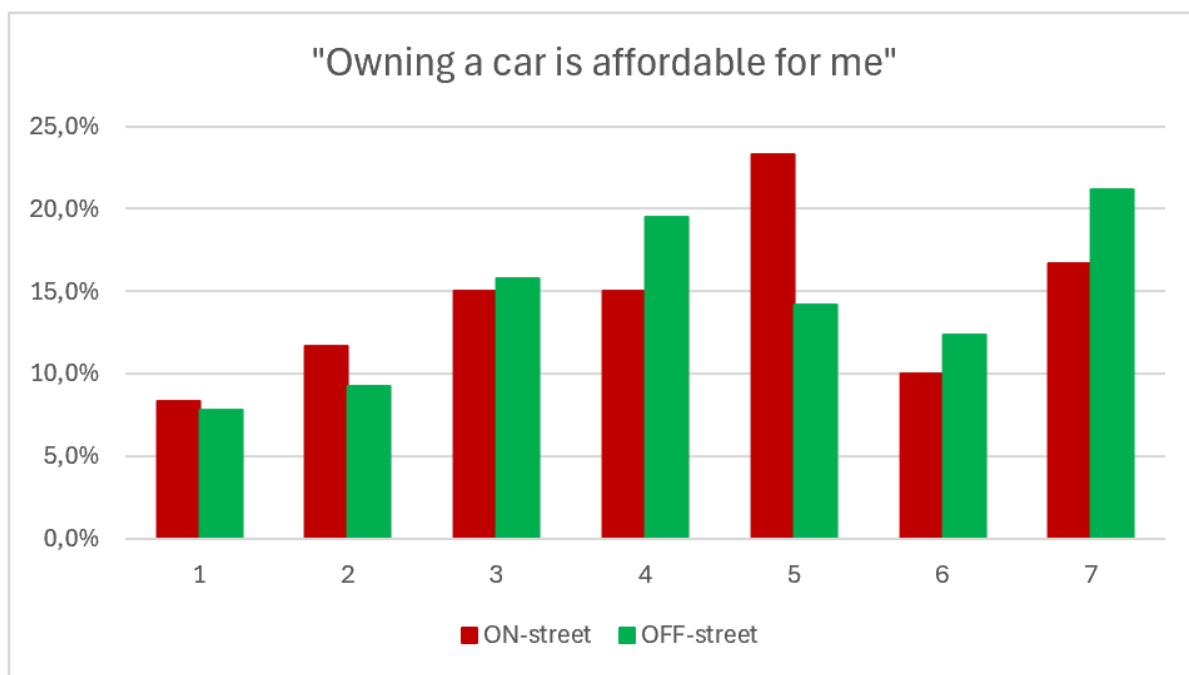


Figure B.5.

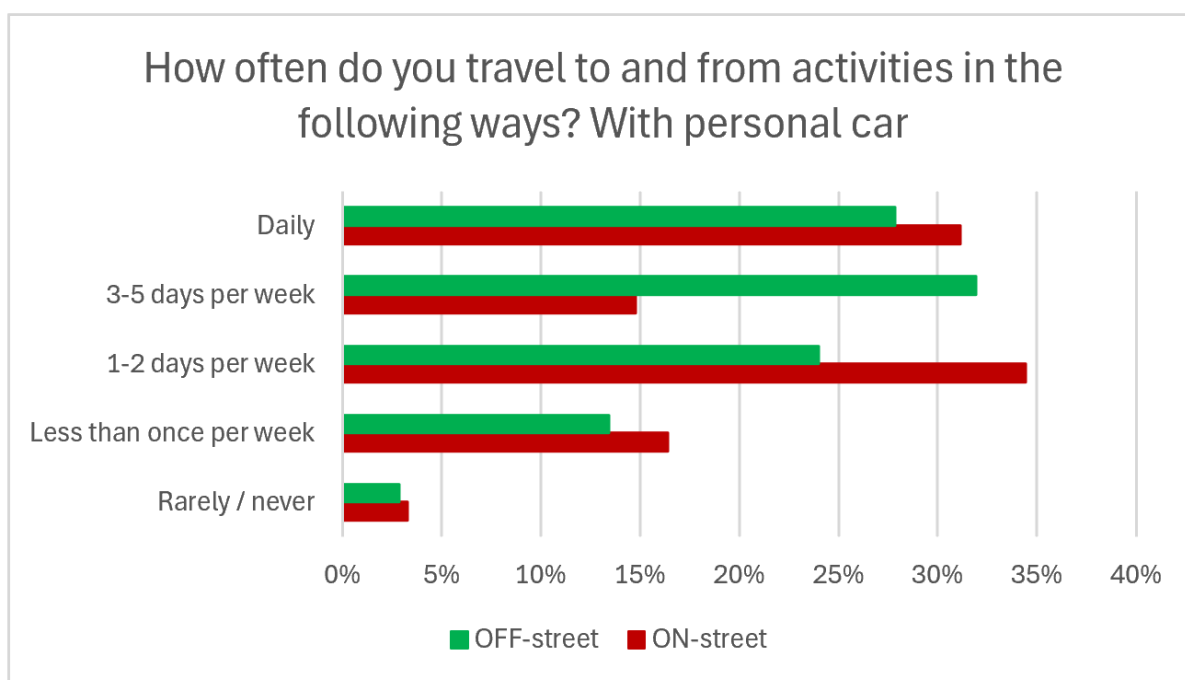


Figure B.6.

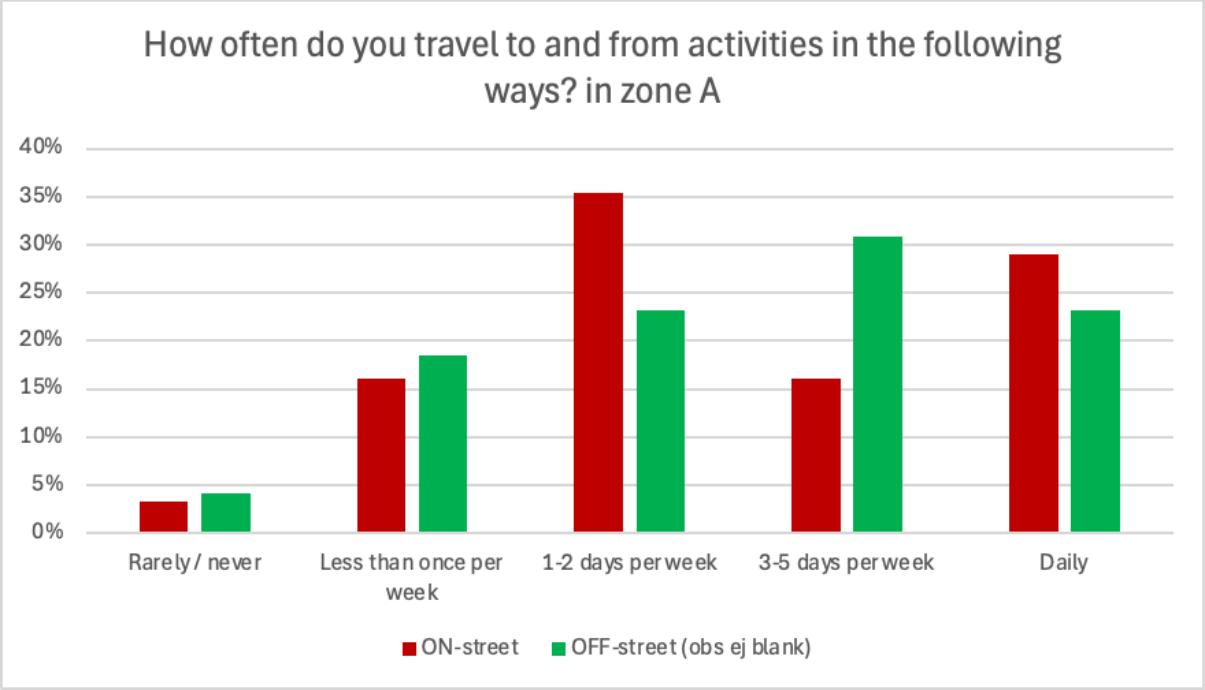


Figure B.7

Appendix C

Table C.1 is filled with information about the chosen areas for the area-based parking analysis. Block ID and Property ID are identifications from the Gothenburg Mobility Survey. Property designations (fastighetsbeteckningar) is a unique number for every property used by Lantmäteriet. Base area code (basområde) is a classification of areas used by the statistics bank of Göteborgs Stad.

Table C.1 detailed information about the areas

Property Name	Block ID	Property ID	Property designations	Base area code
Mandolingatan	21-29	2	JÄRNBROTT 186:3,4 217:1,2 140:1,2,3,4,6	51701, 51705
Fixfabriken	51,52	5	SANDARNA 28:2,3	10206
Rambergssmeden	131-134	13	RAMBERGSSTADEN 74:4,17,11,12	41553
Kallebäckss terrasser	41-45	4	KALLEBÄCK 18:2,3,6,7,8	20405
Ekebackshöjd	181-183	18	JÄRNBROTT 117:11,12,13,14,5,6	51101, 51104
Munspelsgatan	11-15	1	RUD 8:15,16,17,10 (1,2,3)	51703

Appendix D

```
import pandas as pd
from random import randint
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.lines import Line2D

survey_data = pd.read_csv("GotparkSurvey.csv", sep=";",
skiprows=1)
survey_data = survey_data.rename(columns=COLUMN_RENAME)

survey_data["p_zone"] = survey_data["p_zone"].map(zone_map)
survey_data["car_use_freq"] =
survey_data["car_use_freq"].map(car_freq_value)
survey_data["park_cost"] =
survey_data["park_cost"].apply(park_cost_value)
survey_data["parking_home_dist"] =
survey_data["parking_home_dist"].apply(park_dist_value

# ColPlot (Individual Respondents)
sel_park_types = {
    "Street Parking",
    "Street Permit Parking",
    "Off-Street Parking (at building)",
    "Off-Street Parking (not at building)",
}

var1 = ""
var2 = ""
var3 = ""

# Remove null data - Update to match plotting
plot_data = survey_data.dropna(subset=[var1, var2,
var3]).copy()
plot_data["park_type_grouped"] =
plot_data["park_type"].map(park_type_mapping)
plot_data =
plot_data[plot_data["park_type_grouped"].isin(sel_park_types)]

# Boundaries
plot_data = plot_data[plot_data[var1] < 5000]
plot_data = plot_data[plot_data[var2] < 5000]
plot_data = plot_data[plot_data[var3] < 5000]
```

```

# Apply color dictionary
plot_data["color"] =
plot_data["park_type_grouped"].map(park_group_colours).fillna(
"#999999")

# 3D Figure
fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection="3d")

ax.scatter(
    plot_data[var1], # X
    plot_data[var2], # Y
    plot_data[var3], # Z
    c=plot_data["color"],
    s=30,
    alpha=0.75,
    edgecolor="black")

# Legend
legend_elements = []
for park_group in sel_park_types:
    color = park_group_colours.get(park_group, "#999999")
    legend_elements.append(
        Line2D(
            [0], [0],
            marker='o',
            color='w',
            label=park_group,
            markerfacecolor=color,
            markeredgecolor='black',
            markersize=10))

# Axis labels
ax.set_xlabel(var1)
ax.set_ylabel(var2)
ax.set_zlabel(var3)
ax.set_xlim(0, None)
ax.set_ylim(0, None)
ax.set_zlim(0, None)
ax.legend(handles=legend_elements, loc='best',
bbox_to_anchor=(1.05, 1))
print(plot_data.shape)
plt.show()

```

```

# MxPlot (Property Grouping)
# Map property to its matrix quadrant
def get_quadrant(prop):
    for quadrant, props in prop_matrix.items():
        if prop in props:
            return quadrant
    return 'Matrix quadrant assignment error!'

var1 = ""
var2 = ""
var3 = ""

# Remove null data - Update to match plotting
plot_data = survey_data.dropna(subset=[var1, var2,
var3]).copy()
plot_data["matrix_quadrant"] =
plot_data["prop_name"].apply(get_quadrant)

# Boundaries
plot_data = plot_data[plot_data[var1] < 5000]
plot_data = plot_data[plot_data[var2] < 5000]
plot_data = plot_data[plot_data[var3] < 5000]

avg_data = plot_data.groupby(["prop_name", "matrix_quadrant"],
as_index=False).agg({
    var1: "mean",
    var2: "mean",
    var3: "mean",
    "prop_name": "count"
}).rename(columns={"prop_name": "n_obs"})

# Apply color dictionary + Plot size
avg_data["color"] =
avg_data["matrix_quadrant"].map(matrix_colours).fillna("#99999
9")
avg_data["size"] = (avg_data["n_obs"] ** 0.5) * 25

# 3D Figure
fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection="3d")

ax.scatter(
    avg_data[var1],
    avg_data[var2],

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    avg_data[var3],
    c=avg_data["color"],
    s=avg_data["size"],
    alpha=0.6,
    edgecolor="black")

# Legend
legend_elements = [
    Line2D([0], [0], marker='o', color='w', label=quad,
            markerfacecolor=color, markeredgecolor='black',
markersize=10)
    for quad, color in matrix_colours.items()]

# Axis labels
ax.set_xlabel(var1)
ax.set_ylabel(var2)
ax.set_zlabel(var3)
ax.set_xlim(None, None)
ax.set_ylim(None, None)
ax.set_zlim(None, None)
ax.legend(handles=legend_elements, loc='best',
bbox_to_anchor=(1.05, 1))

print(avg_data.shape)
plt.show()

COLUMN_RENAME = {
    "ID": "id",
    "Property ID": "prop_id",
    "Block ID": "block_id",
    "Property name": "prop_name",
    "Mobility agreement": "ma",
    "Parking zone": "p_zone",
    "What is the main mode of transportation you use most often
to get to and from work or school?": "main_trans",
    "What type of car parking is available at your workplace or
school?": "work_park",
    "Personal car (as driver or passenger)": "car_use_freq",
    "Personal car (as driver or passenger).1": "car_use_time",
    "Do you drive more or less?": "drive_less",

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    "How much did the availability and cost of parking
influence your decision to live in your current residence?":
"park_res_inf",
    "Mobility measures allow me to drive less.":
"ma_drive_less",
    "How many cars do you / your household own, including
leased cars and company cars?": "hh_cars",
    "Parking at my apartment building is expensive.":
"park_exp",
    "There is enough car parking for everyone in my building
who wants it.": "park_build",
    "It is always easy for my guests to find car parking when
they visit.": "park_visit",
    "What type of car ownership?": "car_own",
    "Since moving into your current residence, have you
increased or decreased the number of cars in your household?":
"hh_cars_dif",
    "Owning a car is very affordable for me / my household.":
"hh_car_kr",
    "Parking fees in your apartment were double their current
rate.": "park_kr_double"
    "How do you park your car at home? If you have more than
one car, choose the parking option used for your primary
car).": "park_type",
    "How much do you pay per month to park your car? If you
have more than 1 car, please indicate cost per car.":
"park_cost",
    "Is the monthly fee for parking reported to you separately
from your rent or housing association fees?": "park_fee_sep",
    "Approximately how many meters is it from your home to
where you usually park your car?": "parking_home_dist",
    "I / my household would own more cars if there was more
parking available.": "hh_car_up_if_park",
    "I / my household would own fewer cars if parking was more
expensive.": "hh_car_down_if_cost",
    "Did you / your household own a car before moving into your
current residence or sell one since moving to your current
residence?": "hh_car_before",
    "What is the main reason you do not own your own personal
car?": "hh_no_car_note",
    "How much does the cost of parking influence your decision
to not own a car?": "hh_no_car_cost",
    "How much does the availability of parking influence your
decision to not own a car?": "hh_no_car_park"}

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zone_map = {
    "A": 1,
    "B": 2,
    "C": 3,
    "D": 4}

def car_freq_value(x):
    if x == "Daily":
        return randint(25, 30)
    elif x == "3-5 days per week":
        return randint(10, 25)
    elif x == "1-2 days per week":
        return randint(4, 10)
    elif x == "Less than once per week":
        return randint(1, 4)
    elif x == "Less than once per month":
        return randint(0, 1)
    elif x == "Rarely / never":
        return 0
    return np.nan

def park_cost_value(x):
    if x == "0 kr":
        return 0
    elif x == "1 to 500 kr":
        return randint(1, 500)
    elif x == "501 to 1,000 kr":
        return randint(501, 1000)
    elif x == "1,001 to 1,500 kr":
        return randint(1001, 1500)
    elif x == "1,501 to 2,000 kr":
        return randint(1501, 2000)
    elif x == "Over 2,000 kr":
        return randint(2001, 2500)
    return np.nan

def park_dist_value(x):
    if x == "Less than 100m":
        return randint(10, 100)
    elif x == "100m to 250m":
        return randint(101, 250)
    elif x == "250m to 500m":
        return randint(251, 500)
    elif x == "More than 500m":
        return randint(501, 800)
    return np.nan

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street_types = [ "Parking permit / Tillståndsparkering, from
Goteborgs stad",
                 "Street parking (e.g., without permit, free)",
                 "Residential parking permit, from Goteborgs
stad"]
def prop_streetpark_calc():
    table_rows = []
    for prop in survey_data["prop_name"].dropna().unique():
        subset = survey_data[survey_data["prop_name"] == prop]
        total = len(subset)
        street_users =
subset["park_type"].isin(street_types).sum()
        pct = round((street_users / total) * 100, 2)
        ma_value = subset["ma"].iloc[0]
        table_rows.append({
            "Property Name": prop,
            "MA/CO.": ma_value,
            "Total": total,
            "Street": street_users,
            "Pct": pct})
    prop_table = pd.DataFrame(table_rows)
    return prop_table
prop_streetpark_calc_table = prop_streetpark_calc()
def matrix_populate():
    func_matrix = {"MA_HI": [], "MA_LO": [],
                   "COMP_HI": [], "COMP_LO": []}
    for _, row in prop_streetpark_calc_table.iterrows():
        ma_status = row["MA/CO."]
        street_usage_hi = (row["Street"] >= 3) and (row["Pct"]
>= 5)
        usage_status = "HI" if street_usage_hi else "LO"
        fmx_key = f"{ma_status}_{usage_status}"
        func_matrix[fmx_key].append(row["Property Name"])
    return func_matrix
prop_matrix = matrix_populate()

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park_type_colours = {
    "Street parking (e.g., without permit, free)": "#e53935",
    "Parking permit / Tillståndsparkering, from Goteborgs
stad": "#fb8c00",
    "Residential parking permit, from Goteborgs stad":
"#fb8c00",
    "Outdoor parking lot not at apartment": "#ccf08f",
    "Underground parking garage": "#388e3c",
    "Outdoor parking lot at apartment building": "#388e3c",
    "Above ground, stand-alone parking garage": "#388e3c"}
park_type_mapping = {
    "Street parking (e.g., without permit, free)": "Street
Parking",
    "Residential parking permit, from Goteborgs stad": "Street
Permit Parking",
    "Parking permit / Tillståndsparkering, from Goteborgs
stad": "Street Permit Parking",
    "Outdoor parking lot not at apartment": "Off-Street Parking
(not at building)",
    "Underground parking garage": "Off-Street Parking (at
building)",
    "Outdoor parking lot at apartment building": "Off-Street
Parking (at building)",
    "Above ground, stand-alone parking garage": "Off-Street
Parking (at building)",}
park_group_colours = {
    "Street Parking": "#e53935",
    "Street Permit Parking": "#fb8c00",
    "Off-Street Parking (not at building)": "#ccf08f",
    "Off-Street Parking (at building)": "#388e3c"}
matrix_colours = {
    "MA_HI": "#FFFF66",
    "MA_LO": "#FFA500",
    "COMP_HI": "#60A5FA",
    "COMP_LO": "#1E3A8A"}

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