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# **Car Free Living with Children**

Insights from a Qualitative Case Study of a Gothenburg District

Master's thesis at Chalmers Challenge Lab

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MASTER'S THESIS 2020

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Department of Space, Earth & Environment  
*Division of Physical Resource Theory*  
CHALMERS UNIVERSITY OF TECHNOLOGY  
Gothenburg, Sweden 2020

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## **Abstract**

Cars dominate personal mobility but are unsustainable in many aspects. Goals addressing the issues exist on global, national and regional levels. In order to reach the goals willingness to transition to sustainable alternatives is required from currently car dependent groups. We have identified families with children as showing great potential for a transition while being overlooked in research. The willingness of families was assessed through a qualitative case study of the district Guldheden. Data was gathered through interviews and a survey. The data was sorted and analysed through an affinity diagram, force field mappings, a causal loop diagram and a stakeholder mapping. The results indicate that willingness of families is affected by many factors and is a complex issue. Main findings include that weekends and holidays seem more restraining than weekdays and that factors are connected through relationships and affect each other in a complex system. Nine stakeholders were identified where only two are actively working towards car free living. The results are of interest to policymakers and service providers to facilitate car free living and achieve sustainability goals. Identified stakeholders could also make up the basis for future collaborations and joint ventures aimed at families in cities.

Keywords: Car Free Living, Personal Mobility, Families with Children, Case Study.



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Niklas Gren & Jakob Wahl, Gothenburg, June 2020



# Vocabulary

Table 1 below presents and defines terms and abbreviations used throughout the thesis.

**Table 1:** List of terms and abbreviations used throughout the thesis

<b>Terms</b>	<b>Meaning of the term</b>
Car free living	In this thesis, this term was used to describe the lifestyle without access to a privately owned car. Access and utilization of different carpools was not included in this term.
Families with children, Families	These terms refers to families who have children living with them. In this case, it refers to children with age between 0-18 years.
FFM	Force Field Mapping
CLD	Causal Loop Diagram
VGR	The region of Västra Götaland
GR	The region of Gothenburg



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# 1

## Introduction

### 1.1 Background & Problem Setting

Private motorized vehicles stand for 71% of the urban mode share in the 100 biggest cities worldwide (Aguilera and Grébert, 2014). This indicates that private cars are a dominant means of personal transport in urban areas. The reasons for this are many. One explanation suggested by Steg (2003) are subjective benefits that the private car provides, such as flexibility, comfort and speed. However, while providing benefits to the owner, private cars also come with many disadvantages. Automobiles are, regardless of their fuel type and whether or not they are autonomous, inefficiently used (Bates and Leibling, 2012), lead to decreased health and well-being (Nieuwenhuijsen and Khreis, 2016), contribute to urban sprawl and they create and sustain inequity in cities (Jain and Guiver, 2001).

There is widespread awareness of the issues with cars and they are addressed on a global, national and regional level. On the global level the United Nations' Sustainable Development Goals (UN SDGs) address the negative effects of extensive car use. Examples of this are SDG 3.9 within Good Health and Human Well-being, SDG 11.2 within Sustainable Cities and Communities, SDG 12.2 within Sustainable Consumption and Production and SDG 13.2 within Climate Change (United Nations, 2015). On a national level Sweden has several goals and strategies to decrease emissions from cars, increase road safety and increase human well-being as well as a national strategy to increase biking (Regeringskansliet, 2017; Prop. 2016/17:21, 2016). Similar actions are taken at regional levels and in cities. Cities provide a high density of people and relatively short distances creating potential for sustainable transport alternatives (Nieuwenhuijsen et al., 2018). One of the cities in Sweden which is considering this leverage is the City of Gothenburg. The city showcases a very ambitious goal to decrease transport emissions by 80% by 2030 (Göteborg Stad, 2014a) along with a strategy to densify the city and improve infrastructure to support a shift towards active transport (Hellberg et al., 2014; Göteborg Stad, 2014b).

To reach the measures above, a willingness is required from the currently car depending groups to shift to other transport modes. One group in society that currently is car dependant to a high degree is families with children (Ryley, 2006). Hjorthol and Fyhri (2009) provide children's activities as one reason for this and Price and Matthews (2013) suggest child-related equipment and flexibility as contributing factors. However, McCarthy et al. (2017) point out that despite this, they have a

high potential to adopt sustainable travel habits. This can be explained by the fact that having a child is a disruptive life event which creates a chance to rethink old habits (Klößner, 2004). Furthermore, children are influenced by their parents' travel patterns, meaning that sustainable transport choices by the parents might have a positive and lasting impact (Susilo and Liu, 2016).

Altogether, the characteristics and potential of families with children implies the importance of aiming transition strategies towards them. In order to do so it is essential to understand the user perspective of this group. However, most research on travel patterns of families focus on quantitative aspects. This results in a knowledge gap concerning qualitative and subjective perspectives of the families (KG1). Furthermore, McCarthy et al. (2017) call for an enhanced understanding of barriers and motivations for families to choose sustainable travel alternatives, resulting in a second knowledge gap (KG2). Lastly, few studies, if any, have explicitly researched stakeholders affecting the car use of families, translating into a third knowledge gap (KG3). By exploring these knowledge gaps a contribution can be made to understand this largely overlooked group and address their mobility challenges.

## 1.2 Aim & Research Questions

Based on the issues and knowledge gaps raised above, the aim of this thesis is to explore and illustrate the willingness and preconditions of families to live without a private car. This is achieved through a case study of the district Guldheden in the city of Gothenburg.

To reach this aim there is a need to understand more about families, influences and their context. Therefore, three research questions (RQs) are addressed and will be explored during the thesis:

1. What are the enabling and restraining factors for families to live without a private car in Guldheden?
2. What causes and effects related to car use or non-car use can the families of Guldheden see?
3. Which stakeholders are relevant in affecting car free living for families in Guldheden?

## 1.3 Scope & Delimitations

The report focuses on factors on the individual level and not on political or business perspectives. Those are also important and influential, however, in order to understand the perspective of the families the chosen approach was a subjective one. Broadening the scope to include other aspects would make it too broad to handle within one thesis.

Furthermore the scope is delimited to families living in central city areas as the situation of different families likely differs greatly between city, suburbs and rural

areas. Including all these geographical areas would also result in a broad scope for a single thesis.

Finally, this thesis does not intend to present concrete solutions to be implemented right away. The scope of this thesis is to explore the willingness of the families, thus it contributes to holistic solutions by filling knowledge gaps.

## 1.4 Reading Instructions

This thesis is divided into 6 chapters with several sections and subsections within each chapter.

After the introduction chapter 2 presents the overarching methodology, describes challenge lab through which this thesis has been written and goes on to explain the methods used in the thesis.

Chapter 3 provides a short description of the district Guldheden where the case study of this thesis was based.

Chapter 4 presents the analysis and results of the thesis in three steps. First it explains the qualitative insights and the thematic areas found. It then continues with a presentation of quantitative representations of the qualitative data. Subsequently a dynamic mapping of variables affecting willingness to live car free is presented and finally it brings up the involved stakeholders.

Chapter 5 discusses the results by highlighting and commenting the key findings and brings up limitations of the study and the methods used.

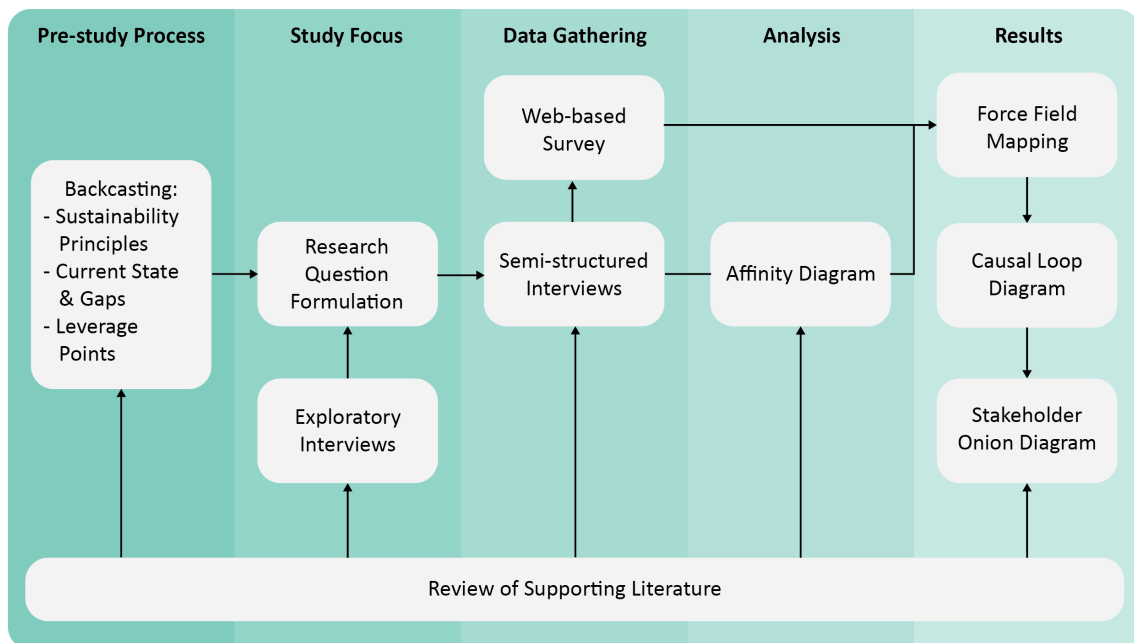
Chapter 6 wraps up the report by summarizing it briefly and concluding the aim and main findings.



# 2

## Methodology

This chapter outlines the methodology of the study. It is divided into the following parts; Pre-study process, Study focus, Data gathering and finally Data analysis and results. The pre-study process describes Challenge Lab, which is the context of the thesis. The process of reaching the aim, methodology and research questions is covered in study focus. Finally the specific methods used as well as how and why they were applied are presented in data gathering. Figure 1 displays a graphical representation of the steps and the methods used in the thesis. It should however be emphasised that the figure depicts a simplified process, in reality it was iterative and to some extent simultaneous. E.g. the web-based survey was based on the insight from the interviews together with the result of the affinity diagram. Therefore, it was implemented as a data gathering process after the first analysis.



**Figure 1:** Graphical representation of the methodology of the thesis

### 2.1 Pre-study Process

This thesis was written as a part of the Master Thesis Lab within Challenge Lab at Chalmers University of Technology. The Challenge lab is a space where interactions and sustainable transition are in focus (Holmberg, 2014). Every year, students

with different backgrounds and master programs are selected to be part of the lab. The selected students identify and address sustainability challenges in a regional context and acts as a bridge between companies, public sector and academia. The bridge is created with an interdisciplinary setting using methods such as *Backcasting*, *Dialogues*, *Systems Thinking*, and *Systems Innovation*.

Each run of the Challenge Lab focuses on different thematic areas, and this year the area *Mobility and Non-mobility* was predefined from the start of 2020. The students then work on their master's thesis within this thematic area for 20 weeks divided into two phases. The initial phase aims to identify leverage points where there are potential for smaller interventions which in turn can lead to larger changes. The subsequent phase seeks to address the leverage points by creation of research questions and proceeds by addressing them. See the results and the process from the initial phase in appendix A.

## 2.2 Study Focus

The initial phase of Challenge lab resulted in a leverage point regarding car free living. To be able to formulate research questions within this area, material was examined through literature review and exploratory interviews.

The literature review was used to get an understanding of the historical aspects of car free living. Qualitative data e.g. literature, reports and previous studies were used to create knowledge of the leverage point and related projects. The literature was also used to identify actors with an interest in the subject.

Exploratory interviews were held with some of the identified actors with the aim to identify how relevant the area was and whether there was interest in the subject. The interviews were sampled using the snowballing technique where the interviewees were asked to identify other relevant stakeholders within the subject. Five exploratory interviews were held and several of these saw an interest in spreading and facilitating the concept of car free living. See table 2 for the interviewed actors.

**Table 2:** Interviewed actors

Actors	Relevance within the area of car free living
Riksbyggen, Brf Viva	Contributed with insights regarding the perspective of estate managers. Focus was on how Riksbyggen has worked with the project Brf Viva to facilitate car free living.
Division of Design and human factors at Chalmers University	Insights regarding the perspective of academia. Focus was on their research regarding mobility as a service for residential areas.
Framtiden Byggutveckling AB	Provided information of resident projects and developments within the Gothenburg area. Had a focus on solutions which can reduce car use.
The Region of Gothenburg	Contributed with the perspective and projects in the municipalities closest to and within the city of Gothenburg.
The Region of Västra Götaland	Provided insights and information regarding the County of Västra Götaland, and thoughts regarding the rural areas.

Our own interests together with the information provided by literature and interviews resulted in a research aim concerning the willingness and preconditions of families to live without a private car. The aim and consequent research questions can be seen in section 1.2. To be able to proceed with our formulated research questions, the setup and methods described in the sections below was used.

### 2.2.1 Inductive and Qualitative Research

Since the aim of the thesis was to *explore and illustrate the willingness and preconditions of families to live without a private car*, an inductive and qualitative research approach was chosen.

In an inductive approach, findings are described impartially, and theories are described based on the data obtained (Bryman, 2012). However, true induction was unachievable since we as researchers entered the process with own interests and conceptual reference points (Miles and Huberman, 1994). This affects the questions that were asked during the interviews. Nevertheless, the inductive approach provided the opportunity to fulfil the aim and letting families in their own words and references describe their preferences. This allowed a deeper understanding of the study group’s willingness to live car free and findings could emerge from the collected data. The findings could later be used to formulate answers and explanations of families behaviour and transport preferences (Brinkmann, 2013).

To support the inductive approach, a qualitative focus was chosen. Qualitative research is useful in situations where the focus is on answering the question “why” and “how” (Marshall, 1996). These small query words mean that the focus in a qualitative research is on understanding the behaviour and beliefs of the study group (Bryman, 2012). This enables an understanding of the study group and what they think is important. Furthermore, Creswell (1994) describes how the qualitative

research empowers the researcher to get detailed information from actual experience. This information and understanding of the study group are often provided through focus groups or interviews (Gill et al., 2008). In this thesis, we used interviews and a survey to provide qualitative data of the families in Guldheden. Read more about this and the data gathering process in section 2.3.

### 2.2.2 Case Study

Case studies are often used in qualitative research, so also in this thesis. By a case study it is meant a process where time is spent on exploring and understanding a situation in depth (Bryman, 2012). Examples of cases could be either a community, organization or individuals. The uses of a case study enables a method where complex situations can be studied in their right environment (Baxter and Jack, 2008). After a case study is selected different methods can be used to collect and analyse data. In this thesis a case study regarding families in the district of Guldheden was chosen. For more information about the chosen case study see chapter 3.

## 2.3 Data Gathering

### Semi-structured Interviews

The primary data source for this thesis was based on interviews with families within the district of Guldheden. These interviews collected the views and values of the target group in a qualitative way. To facilitate an inductive approach, the interviews were organized in a semi-structured setting. This setting allowed the interviews to have depth in the same time as answers could be compared and analysed (Leech, 2002). Furthermore, it provided a structure where the families were able to describe their situation with their own words.

In advance of the interview, an interview guide was developed with an interest in generating insights around the travel habits of families. This information could later be analysed to find factors which influenced their choice of having or not having a private car. With this in mind, several questions were based on the *grand tour* principle, where the interviewee was asked to describe a typical day in their life (Leech, 2002). The guide was created with the help of previous research steps and literature studies along with own assumptions. See the appendix B for the interview guide used during the interviews.

The selection for the interviews was based on a convenience sampling. This technique was used since it is based on accessibility, availability and willingness of the target population (Etikan et al., 2016). Due to the time scope of the study, it was important to have interviewees which were willing to participate in the study. The selection was made by contacting preschools in the area and informing them about the study. In order to include families with older children, requests were also sent via e-mail to residents in Guldheden. This created an interview base which can be seen in table 3. In total six in-depth interviews were conducted which proceeded in one hour each. Five out of the six interviews were held online. Both families with and

without private car ownership were considered to be of interest for the study. The interviews are reported anonymously, and the names given are therefore fictitious. The anonymity was used to create a safe environment and enable higher interaction during the interviews (Alvesson, 2010).

**Table 3:** Structure of the interviewees and their background

Codename	Ageinterval [Years]	Number of children	Ageinterval of the children [Years]	Private car owner
"Josefine"	30-35	2	0-4	No
"Markus"	35-40	2	0-4, 5-10	No
"Eleonora"	35-40	1	0-4	No
"Emelie"	45-50	2	10-15, 10-15	Yes
"Olivia"	25-30	1	0-4	Yes
"Erik"	40-45	1	5-10	No (Has previously owned one)

The interviews were recorded with the approval of the interviewee, and then transcribed. This was done to enable thorough and repeated analysis of the answers with different analytical methods (Bryman, 2012). After the analysis of the interviews, the audio files were deleted to ensure anonymity for the interviewees.

## Self-administered Questionnaire

Surveys that are sent out to and completed by the respondent without any help are called *self-administered questionnaire* or *self-completion questionnaire* (Bryman, 2012). In their design they are similar to structured interviews and should contain few open questions to increase the response rate. This kind of questionnaire or survey can be sent out physically by paper or digitally by e-mail.

A web-based questionnaire was chosen for this thesis to complement and contrast the results from the semi-structured interviews (Hanington and Martin, 2019). The interviews were more exploratory in their nature and their purpose was to give a broad overview of factors affecting the interviewees. However, the interviews did not in a structured way cover aspects such as impact or importance, which is something that a survey better could map.

The design of the survey was based on the identified factors affecting car free living which was identified through the interviews. The questions were based on a ranking principle, where a factor was given and the participants got to rank how important it was. The scale used were in 5 steps, from very important to very unimportant. This was later converted into numbers where very important and very unimportant corresponded to 5 and 1 respectively. From this, an average value of each factor could be calculated based on all six answers from the interviewees.

The design of the questionnaire was chosen after a number of iterations with intermediate pilot tests on individuals in similar target groups. This was done to get the

best possible outcome and response from the study group. The survey design can be seen in appendix C.

## 2.4 Data Analysis

### Structuring of Data through Affinity Diagram

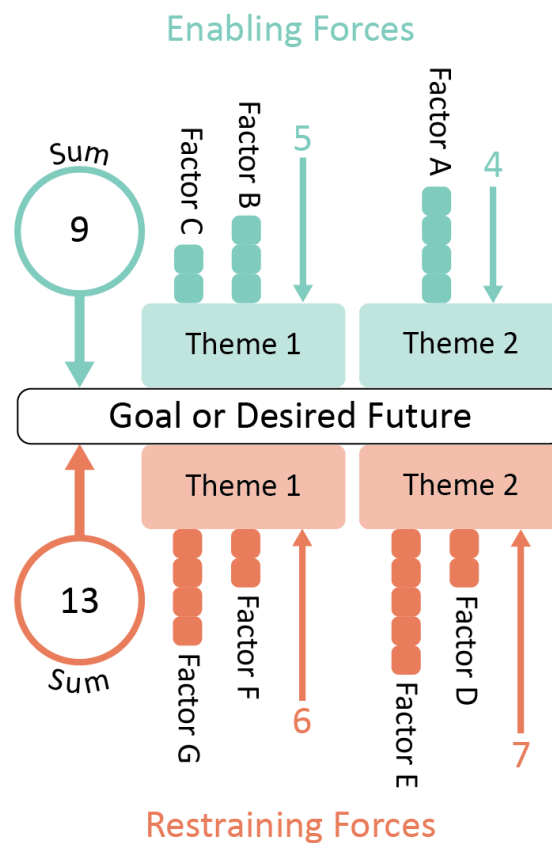
Once the interviews were completed, the provided information was analysed in a simplified *affinity diagram*. The method is also called *thematic analysis* or *K-J method* after the Japanese geographer Kawakita Jiro who invented it (Scupin, 1997). The method is used to structure and visualize field data in a simple way and is being used in a variety of fields, both in research and industry (Holtzblatt and Beyer, 2017). As the name *affinity diagram* suggests the method is based on grouping data in a hierarchical way instead of e.g. pre-defined categories. That way fresh perspectives on the data are encouraged. This is usually done by transferring data to e.g. post-it notes so that each note displays an unique point or issue. The notes are then gradually configured into small groups of 4-5 notes each on a wall or board. Each group is labelled according to the content and related groups can be arranged into larger groups to further organize the data (Holtzblatt and Beyer, 2017).

The purpose of applying an affinity diagram in this thesis was to organize the semi-structured and highly exploratory interviews in an ordered way. This was done by analysing printed transcripts from the interviews and searching for interesting quotes and pieces of information. These pieces were cut out and gradually grouped into coarse themes. After going through all the transcripts, the themes were analysed in a second round and then divided into more detailed sub-themes, so-called factors. These factors were either restraining or enabling families to live car free in Guldheden.

### Enabling and Restraining Factors through Force Field Mapping

Force Field Mapping (FFM) is a method that visualizes and evaluates restraining and enabling forces for change. It is based on field theory by Kurt Lewin in the 1950's which was developed to implement changes in technology, people and structure (Lewin et al., 1951). During the course of time the scope of use has broadened, and Thomas (1985) suggests that it has potential to also evaluate strategies and planning.

The mapping is based on a goal or a desired future which is placed in the middle and arrows that represents enabling or restraining forces (Thomas, 1985). This was used together with the identified themes and factors from the affinity diagram to create an illustration of the forces in the current system. See figure 2 for a conceptual illustration of the used FFM.



**Figure 2:** Conceptual picture of the Force field mapping

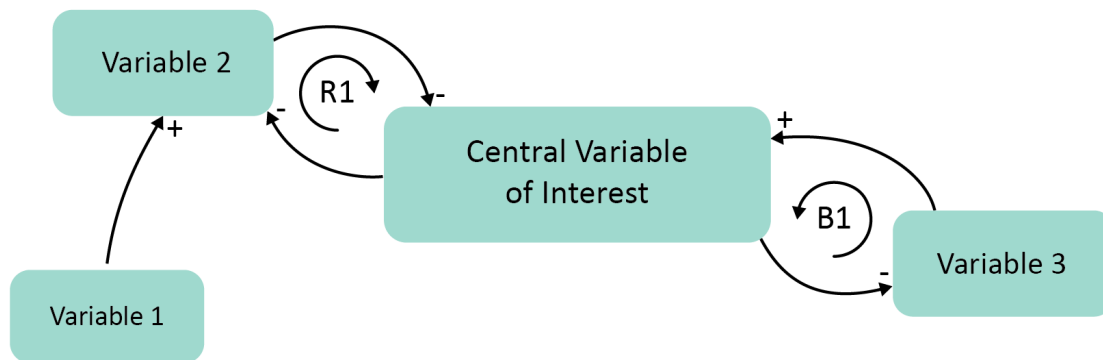
The force field mapping was used in two steps with different perspectives in the thesis. The first step was to illustrate the factors based on the occurrence during the interviews. Each unique mention of a factor in each of the six interviews, both direct and indirect, resulted in a bar in the FFM. The total sum of all factors inside a theme was illustrated with an arrow. The longer the arrow the more influential was the theme. To complement and contrast this first occurrence-based FFM the second step was to make a severity-based FFM. This was done by using the compiled and sorted results from the questionnaire which was focused on severity of enabling and restraining factors. Here the level of the factors represents the average rating from the six interviewees.

To further increase the readability of the results, the occurrence- and severity-based mappings were combined into a four-field matrix with occurrence on one axis and severity on the other. The top quadrants in the four-field matrix were used to map the enabling forces and the bottom ones to map the restraining ones. This was done to keep the layout similar to the original FFM with opposing forces.

In this thesis the use of force field mappings provided a good way to quantitatively visualize and convey the qualitative results from the interviews, i.e. restraining and enabling forces. It was also a good way to display and find relations to the larger context as well as stakeholders on different levels.

## Dynamic Illustration through Causal Loop Diagram

To supplement previous methods with a dynamic approach, a system thinking process was used. The system dynamic provides a method where complex systems can be understood (Baker and Singh, 2019). Willingness to live car free is a complex matter since it involves human interests and behaviour (Checkland, 2000). Thus, much can be learned from looking at the system as a whole instead of individual factors which the force field mapping presented. In this thesis a Causal loop diagram (CLD) was used to illustrate the system dynamic regarding families' willingness to live car free. A CLD is typically used when trying to understand causal relationships and how feedback works in a complex system (Haraldsson, 2004). It visualises the underlying relationships and patterns of the problem. Haraldsson (2004) further describes how a CLD illustrates causal relationships between variables and that this creates influences in forms of dynamic feedback loops. See figure 3 for a conceptual figure to understand how CLDs are interpreted.



**Figure 3:** Conceptual picture of the used causal loop diagram

In figure 3, the causal relationships are illustrated by arrows and a plus or minus sign. The signs indicate a change in the same or the opposite direction of the origin. A plus sign means that the variable changes the same way as the origin, i.e. if the origin increases the variable also increases. A minus sign, on the other hand, means that the variable changes opposite to the origin, i.e. if the origin increases the variable decreases (Haraldsson, 2004).

A CLD can also contain loops as can be seen in figure 3. Loops can be reinforcing (R) or balancing (B). A reinforcing loop indicates that the variables in the loop affect the system in a way that moves it away from the equilibrium state. A balancing loop affects the system in a way that moves it closer to the equilibrium state (Haraldsson, 2004).

Dynamic thinking and CLD was of interest for this study since it is a way of transforming individual factors into a more holistic picture. It also identifies dynamic behaviours in the system (Sedlacko et al., 2014), which a force field mapping does not.

The CLD and the system it illustrates was based on the perception of the interviewees. Consequently, the transcripts from the interviews formed the data source for

the CLD. They were used to find statements which contained a cause and effect, so called causal statements. By going through the transcripts from the interviews, a list of causal statements were created. This list was then used to sort out similar statements and gradually connect several statements. By doing so, relationships between different variables were identified and finally visualised in the presented CLD.

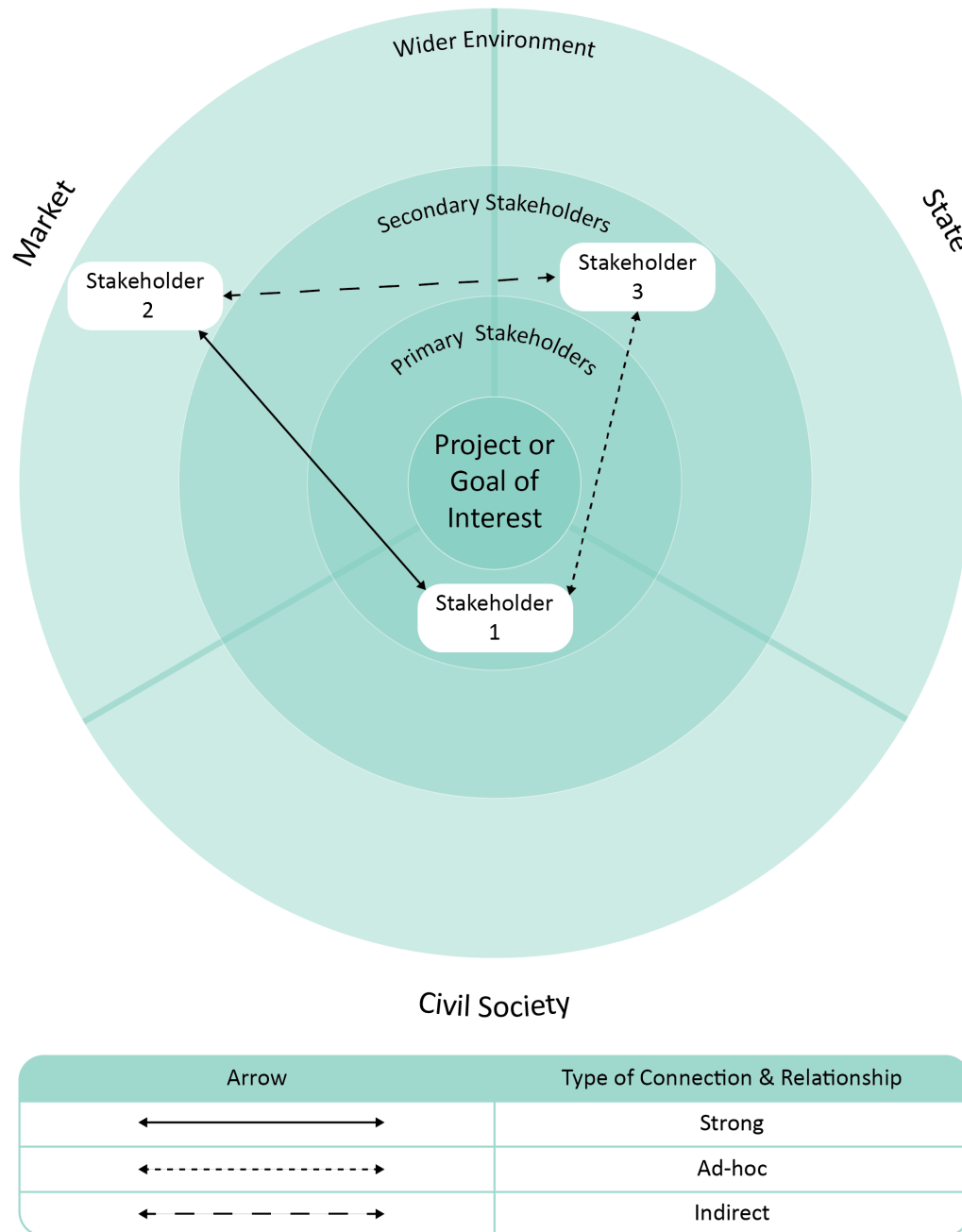
In sorting and interpreting the statements it was assumed that all the statements were generally applicable. Furthermore, as the diagram was to be based on the subjective statements of the interviewees, no statement was disregarded because of invalidity. Since there were few explicit questions regarding cause and effect in the interviews most of the statements were implicit rather than explicit. This resulted in a certain degree of interpretation during the process. Nevertheless, only the statements where a strong implication could be seen were included in the final CLD.

### **Mapping of Stakeholders with Stakeholder Onion Diagram**

The CLD depicts the dynamic relations affecting the willingness to live car free. However, it does not show the external stakeholders affecting a car free living in Guldheden. Therefore, a stakeholder approach was used in this thesis where stakeholders related to Guldheden were identified. This made it easier to understand the larger system and connect stakeholders with car free living in Guldheden.

One definition of a stakeholder according to Alexander and Robertson (2004) is someone who have something to gain, lose or in any way have an impact on the project. If collaboration between stakeholders exists there is an increased possibility for successful implementation of the project. Stakeholders often exist on different levels and are based on relationships found between different actors and sectors (Czischke, 2018).

To be able to illustrate this, a *Stakeholder Onion Diagram* was used and stakeholders were identified through the interviews. The stakeholder onion diagram starts from a project, or in this case car free living, and maps the stakeholders according to their relationships and their importance (Czischke, 2018). The closer to the center of the chart, the greater involvement and importance of the stakeholder. The Stakeholder onion diagram used in this analysis was based on the diagram created by Czischke (2018). The diagram combines three different domains and three different levels. See figure 4 for a conceptual picture of the used model.



**Figure 4:** Conceptual picture of the used stakeholder onion diagram

The domains represent three different areas where the stakeholder can act, either market, state or civil society (Czischke, 2018). These were considered to be of great

relevance also to this thesis since they cover most of the areas where stakeholders related to car use belongs. To distinguish the power and interest of the stakeholders, the onion diagram is typically based on different levels or circles around the main project. In line with the diagram created by Czischke (2018), three different layers were used.

- Level 1, closest to the inner circle, represents the primary stakeholders which were involved on a day-to-day basis and exert the most influence on car free living for families in Guldheden.
- Level 2 are the secondary stakeholders, the importance and power were still high, but the involvement has decreased compared to level 1.
- Level 3 consists of a wider environment. Stakeholders in this level create a framework around the project but their main interest is not linked to car free living.

To include the relationship between the stakeholders, arrows are used to visualize the connection. The relationships were analyzed based on the interviews and followed the structure of Czischke (2018), where three different kinds of relationships are applied.

- **Strong connection and relationship** - A relationship based on day-to-day connection where the stakeholders are interdependent.
- **Ad-hoc connection and relationship** - More limited relationship and a connection based on more specific means.
- **Indirect connection and relationship** - This category was dominated by relationships based on laws or restrictions.



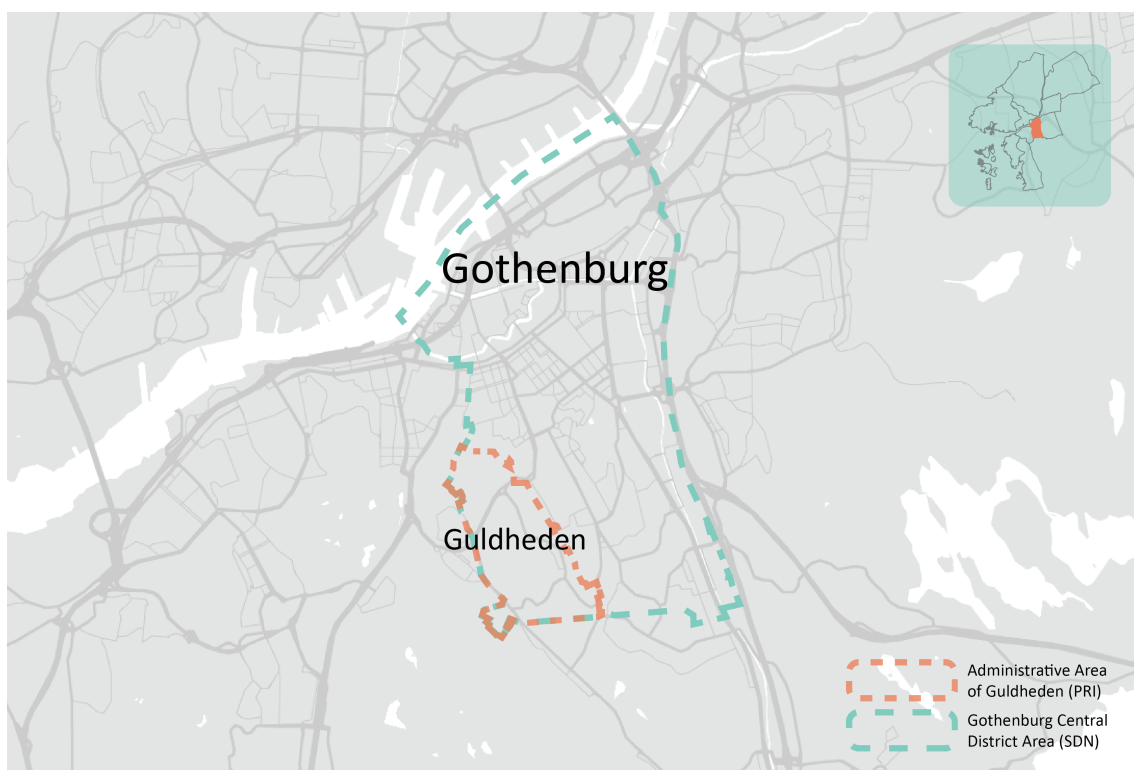
# 3

## Case Study Background

This chapter brings up the case study which are studied in this thesis. It presents a description of the area Guldheden as well as presenting numbers of cars and families in the district.

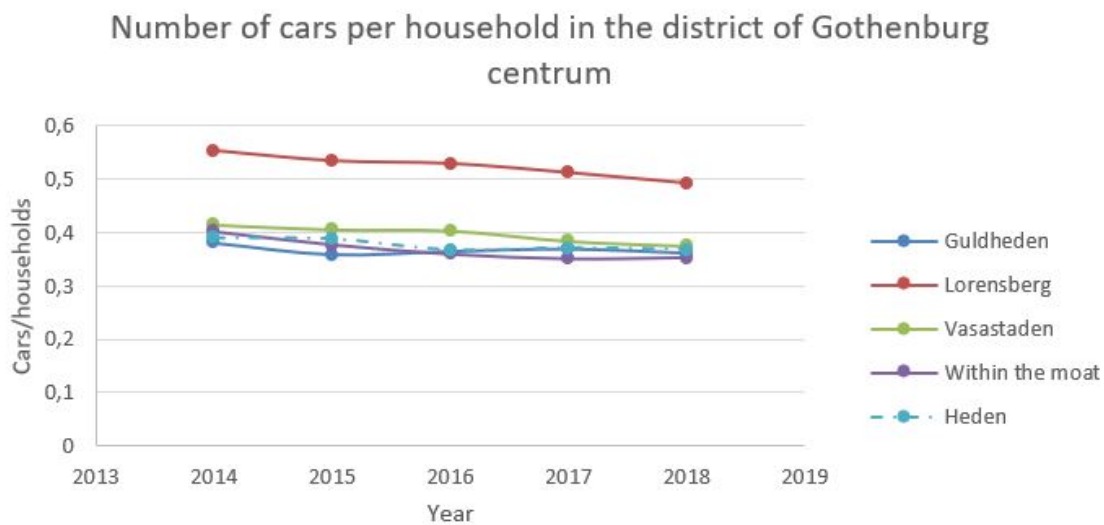
### 3.1 Area of Guldheden

Guldheden is a district in southern Gothenburg with close proximity to central Gothenburg. The city of Gothenburg is divided into ten administrative areas, so called *Stadsdelsnämndsområden* (SDN). They are in turn divided into smaller administrative areas, *Mellanområden* (MO) and *Primärområden* (PRI) (Göteborgs Stadsledningskontor, 2019). Guldheden is a PRI within Central Gothenburg. See figure 5 for a map of the administrative area of Guldheden.



**Figure 5:** Map of the administrative area of Guldheden within Gothenburg central district area. The map is based on data from Google (nd) & Göteborgs Stad (2018).

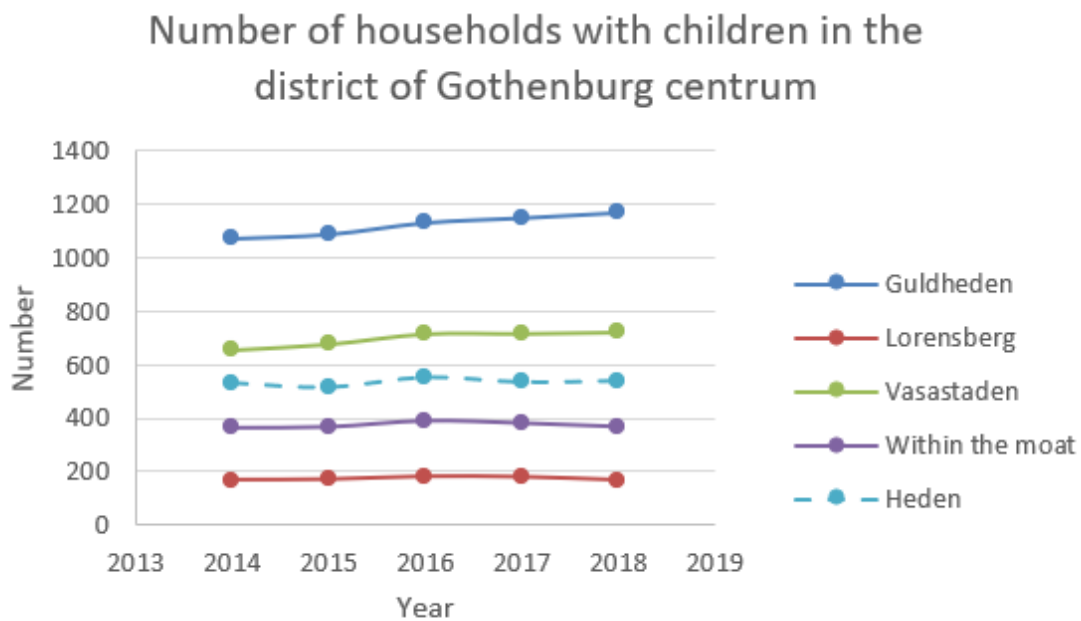
The area of Guldheden consists mainly of apartment blocks which were built during the years 1945-1953 after the principle *Grannskapsprincipen* (Sjölin, 2004). The idea, like the more famous Radburn model, was to create residential areas where services such as grocery stores could be reached without crossing the roads (Bertheden and Karlsson, 2009). Today, Guldheden is a popular residential areas in central Gothenburg with a population of 10 628 inhabitants (Göteborgs Stadsledningskontor, 2019). The number of cars in the district is slightly lower than average but is at the same level as other areas in the city center, see figure 6. The fact that the number of cars is slightly smaller than the average is assumed to be due to the fact that Guldheden is also attractive to students and elderly who generally do not own private cars.



**Figure 6:** Number of cars per households in different districts of Gothenburg centrum (Göteborgs Stadsledningskontor, 2019).

## 3.2 Families with Children in Guldheden

As mentioned in the introduction, see chapter 1, some groups of society will be more affected than others when urban development moves towards car free solutions. Both Ryley (2006) and Pooley et al. (2011) emphasize the needs and car dependence of families with children. In central Gothenburg, Guldheden is the district with the highest number of households with children (Göteborgs Stadsledningskontor, 2019). Here the category families with children represent 16.4% of all the residents. See figure 7 for numbers of families with children in different districts of central Gothenburg.



**Figure 7:** Number of households with children in different districts of central Gothenburg (Göteborgs Stadsledningskontor, 2019).

In conclusion, the overall picture is that Guldheden shows an interesting tension where the area has a large proportion of families with children and a relatively high proportion of cars per household. This can be seen together with the fact that the City of Gothenburg is showing interest in reducing the amount of cars. Therefore, Guldheden and its families fit well as a case study. If the families' willingness to live car free in Guldheden is understood, the insights could be used to facilitate car free living in the region of Gothenburg.

### 3. Case Study Background

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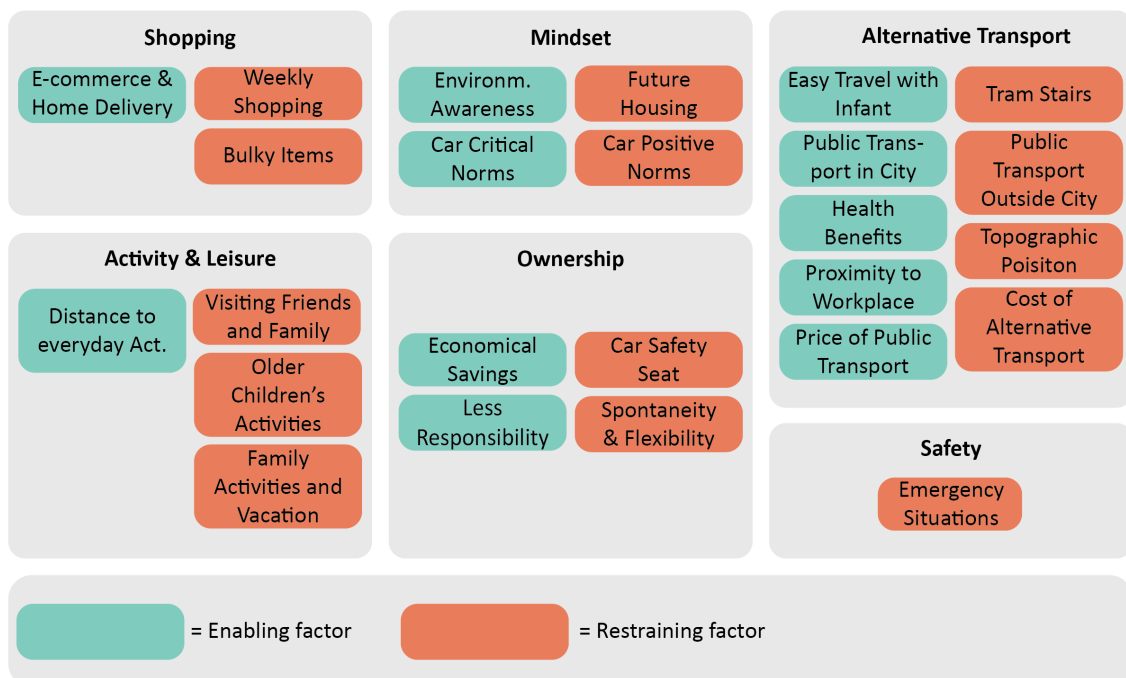
# 4

## Analysis & Results

This chapter presents the results and analysis of the study. It starts by presenting qualitative insights (4.1), followed by a quantitative representation (4.2). It also introduces a dynamic system mapping (4.3) and finally a presentation of relevant stakeholders (4.4).

### 4.1 Qualitative Insights & Thematic Areas

The qualitative data generated from the six interviews were analyzed using an affinity diagram. The diagram resulted in six main themes which emerged during the interviews. Each theme also contained sub-themes, so called factors, where similar statements were grouped. The factors contained either enabling or restraining statements for car free living in Guldheden. See figure 8 for the affinity diagram and its themes' respective factors. The original affinity diagram with raw data from the interviews is presented in appendix D.



**Figure 8:** Affinity diagram with the identified themes together with restraining and enabling factors.

As seen in figure 8 the identified themes were *Shopping, Mindset, Alternative transport, Activity and leisure, Safety* and *Ownership*. The subsections 4.1.1 to 4.1.6 will present the different themes and their factors and how they relate to enabling and restraining forces for car free living. To clarify the factors examples of quotes from the interviews are included. Frequency and severity of the factors is presented in section 4.2.

### 4.1.1 Shopping

Shopping emerged as a theme from the performed interviews. To narrow the theme, the statements could later be divided into enabling and restraining factors related to different behaviours connected to the families' purchasing of goods.

#### Enabling factors

On the enabling side, statements regarding **E-commerce and home delivery** created their own factor. The technological change during the recent decades seems to also have affected behavioral patterns of families in Guldheden. Interviewees stated that they buy their groceries online and get them delivered home. The interviewee "Josefine" provided one example of this when she stated:

*"I am grateful that you can buy food online instead of going shopping, it has made shopping a lot easier. We probably use these services even more now when we have children, especially for grocery shopping."*

This change of behavior seems to result in a reduced need for a private car and home deliveries are seen as an influential factor in enabling living without a private car. According to "Eleonora" it is so important that it controls where their future housing should be.

*"We don't have to go to a big super market or something, instead we have the opportunity to have it home delivered. I think that helps a lot. We are in the process of looking for a house and it must be within the area of the home deliveries."*

#### Restraining factors

When it comes to restraining factors, **Inconvenient weekly shopping** and **Transporting bulky items** were the two occurring factors which worked against car free living. Both factors include transporting something that is often considered inconvenient to transport without a car. This was something that sometimes created a desire to buy a car. As "Josefine" expressed it in an interview:

*"It may not be very easy to go shopping at IKEA or Bauhaus and not have a car... and sometimes the desire may be that you want to do the weekly grocery shopping."*

### 4.1.2 Mindset

This theme is related to the approach and attitude towards cars and car free living. The statements regarding this theme was divided into two enabling and two restraining factors.

#### Enabling factors

The enabling part of the interviewees' mindset consisted of two different factors, namely *Environmental awareness* and *Car critical norms*.

**Environmental awareness** was something which emerged from the interviews as its own factor. The awareness was almost exclusively expressed in terms of emissions created by cars and was a strong argument against a private car. "Eleonora" showcased this factor strongly in an interview:

*"I think it is extremely environmentally unfriendly with a car so I do not want to have one."*

"Josefine" also agrees with this and stated:

*"...for both cost and environmental reasons I do not want to have a private car"*

**Car critical norms** was the second enabling factor. Some of the statements from the interviews were related to friends who influenced each other through values and behaviour. An example of this was when "Josefine" described that in her network it is frowned upon to buy a car and that many came with excuses when explaining it. This factor was also mentioned by those who currently owned a private car. "Olivia" described that a close friend expressed strong opinions against long distance travelling and mentioned that she felt bad over owning a petroleum-fuelled car. Although these norms to some extent seemed to create mental displeasure for some of the interviewees, it was interpreted as a force which enables a car free Guldheden.

#### Restraining factors

On the restraining side, the theme mindset was expressed by the factors *Car positive norms* and *Increased need of transport in future housing*.

**Car positive norms:** Norms also occurred on the restraining side of a car free living. Here there were some statements regarding norms from the society which could affect people to buy their own car. The most evident case was explained by "Josefin" in an interview:

*"[if moving to a house outside the city centre]... of course you can bike and get goods delivered home and so on to get it all to work out, but it would require to break the norm to a high degree, much more than when living in an apartment in the city without a car"*

"Josefin" admits that there are norms regarding car ownership when living in the city

and in Guldheden. But she also states that the norms may even be stronger when living in houses in districts further away from downtown Gothenburg compared to Guldheden.

**Increased need of transport in future housing:** Although the families interviewed at the moment live in apartments, many people were thinking about future housing. This was a scenario which, according to them, affected their need for a car. This factor is not specifically linked to Guldheden but it was brought up by several interviewees and is something which can get families to buy a car already now. Therefore, this was considered to be a factor to include in the analysis. Example of statements regarding this factor was when "Eleonora" was asked if anything in the future could influence the family's decision to buy a car. She answered the following:

*"Yes, I think if we decide to move to a house ... Then in the long term it can be an untenable situation. We are trying to find schools nearby but there are many parameters that must work out. It is mainly this scenario that would influence us".*

### 4.1.3 Alternative transport

This theme contained the statements related to alternative transport modes which was mentioned instead of a private car. This was also the theme with the largest number of factors with different aspects. The statements were divided into five enabling factors and four restraining ones.

#### Enabling factors

On the enabling side, the statements from the interviews were divided into the following factors: *Easier travel with infant*, *Good supply of public transport within the city*, *Low price of public transport*, *Health benefits of active transports means* and *Proximity to workplace and schools*.

**Easier travel with infant** was a factor intended to represent the statements where the parents experienced calmer children when using alternative transport. This was seen by parents as a valid reason for not using a car for both shorter and longer trips. Instead of strapping the infant into a car safety seat, some preferred using train or bus where both the parent and infant could walk around, leading to happier children. As "Olivia" explained it:

*"Actually, it was much nicer to travel by train, because our baby does not think it is very fun to travel by car. You have to entertain him quite a lot and he does not like to be buckled in. So, you have to sing a lot and stop very often."*

**Good supply of public transport within the city:** Statements connected to this factor were often about how the supply of public transport within the city simplified car free living. Many departures and good connections to the rest of the city meant that the need for a car was quite small when it came to movement within the city and its surrounding areas.

**Low price of public transport:** Very linked to the supply of public transport was the factor regarding the price of the public transport. This factor was predominately seen as a factor which made it easier to live car free. One participant expressed that it is cheaper to go by car within the city. However, she also stated that she did not use a public transport card which provides a discount and did not include the sunk costs of the car. This resulted in the interpretation of the factor as enabling.

**Proximity to workplace and schools** was something that was brought up during the interviews and therefore assigned its own factor. This distance to workplaces and schools seemed to have a big influence and reduced families need for a private car. As "Olivia" described it:

*“So ... if you think what you really need, then you do not need a car when you are travelling to work, and that’s the most important thing to get to.”*

Many of the interviewees were living close to their jobs and therefore used biking or walking as the predominant mode of transport during the weekdays. This was also true for the schools and it was seen as an important location to have close to their accommodation. As "Josefine" motivated it:

*“We have, among other things, chosen to prioritize proximity to preschools because we do not want to be dependent on vehicles to get us there.”*

**Health benefits of active transports means:** Another factor, also related to Alternative transport, was the health aspect of e.g. walking and cycling. Statements regarding this was seen as important and valid reasons for not using a car. A comment given by "Josefine" was a good example of this factor. She saw the distances to work, grocery shops and school as great everyday exercise and a reason for not owning a car.

### **Restraining factors**

On the restraining side, the theme *Alternative transport* consisted of the following factors: *Tram stairs as an obstacle*, *Poor supply of public transport outside the city*, *Topographic position hinder active transport means* and *High cost of alternative transport*.

**The tram stairs are an obstacle:** From the interviews, statements regarding the old trams and their stairs emerged. The stairs were described as an obstacle for families with baby strollers and if they travel alone without their partner they often must ask for help. This made several of the interviewees unwilling to use the tram or only use it in the time span where they know that someone will be there to help. This was considered to be a barrier for the families to use public transport and therefore part of the restraining factors.

**Poor supply of public transport outside the city:** The supply of public transport was mentioned both as an enabling and a restraining force, but with a small difference. The enabling side of the supply was, as mention before, regarding the

City of Gothenburg with suburbs. But when leaving the central areas for the more rural ones, the families mention it more as a restraining factor. Arguments such as few departures, too many connections or long waiting times in the rural areas were used when justifying their use or need of a car.

**Topographic position hinders active transport means:** The uphill in Guldheden was mentioned as a barrier during the interviews. It creates an obstacle for the families when walking or cycling. As "Josefine" said it

*"I feel that I will not be able to take the bike with two children because of the hills".*

The topographic location is seen as a restraining factor since walking and cycling is considered to be two important modes of transport in a car free living.

**High cost of alternative transport** refers to the price of electric bikes and accessories associated with cycling. Some of the interviewees were interested in having an electric bike instead of a car, others were more interested in buying a bike trailer to be able to transport their children. But in the same sentence they all mentioned the high cost of the object and that they therefore never finalized their purchases. As "Erik" stated

*"I have been thinking about cycling but if I want to bring the child then I need a bicycle trailer and they are very expensive. I don't think I can afford it."*

### 4.1.4 Activity and Leisure

Another theme discerned from the interviews was about activities and leisure and the car use related to this. It contained one enabling factor and three restraining ones.

#### **Enabling factors**

The enabling side of the theme *Activity and Leisure* consisted of one factor, namely *Short distances to everyday activities*.

**Short distances to everyday activities** was brought up as a factor which enables car free living. This factor was very linked to the proximity of Guldheden to the rest of the city. The proximity made trips to soccer clubs and similar activities easy, and the transport was often done by cycling or walking. Guldheden was further described as a district with lots of green areas and playgrounds which was appreciated by the families. This was described as a resource which reduced the need for longer trips regarding everyday activities. Moreover, those who liked nature described the proximity to nearby forests and reserves as location for everyday activity which was possible to reach without a car.

## Restraining Factors

The restraining side of *Activity and leisure* consisted of the factors *Visiting friends and family*, *Older children's activities* and *Family activities and vacation*.

**Visiting friends and family** was a factor which emerged when talking about car needs. The reason why many of the families had a private car or were considering to buy one was because of the possibility to visit family and friends. The car was seen as an easy and fast way of being in contact with their families as the child grows up even if they live in another part of the region or country.

**Older children's activities:** This factor described the families' thoughts on increasing need for transportation with older children. This was something that affected their attitude towards buying and owning a car even in their current situation. As "Josefine" described it:

*"Now we are satisfied with hanging out in Guldheden, but when we have a nine-year-old, she may want to visit some activity or friends somewhere. Then the mobility need becomes greater and you also have to be humble that this situation may arise and evaluate the need for a car along the way."*

This was also confirmed by "Emelie" who has slightly older children and according to her an interest in horses from one of the daughters made the need for a private car increase. So, although the activities of today can be fulfilled in Guldheden, the families were considering a future scenario with older children. It also implied that this opened up to buy a car already now.

**Family activities and vacation:** This factor was based on statements regarding activities and vacation of the families. During the interviews a desire to travel elsewhere during weekends and vacations was noticed. Some indicated that a summer house was a family vacation that made them consider either buying a private car or to keep the car. As "Josefine" and "Olivia" stated it:

*"And how do you get to a summer house with two children, in the easiest way...? Yes, it is maybe with a private car. Because you will find that public transport in the countryside is not the same as in the city. And renting a car just to drive it out there and have it parked become very expensive in a car renting perspective."*

*"Yes, we drive a lot during the summer. When it is vacation time, we travel around quite much. We have a summer house in Skåne for example where we like to travel around with the car."*

### 4.1.5 Safety

The theme *Safety* contained one factor, namely **Inconvenient in emergency situations**. This factor was acting as a restraining force and refers to the car being mentioned as the fastest mean of transport in emergency situations. "Josefine" described the fear of an emergency, especially regarding the children, as a reason when

considering a private car.

### 4.1.6 Ownership

This theme relates to the actual ownership of the car and factors affecting it. It contains two enabling factors and two restraining ones.

#### Enabling factors

The enabling side of the theme *Ownership* consisted of two factors, namely *Economical savings* and *Less responsibility*.

**Economical savings:** A factor related to car ownership was the cost a private car entails. Interviewees without a car saw the cost as a reason not to buy a private car. As "Erik" stated it:

*"A car is a luxury good. The cost is a big factor for me not to have a car".*

However, even those who owned a car recognized the cost as high and something they would get rid of if experiencing difficult times. "Olivia" described that their private car would be the first thing they would get rid of if one of them were to lose their job.

**Less responsibility:** From the families who owned a private car it was also mentioned that their car requires time and effort with e.g. service and cleaning. This time and effort that an ownership of car entails was something they did not like and would like to avoid. This factor is therefore acting as an enabling force for a car free living.

#### Restraining factors

On the restraining side, the theme *Ownership* consisted of two factors, namely *Bringing and installing a car safety seat* and *Spontaneity and flexibility*. These factors make the alternative of a private car more attractive to families.

The factor **Bringing and installing a car safety seat** refers to the statements where the families often felt that the car safety seat made it more difficult to ride a bus or being part of a carpool. The reason was that the seat is large and heavy. "Josefine" described the situation of renting a car and installing their car seat as *"it will be too big of a project"*. "Erik" also pointed out that even if you travel by bus you often get picked up at the station in a car and then you need to have the car safety seat with you. All this made it easier for the families to have and drive the private car right from the start as the seat would always be installed.

**Spontaneity and flexibility:** This factor depicted the spontaneity and flexibility a car enables as well as an increase of planning when living car free. As "Emelie" describes it:

*“Planning is not natural for us and we have set up life with a car so that we don’t have to do planning”.*

The fact that a car-free living involves more planning was something that the families without a car also pointed out. Some of the families saw it as a positive side effect while others saw it as something a bit more negative. As "Josefine" and "Erik" put it:

*“We try to do all the shopping together during the same weekend as a family trip, because then we can rent a car for a whole weekend. I am a planner so I love planning!”*

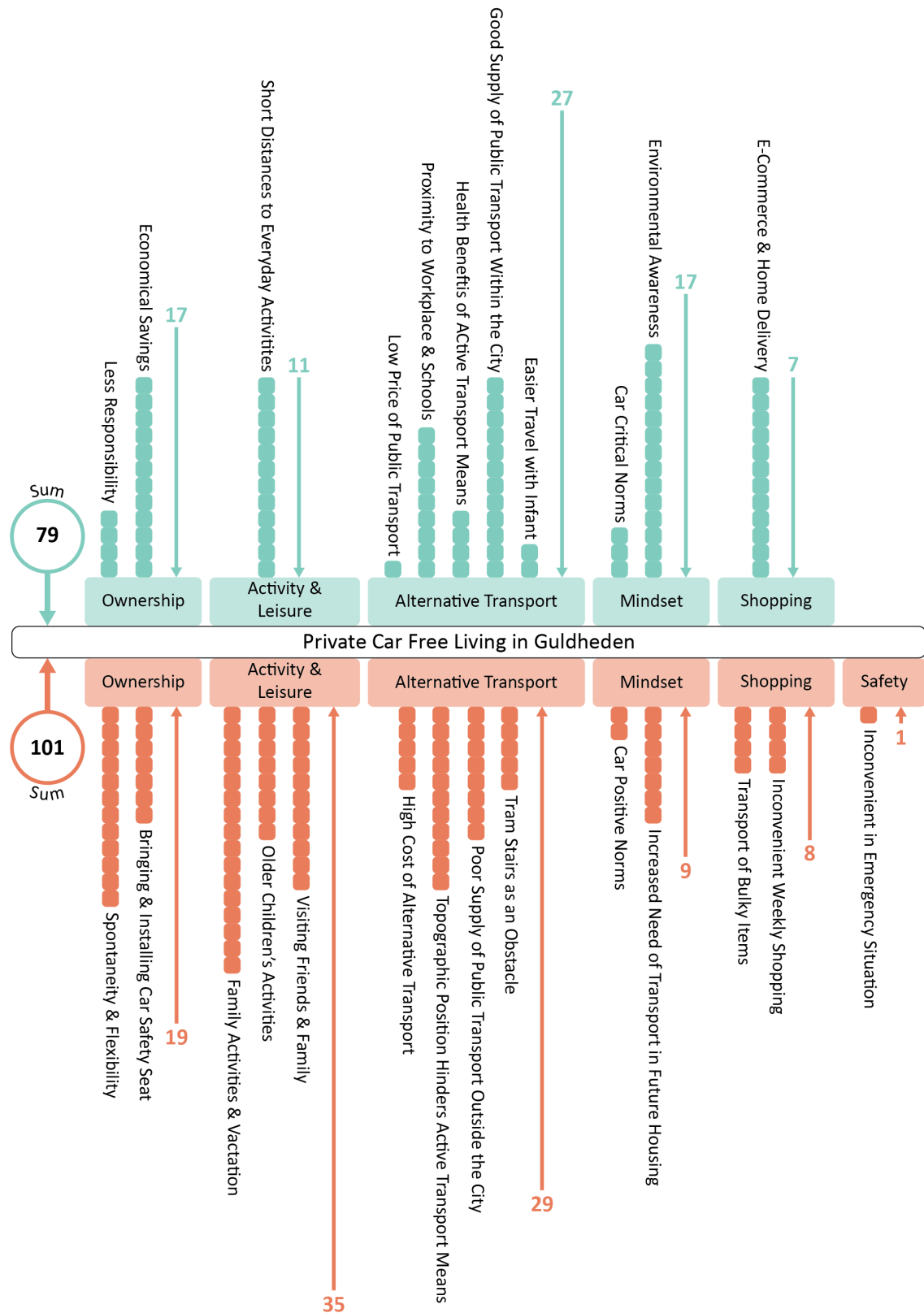
*“We have to plan more after we had a child, it requires more preparations. We have to prepare by buying tickets and planning what things we should bring. It is nothing that we prefer.”*

## 4.2 Quantitative Representations of the Insights

The factors presented above varied in both occurrence and stated importance throughout the interviews as well as in the the online survey. This aspect is something which cannot be interpreted in the affinity diagram, see figure 8, or the qualitative insights. Therefore, the insights are quantitatively represented in this section. This enables a more clear visualization of the results and a better basis for the analysis.

### 4.2.1 Occurrence of Enabling and Restraining Factors

The amount of mentions is the basis for a force field mapping (FFM), where the occurrence of the enabling and restraining factors are visualized. See figure 9 for this visualization.



**Figure 9:** Force field mapping based on the occurrence of statements in interviews, grouped in factors and themes

Figure 9 illustrates more or less shared opinions among the families regarding the identified themes and their factors. Most of the themes have factors that occurred frequently during the interviews. This strengthens their relevance and suggests that the families, to a high extent, share experiences. In total, the occurrence of the factors illustrates 101 statements against a transition and 79 enabling ones. The total amount of enabling and restraining statements indicates a relatively large difference in favor of restraining ones. However, if calculating the average occurrence of each factor on the two sides, the result becomes more balanced. The result is an average of 7.1 and 7.2 statements per factor for the enabling and restraining side, respectively. This indicates that the factors on both sides occurred an equal amount of times but the restraining side contains more factors and therefore gives greater impact on the total sum.

Regardless of calculation method, figure 9 shows that the major contributing themes to the restraining side are *Activity and leisure* followed by *Alternative transport* and *Ownership*. These themes contain 35, 29 and 19 statements, respectively, of the total 101 statements. In the theme *Activity and leisure*, the occurrence of the factors is relatively evenly distributed. The single most occurring factor is *Family activities and vacation* which was mentioned 16 times during the interviews. Here summerhouse and weekend trips were frequently mentioned as a valid reason for having a car. This is connected to an interesting aspect that emerges from figure 9. The most occurring factors *Family activities and vacation*, *Visiting friends and families* and *Spontaneity and flexibility* are all linked to the use of a car during the weekends. The interviewed families described the weekend as a time to do activities and socialize with friends further away, and nice weather during the weekends could create a desire to be spontaneous. Thus, the need for a car seemed to be higher on the weekends which creates frequently occurring statements against a car free living among families. Moreover, some of the most occurring factors on the enabling side, *Short distance to everyday activities* and *Proximity to workplace and schools* indicates the possibilities to live car free during the weekdays. The factor *Good supply of public transport within the city* was also mentioned as facilitating car free mobility during weekdays.

The two aspects of a greater car need during weekends and a low need during weekdays was something that interviewees also stated explicitly. "Olivia" and "Emelie" described it as following:

*"So in normal cases we do not need to use the car other than if we are going away for something on the weekend. So we have pretty much a car free living during the weekdays."*

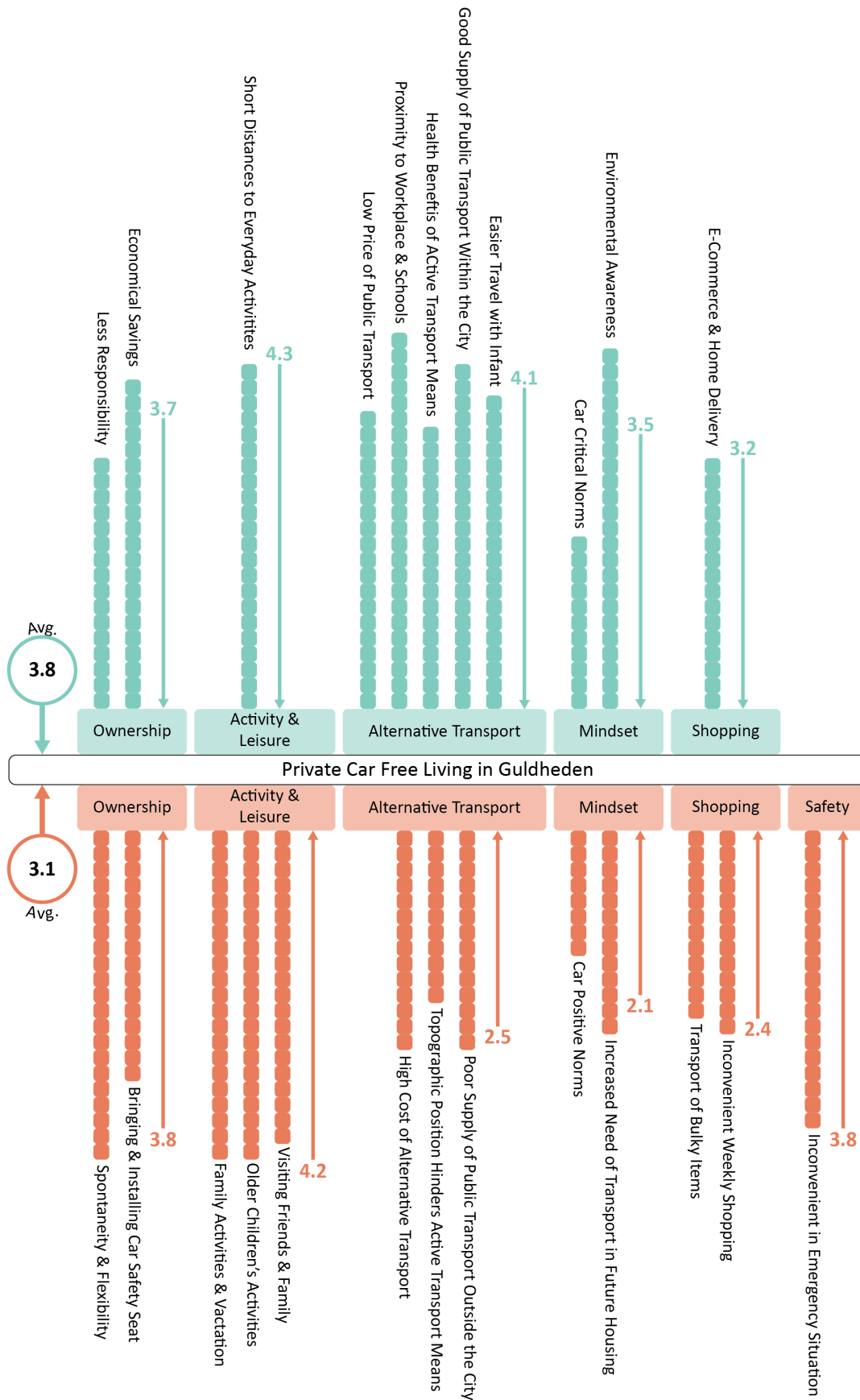
*"You could say that we manage to live without a car for our everyday needs such as shopping, work and to be in town as well. But when we want to go and visit friends and acquaintances who live farther away, then we use the car."*

The two most occurring factors on the enabling side, in addition to close proximity and short distances, are *Economical savings* and *Environmental awareness*,

these two occur 12 and 14 times. This indicates that there is also a shared opinion about the negative aspects that an ownership of a car entails. Both in terms of cost as well as emissions from the car. These two factors were the most frequent arguments against a car and therefore also frequent enabling factors for a car free living.

### **4.2.2 Severity of Enabling and Restraining Factors**

The occurrence of different statements gives a first impression of the shared opinions regarding the factors. However, it does not give an indication of a factor's importance. So when the factors are visualized through severity, with the help of the questionnaire, the ratio changes. See a visualisation of the severity of the factors in figure 10.



**Figure 10:** Force field mapping based on the average severity of the factors assessed through online survey

This force field mapping (FFM) shows a scenario different from the previous one based on occurrence. The perceived severity suggests that the enabling factors were generally ranked as more important than the restraining ones. The enabling factors were ranked an average of 3.8 while the restraining ones only scored 3.1. This means that most enabling factors were seen as important whilst the restraining ones were more balanced.

On the enabling side, factors connected to everyday life in Guldheden, such as *Proximity to everyday activities*, *Proximity to workplace and schools* and *Good supply of public transport within the city* are all of high importance in families' decisions to not own a car. These are more or less all linked to the geographical preconditions of Guldheden. However, the factors *Environmental awareness* and *Economical savings*, which are more linked to the car use, are also of high importance in families' decisions regarding owning a car. This is consistent with the result of the occurrence which show that they were mentioned frequently. Nevertheless, the severity in figure 10 shows less variation among the enabling factors, which makes it less evident.

On the restraining side the theme *Activity and leisure* is ranked as the most important. All the factors within the theme are evenly ranked above 4. Thus, the factors *Visiting friends and families* and *Family activities and vacation* continues to show high influence on car free living in Guldheden. They both appeared several times in the interviews and are ranked as important when reflecting over the decision to own a car or not. In the severity FFM, these factors are joined by a high impact from the factor *Older children's activities*. This implies that future needs of the families are of importance when considering buying a car. Furthermore, *Spontaneity and flexibility* is also assessed as important, and was mentioned frequently in the occurrence FFM.

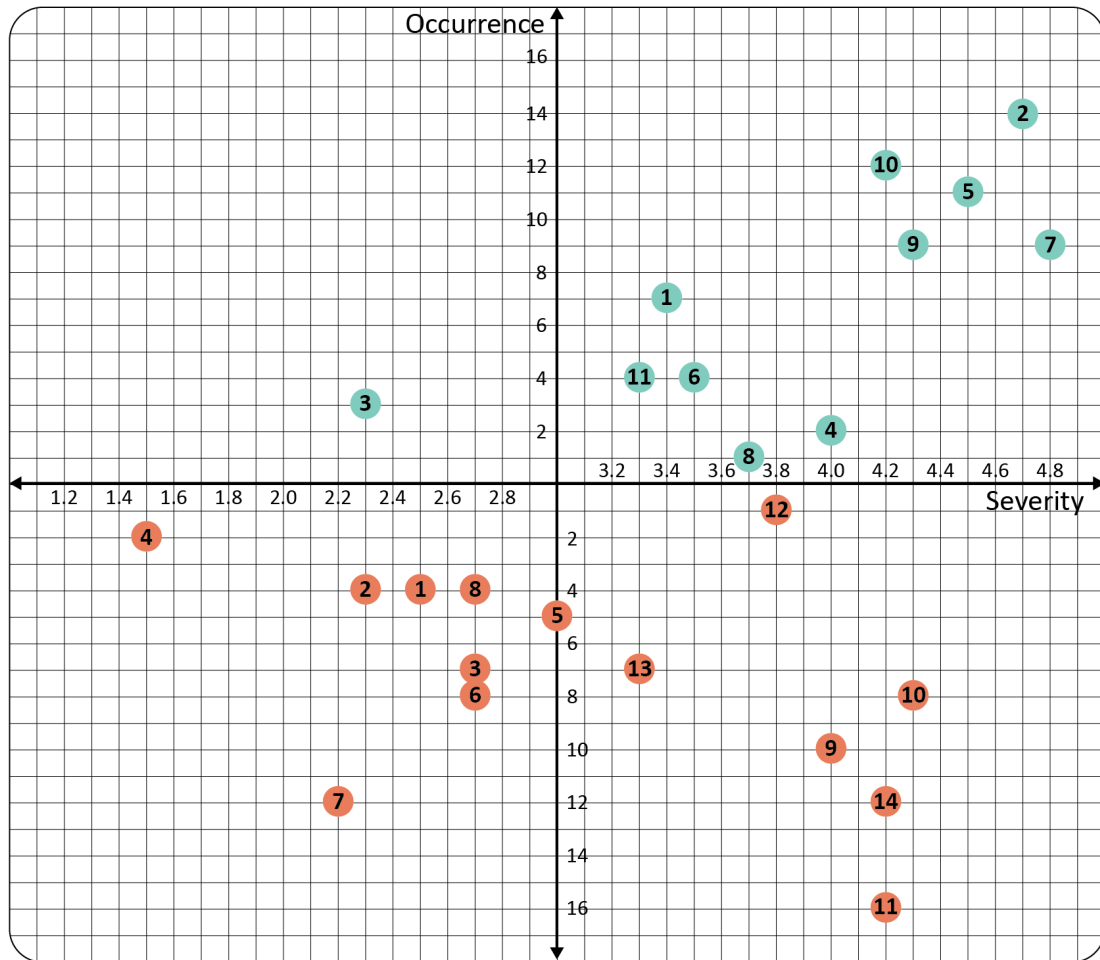
Another interesting finding from the restraining side is the increase of the theme *Safety* and the decrease of *Alternative transport*, compared to when measuring occurrence. The theme *Safety* was mentioned by only one of the interviewees but is ranked as the second most important theme. *Alternative transport* on the other hand, was the most occurring theme on the restraining side but is here assessed as an unimportant restraining theme.

In the process of designing the questionnaire and the iterations of pilot tests the factor with tram stairs was excluded accidentally. However, during the interviews it could be discerned that the factor corresponds to neither important nor unimportant when choosing to buy a car or not. This factor was more of an observation which the families have learned to cope with. Due to the mishap in the questionnaire and the uncertainty in the estimation, this factor is not reported in figure 10.

### **4.2.3 Combined Occurrence & Severity**

Combining the two aspects of occurrence and severity provides a more clear and complete picture of which factors that actually affect the families the most. Practically the combination is represented in a four-field matrix, see figure 11.

#### 4. Analysis & Results



Enabling Factors		Restraining Factors	
1	Opportunities for E-commerce	1	Inconvenient Weekly Shopping
2	Environmental Awareness	2	Transport of Bulky Items
3	Car Critical Norms	3	Future Housing
4	Easier Travel with Infant	4	Car Positive Norms
5	Good Supply of Pub. Trans. within the City	5	Tram Stairs
6	Health Benefits	6	Poor Supply of Pub. Trans. Outside the City
7	Proximity to Workplace and School	7	Topographic Position
8	Low Price of Public Transport	8	Cost of Alternative Transports
9	Short Distance to Everyday Activities	9	Visiting Friends and Family
10	Economical Savings	10	Older Children's Activities
11	Less Responsibilities	11	Family Activities and Vacation
		12	Emergency Situations
		13	Car Safety Seat
		14	Spontaneity and Flexibility

**Figure 11:** Four-field matrix with occurrence and severity of the identified factors which affect a car free living

Figure 11 is a combination of the previous force field mappings shown in figure 9 and 10 and consists of two axes. The horizontal axis represents average severity and is graded from 1-5 in increments of 0.2 to correspond to the survey where the data was gathered. The other axis represents occurrence and is graded from 0-16 in increments of 2 in two directions to keep the division of restraining and enabling factors from the force field mappings. The green numbered circles in the top quadrants represent the enabling factors explained in 4.1 while the red numbered circles in the bottom quadrants represent the corresponding restraining factors also explained in 4.1.

Looking upon the combined matrix, two groups of factors that score high both in occurrence and severity can be seen. In the upper right corner with both high occurrence and severity the following enabling factors are located: *Environmental awareness*, *Good supply of public transport supply within the city*, *Proximity to workplace and schools*, *Short distance to everyday activities* and *Economical savings*. On the other side, in the lower right corner, the restraining factors *Visiting friends and family*, *Older children's activities*, *Family activities and vacation* and *Spontaneity and flexibility* are also creating a group with high occurrence and severity. This indicates that these two groups of factors are easily available to think of and of high importance to the families. Thereby they can be seen as the most influential factors affecting the preferences of car free living.

As previously mentioned in the preceding sections, this is in line with a car free living during weekdays where the location of Guldheden creates good connections to activities and everyday needs. Green areas, schools and workplaces are nearby which creates possibilities to use active transport instead of a car. This was something that was observed both for those who owned a car and those who did not. This together with an awareness of both cost and environmentally unfriendly aspects of having a private car creates a good basis as forces for a car free living.

Figure 11 shows that the restraining group consists of factors related to the spontaneity a car provides and the weekend behavior of the families. Family, friends and vacation needs were something with both high occurrence and high severity and affects the need for wanting or keeping the private car. This was something where alternatives to cars were seen as inconvenient solutions and the private car was expressed as the best option.

Another interesting result that can be seen in figure 11 is that both car positive norms and car critical norms are ranked as unimportant and almost not mentioned at all.

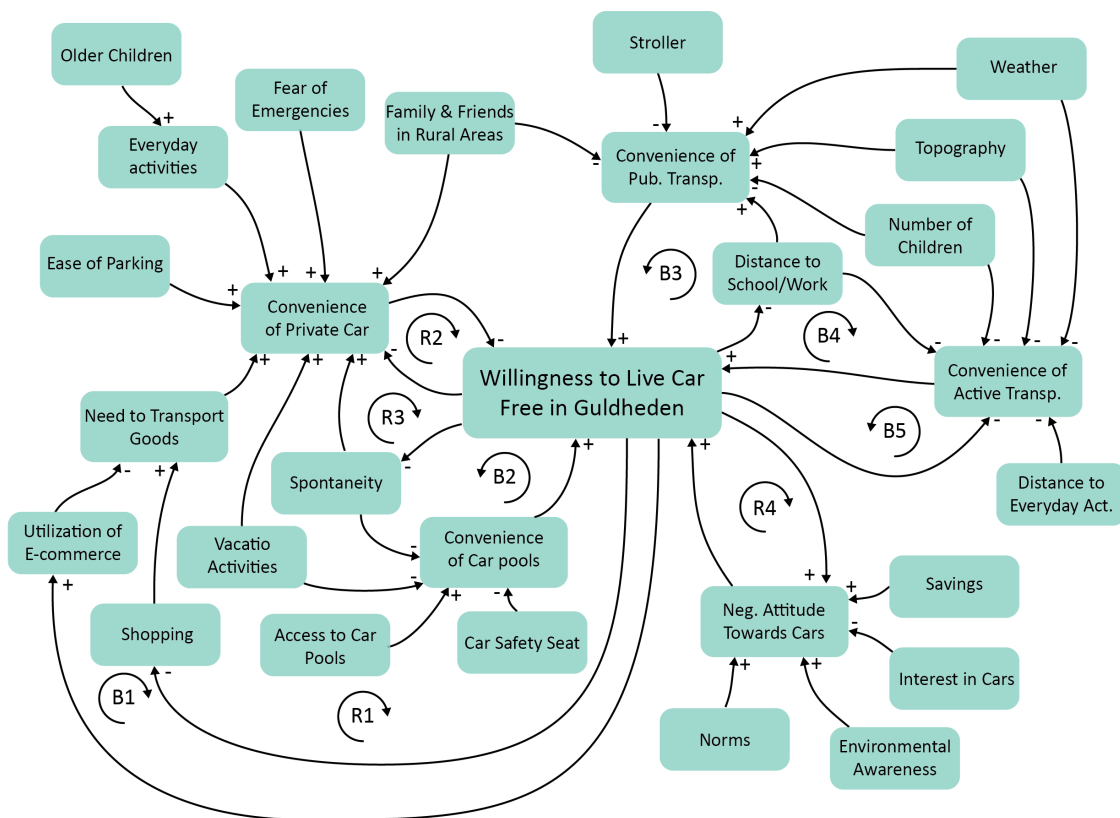
### 4.3 Dynamic Illustration of Mobility Preferences

The force field mappings and the four-field matrix shows the identified factors as specific and individual aspects which either enables or restrains a car free living. However, connections and causal statements were identified several times in the interview transcripts. This means that the system that the interviewees jointly depicts is more complex than the results from sections 4.1 & 4.2 indicates. It is therefore of importance to also understand the dynamics behind the willingness to explore car free living among the families. The purpose of this section is accordingly to present a causal loop diagram (CLD) based on the interviewees' perspectives.

For examples of the causal statements which were interpreted and transformed into the CLD, see table 4. The CLD and the interviewees' perceptions of the system are presented in figure 12.

**Table 4:** Examples of causal statements from interviews and their interpretation

Statement	Cause	Effect
"I think that we as a family will have to transport ourselves across longer distances as the children grow older"	Older children	Convenience of private car
"Not everyone is so committed that they will walk 10-15 minutes to pick up a car, they should be available within a minute's walking. The closer they come to us the further we will get from buying a private car."	Access to car pools	Convenience of car pools
"But sometimes you can't go by train. As with my parents, they live on the country side so you can't get all the way there"	Family and friends in rural areas	Convenience of public transport
"Now that I've started working, I live so close to my workplace that I walk there."	Distance to workplace /schools	Convenience of active transport
"Sometimes when people buy a car they feel ashamed..."	Norms	Negative attitude towards cars
"The fact that we can have things delivered to us makes things easier. You don't have that possibility wherever you live and then maybe a car would have helped instead."	Utilization of E-commerce and home deliveries	Need to transport stuff



**Figure 12:** Causal loop diagram based on the perception of the interviewees

The CLD in figure 12 shows a complex system based on the central variable *Willingness to live car free in Guldheden*, and includes 27 variables affecting it through causal relations. Some of the variables in the CLD are the same as previously identified factors. Others are insights from the interviews which did not suit as factors but still influence the willingness to live car free. Moreover, there are nine feedback loops of both reinforcing and balancing nature affecting the balance of the system.

A notable change from the force field mappings is the introduction of convenience of different transport modes. Convenience was often the ultimate result from variables raised by the interviewees, which is why it is central to the CLD. The relationships between convenience and contributing variables make up a complex system that the CLD tries to illustrate.

Many of the identified causal statements and the plotted variables in figure 12 are connected to the convenience of the car. This indicates that the interviewees perceive the privately owned car as the most convenient option when it comes to many aspects. This is also something that was brought up in most interviews. Many pointed out that most needs can be solved without a private car but that it is simply the most convenient option there is. This has the effect of a decrease in willingness to live car free. Only when it comes to parking and E-commerce the car is seen as somewhat inconvenient or superfluous.

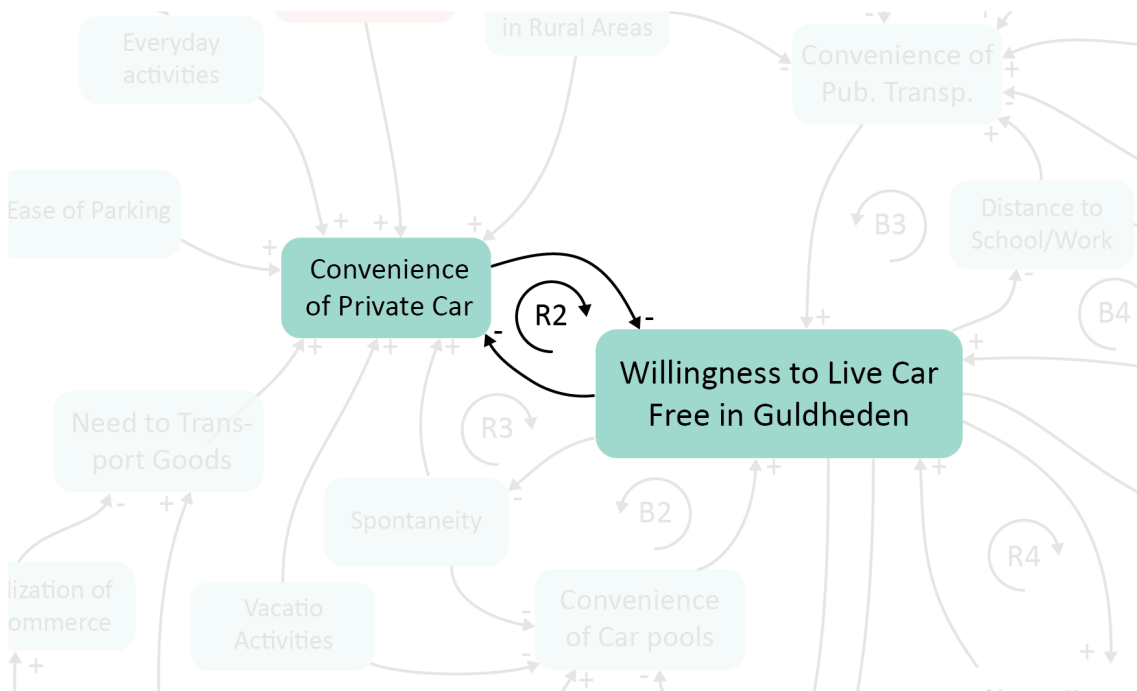
Convenience of public and active transport, on the other hand, have fewer connected variables. Here, the variables *distance to everyday activities and workplace/schools*

seems to play a big role as they are part of three balancing loops, B3, B4 and B5. This is in line with what the quantitative representations indicated, see section 4.2. However, the CLD better shows that there is an interaction of several factors or variables that affect the utilization of public and active transport. E.g. the restraining factor *topography* scored low in the force field mappings. Nevertheless, in the CLD it can be seen that it affects both of these variables thus is a part of the larger system.

The CLD also illustrates the effect of having family and friends in rural areas. If this variable decreases the effect will be a higher utilization of public transport. If on the other hand increases, with more family members in rural areas, the response is a higher convenience of having a private car. This was a causal statement which several of the interviewees mentioned.

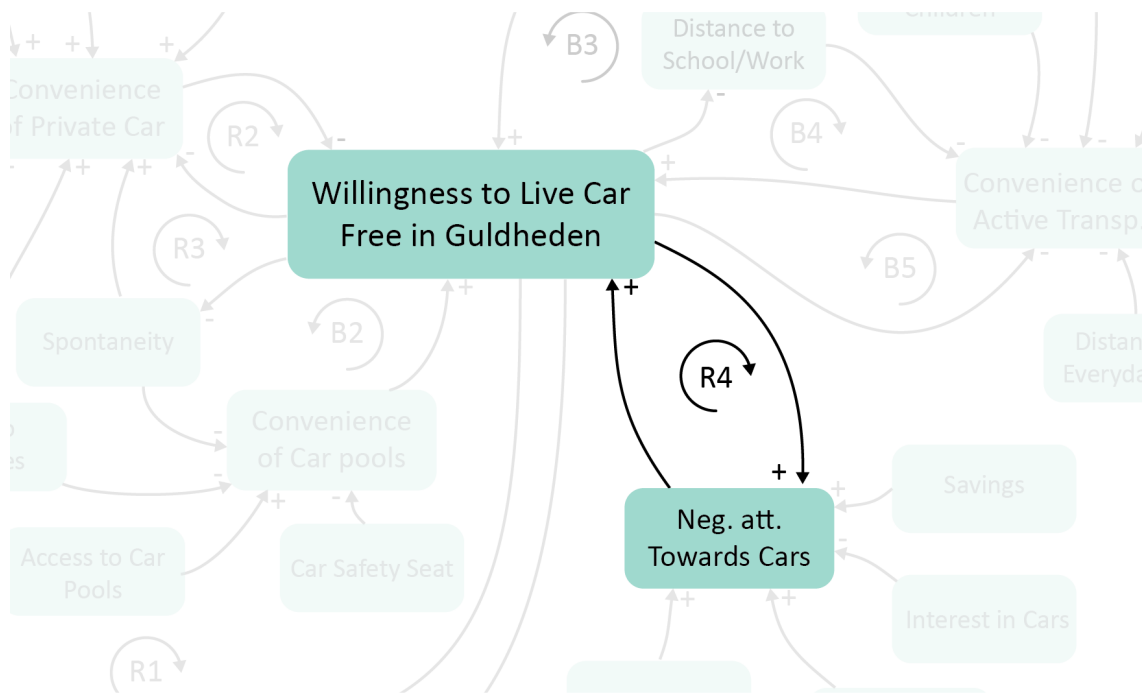
In the bottom right corner of the CLD in figure 12, the variable negative attitudes towards cars can be seen. This variable connects to several of the factors included in the force field mappings, but is also connected to the new variable *Interest in cars*. This variable was expressed through employment in the automobile industry and an individual joy of riding a car. In the end this results in an increased desire to actually own a car and thus counteracts car free living. However, the interviews also contained causal statement with the opposite effect. Lacking interests in cars created a more negative attitude towards having one and thus a higher interests in living car free.

Of the nine feedback loops in the CLD, six are of extra interest as they showcase interesting aspects of the system. They are therefore explained in text and presented in enlarged figures, see figures 13-16.



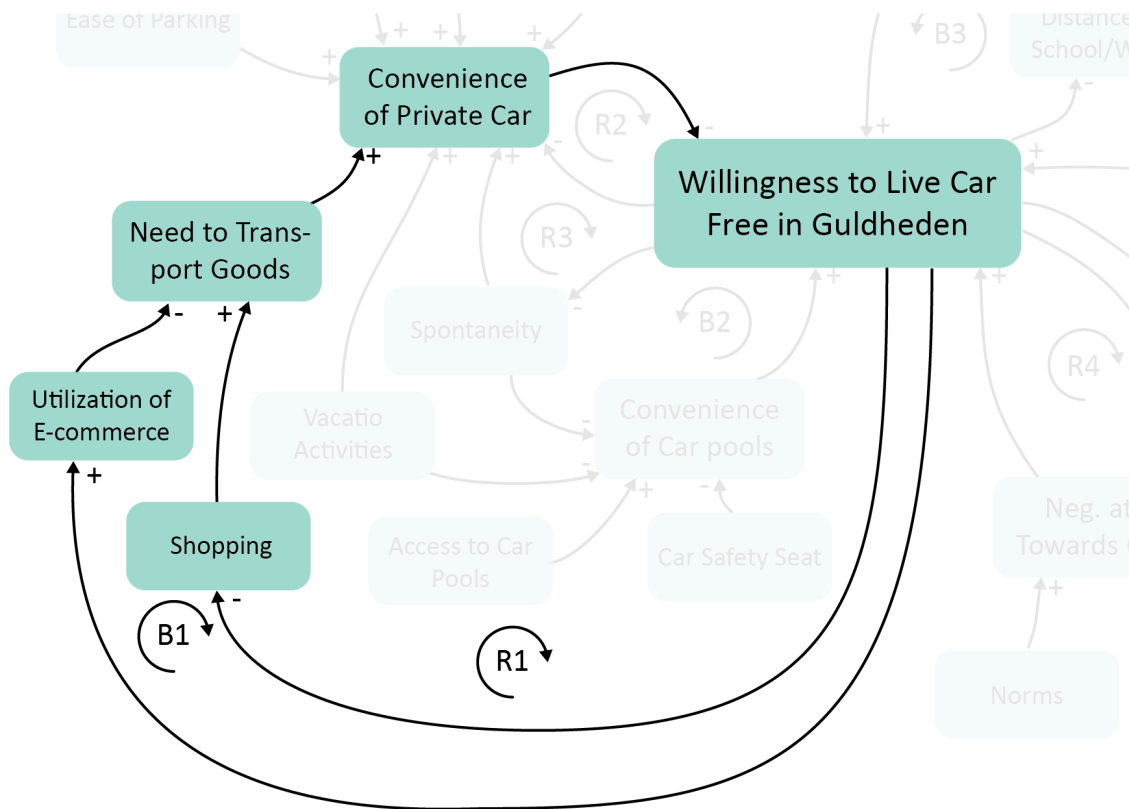
**Figure 13:** Enlarged figure of the feedback loop R2 shown in the CLD

Feedback loop R2, see figure 13, shows an interesting aspect of the system, *Convenience of private car* and *Willingness to live car free* are directly related. The loop represents that experiences of how convenient a car can be may result in a decreased willingness to live without one. Several causal statements supporting this view occurred in the interviews. The interviewees implied that ownership of a private car entails lazier habits and so creates an unnecessary need. This was something pointed out by both interviewees with a car and those without.



**Figure 14:** Enlarged figure of the feedback loop R4 shown in the CLD

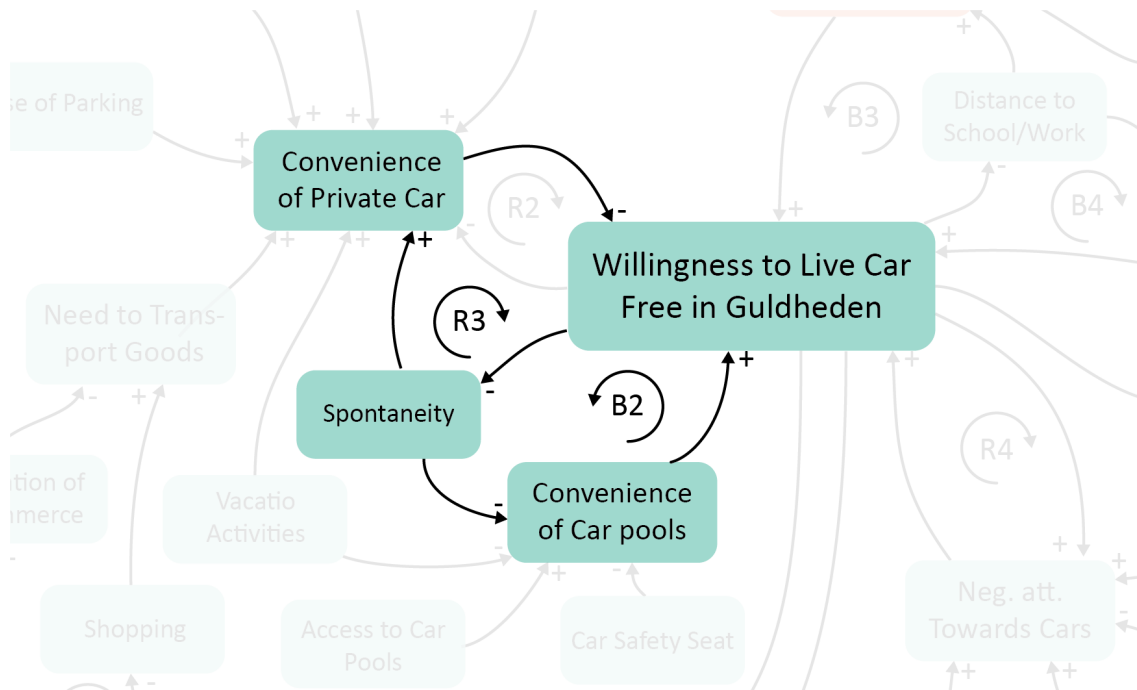
Figure 14 illustrates a reinforcing feedback loop between *Willingness to live car free* and *Attitudes towards cars*. This represents that negative attitudes towards cars result in a greater willingness to live car free. Several statements support this claim by expressing that negative aspects of car ownership and use are greater than the positive ones. Similarly it was found that a high willingness to live car free resulted in a more negative attitude towards cars. This loop was most clearly seen among those who currently did not own a car. However, car owners also expressed opinions that affect their attitude, which result in a decrease in their use.



**Figure 15:** Enlarged figure of the feedback loops R1 and B1 shown in the CLD

Figure 15 shows two loops, one reinforcing and one balancing. Both connect *Willingness to live car free* and the *Need to transport goods*. The loop R1 illustrates that in the eyes of the families a car free lifestyle makes it less convenient to do spontaneous shopping. The meaning of it is therefore, that if car free living increases, chances are that the variable shopping will decrease. Furthermore, if shopping decreases, then the need to transport things will also decrease and the car will not be seen as convenient. This may result in a possibility for higher willingness to live car free. However, this connection was expressed only in one of the interviews. It was stated in the terms that a car free lifestyle entails that unnecessary shopping habits are avoided.

Figure 15 also illustrates a second loop, of balancing nature, B1. As described in the qualitative insights, see section 4.1, E-commerce and home delivery are factors which enables a car free living. The same could be seen in the loop B1. If the utilization of E-commerce increases, the effect will be a reduced need to transport stuff which eventually increases the possibilities to live car free. Both loop R1 and B1 indicates that the variable *need to transport goods* is influencing the willingness to live car free.



**Figure 16:** Enlarged figure of the feedback loops R3 and B2 shown in the CLD

Figure 16 illustrates two loops, one reinforcing and one balancing. They connect *Willingness to live car free* with *Spontaneity*. The variable of spontaneity affects both the convenience of a private car and the convenience of carpools. Here, the CLD is illustrating a difference between families. Some of the interviewees indicated that private cars are very convenient since their need for spontaneity is high. Carpools on the other hand are seen as inconvenient. They are often located some distance away from the apartment and requires carrying of luggage and possibly a car safety seat. This creates the reinforcing loop R3 in figure 16.

Other families which were more willing to be car free seemed to accept lower spontaneity. The planning and foresight that carpools required was not viewed as a problem. They even described the planning as a positive aspect and something they liked. This meant that the families with high willingness to live private car free also saw the carpools as a convenient means of transport. This therefore creates a balancing loop in the CLD, named B2.

### 4.4 Mapping of Stakeholders & Relevant Actors

The CLD depicts the dynamic relations affecting the willingness to live car free. However, it does not show the external stakeholders affecting car free living in Guldheden. Therefore an analysis to identify and map the relevant actors was performed. The analysis shows that stakeholders are in connected to families in different ways, both restraining and/or enabling their car free living. Some of the stakeholders are assumed not to be aware of their influence but they are still identified in the map and affect families' car needs. The identified stakeholders are presented in the *Stakeholder onion diagram*, see figure 17. The diagram illustrates the position of stakeholders on different levels based on their influence. Following the diagram is a description of the different stakeholders and how they relate to each other and in some cases factors from the FFMs.



Arrow	Type of Connection & Relationship
	Strong
	Ad-hoc
	Indirect

Figure 17: Stakeholder onion diagram of the identified stakeholders

### 4.4.1 Primary Stakeholders

In the inner circle, which corresponds to the primary stakeholders, two stakeholders are identified; the main category *Families with children* and the public transport provider *Västtrafik*. These two actors match the definition of a primary stakeholder given by Clarkson (1995) where it is said that a primary stakeholder is necessary for a continued collaboration. They also match the definition given by Czischke (2018) where the primary stakeholder is involved and represented on a day-to-day basis. See explanation of the role and influence from the families and Västtrafik below.

#### Families with Children

This group is the most obvious and important stakeholder as this study is focusing on it. Consequently they are placed in the primary level in the stakeholder onion diagram. As mentioned in section 1 families are extra dependent on the car and they have potential to adopt sustainable travel habits. In section 3 it is pointed out that the amount of families in Guldheden stands out compared to other parts of Gothenburg. Therefore they are an important stakeholder when talking about a lifestyle without a private car.

The analysis of the interviews shows a connection between the families and all other identified stakeholders or groups of stakeholders. The only one that has no direct connection to them is *City of Gothenburg* who influence the families mainly through *Västtrafik*.

#### Västtrafik

The second identified primary stakeholder is the public transport provider Västtrafik. They act on behalf of the region Västra Götaland to plan and provide public transport in the whole region (Västra Götalandsregionen, 2019). Västtrafik decides where bus and tram stops should be located and how the timetable of the public transport should be designed. Their own stated mission is to contribute to a sustainable society where it should be easy to travel sustainably (Västtrafik, 2019). Furthermore, they state that the future transport should be based on public transport, biking and walking. This is something which help facilitate a car free living.

The families described Västtrafik to be represented mainly through tram line no 10, bus line no 52 and the connection point Wavrinskys in the northern part of Guldheden. Statements connected to Västtrafik was mentioned frequently during the interviews and the theme *Alternative transport* contains most of the statements, see figure 9. The severity of the factor *Good supply of public transport within the city*, see figure 11, also indicates that Västtrafik is of high importance in families' decisions to live car free. Although Västtrafik was mentioned often and showcased high severity, some of the interviews also imply a low utilization. As "Olivia" described it:

*"I would say that on a daily basis we almost never drive a car, and not really that much public transport either.... he always cycles to work, and I usually walk with the stroller."*

Despite the low utilization, Västtrafik is a primary stakeholder since they lay the foundation for alternative transport and thus decreases car use. Due to the low utilization among families in Guldheden and the lack of day-to-day connection, the relationship between the families and Västtrafik are assessed to be an ad-hoc link where connections are made based on specific situations.

#### 4.4.2 Secondary stakeholder

The second circle in the Stakeholder onion diagram consists of three actors who are considered to be secondary stakeholders. Clarkson (1995) describes the secondary stakeholders as actors who could influence the development or are affected by its results. However, they are not vital for the continuance of the development. Furthermore, the stakeholder onion diagram defines the influence of the secondary stakeholders as high but not as involved as the primary ones (Czischke, 2018). For families in Guldheden this corresponds to three different stakeholders: The municipality *City of Gothenburg*, the *Estate manager* of the apartment houses and the different *Carpools* in the area. See the explanation of the different secondary stakeholders below and how they affect car free living in Guldheden.

##### City of Gothenburg

The City of Gothenburg is the name of the municipality in Gothenburg. They were never mentioned explicitly in the interviews but several factors in the affinity diagram and the force field mappings are relevant for their projects and objectives. They have adapted several strategies that affect car ownership in Guldheden and the entire municipality. The strategies from the municipality that may have the greatest impact on the families in Guldheden are the climate strategy and the overall development plan for Gothenburg.

The climate strategy states that the municipality should facilitate and encourage residents to live more sustainably (Göteborg Stad, 2014a). The encouragement should be implemented by measures that the inhabitants themselves can implement such as changed behavior around travelling. The strategy also mentions the importance of young people and families and how children can grow up with an awareness of sustainability.

Based on the goals and aims of the climate strategy, the City of Gothenburg created the overall development plan for the municipality (Göteborg Stad, 2014b). The strategy aims to reduce the need for travelling and instead create a densified city with close proximity to grocery stores, schools and public transport (Göteborg Stad, 2014b). The development plan also includes a traffic strategy where it states the importance of prioritizing pedestrians and cyclists in the local environment (Hellberg et al., 2014).

The municipalities in Sweden also have a large influence on car free living since they regulate the placement and amount of parking spaces through the Plan and Building Act (Hrelja et al., 2016). This regulation applies to estate managers and they have

to fulfil a minimum requirement regarding number of parking spaces per resident.

These strategies and regulations demonstrate that the City of Gothenburg governs their relationships through laws and regulations, hence the indirect relation in the onion diagram. The two stakeholders that are directly affected by the strategies are *Västtrafik* and the *Estate managers*. *Västtrafik* is affected by the overall development plan where they act as an important actor to decrease car use and connect the city of Gothenburg. The estate managers are affected by the Plan and building act and the regulations of parking spaces.

### **Estate manager – eg. Riksbyggen, Bostadsbolaget**

As previously mentioned, the *Estate managers* are involved in supplying parking spaces in the district of Guldheden. Their work and strategies also affect the transport modes of the residents. This was something that emerged in some of the interviews and something that the municipality of Gothenburg also wants to highlight. The municipality provides recommendations and guidelines to estate managers on how to improve bike parking (Trafikkontoret, 2017). With these guidelines, the estate manager can create flexible and safe parking possibilities for the residents and in this way get more people to cycle. "Markus" from the interviews agree that security is a problem. He pointed out that he did not have space for cycles or cycle accessories in his apartment and he was reluctant to store it in the common space because of the risk of theft.

Some estate managers in Guldheden are progressive when it comes to private car free living. Brf Viva is a resident area in Guldheden where the estate manager, Riksbyggen, together with the City of Gothenburg has tried to implement different solutions to arrive at zero parking spaces for the residents (Fastighetstidningen, 2019). Instead they have prioritized cycling and different types of shared mobility services. This shows that property owners have the ability to influence the residents' ownership of a private car. However, since they are not involved in day-to-day connections with the residents, the relationship in the onion diagram is based on an ad-hoc link.

### **Carpool – Sunfleet, Move About**

An alternative to a private car that many mentioned during the interviews is the carpool solution. The definition of a carpool is when a group of people share a number of cars and pay either a monthly fee or when using the car (Trafikverket, 2016). Often there are two different types of ownership when it comes to car pools, either the pool is owned by an employer or housing association or it is owned by a commercial company (Trafikverket, 2016). The two carpools mentioned during the interviews were *Sunfleet* and *Move about*. Both are commercially owned but *Move about* was mentioned as a corporate privilege.

During the interviews a difference of opinions emerged around the role of a carpool. Some felt that it became an expensive one-time sum and that it then felt better with a car of their own. Other had a more positive attitude. "Oliva" and "Eleonora"

showcase these different attitudes:

*“We had sunfleet before we bought a car and then you pay every time and we had no subscription either ... but then it gets very expensive for every time .... it felt so hard to pay 500 SEK to go and swim a little.”*

*“It is very nice to have access to the car via sunfleet, you don’t need to have a car yourself.”*

Since many people still want to be mobile, the carpool is considered a solution with a relatively large influence and power which makes them part of the secondary stakeholders. The relationships show a connection between the carpools and the users (in this case the families) as well as some workplaces which provide it as a corporate privilege.

### 4.4.3 Wider environment

The outer circle in the Stakeholder onion diagram represents the wider environment and four stakeholders were identified as belonging here. They have no major interest in car use and ownership itself, but their location may create a need for families to transport themselves to access their services. This means that they have a role in the families’ decisions to have a private car or find other solutions for transportation.

#### Stores – eg. Hemköp and IKEA

The identified theme *Shopping* and its factors, see section 4.1, indicates several involved stakeholders. Their location and whether or not they are present online affects the families’ movement patterns. In other words, they may both enable and restrain a car free living. Actors mentioned in the interviews involve grocery stores, e.g. *mat.se*, *Hemköp*, and *Willlys* as well as warehouses such as *IKEA* and *Bauhaus*.

When looking at the local stores in Guldheden there are several grocery stores who together cover the entire district. Despite this, several interviewees mention that they prefer online shopping with home delivery or weekly grocery shopping in the surrounding districts such as Sisjön or Möndal. Since the stores and their services are utilized on a regular but not daily basis they are identified as an ad-hoc connection in the onion diagram.

#### Schools

Since this study focuses on the primary stakeholder *Families with children*, a large part of the mentioned movement patterns were connected to the children’s preschools or schools. This is therefore considered to be a necessary stakeholder to include. In Guldheden this stakeholder is mainly present through the public schools Guldhedsskolan and Mossebergsskolan. Several smaller ones, mainly preschools, are also located throughout the district. The proximity to the schools was something that facilitated a car-free living for the interviewed families. This was also something

that some of the families lifted as a requirement when choosing a new housing. As "Eleonora" stated it

*"We try to find something (House) where it is close to the pre-school and school, but there are many parameters that should fit"*

Schools also want to create a safe environment for their students and encourage children to use other modes than cars. This is done to remedy traffic problems often existing around schools and to create safer playgrounds (IF Skadeförsäkring, 2019).

The importance of schools in the lives of families and the opportunity to daily use walking or cycling indicates a strong relationship between families and the schools. The close proximity of the schools in Guldheden made it possible to use active transport instead of a car, such as cycling or walking.

### **Workplace**

The workplace is something that controls the adults' movement patterns during the weekdays. Of course the workplaces varied between the interviewees, but all had in common that no one used a car to get to work. Either the interviewees were living close to their workplace or they preferred to use alternative transport modes instead of the car.

One interview also mentioned that a family member was working in the car industry. This made them more willing to buy a private car in the future. It was explained by the desire to own something that they had invested time and interest in. A workplace can also affect car free living by providing facilities and services to the employees. As mentioned above, corporate car pools facilitate car free living and was an argument for some of the interviewees to not buy a private car. Furthermore, access to facilities connected to biking and active transport could mitigate car use. The interviews showed that biking was used to get to the workplace, therefore e.g. showers and bike garages can be used to promote active transport means.

In this study, employers are enabling car free living. Their relationship with the families occurs daily and largely affects their car needs, hence a strong link in the onion diagram.

### **Leisure activities**

For this stakeholder, the actors also varies greatly among interviewees as it is based on the interests of the individual. Nevertheless, leisure activities was shown to be an important factor in the four-field matrix, see figure 11. Moreover, depending on the activity, they influence travel habits of the families to a high degree.

Some of the associations mentioned during the interviews which also are located in Guldheden are Mossens BK and gyms. However, the majority of associations mentioned during the interviews were located outside Guldheden. This is something that creates a need for other transport modes and the car was mentioned in con-

nection to it during the interviews. An example was when "Emelie" described her interest in rock climbing as a valid reason for owning a car.

The relationship between activities and the families are occurring regularly, but not daily, which indicates an ad-hoc connection in the diagram.



# 5

## Discussion

This chapter reconnects to the research aim and seeks to answer the research questions. It highlights and comments the main findings from the study, compares them to other research and connects them to the identified knowledge gaps. Furthermore it discusses limitations to the study as well as its contributions.

### 5.1 Aim, Research Questions and Knowledge Gaps

In the introduction in chapter 1 we identified a first knowledge gap concerning a subjective and qualitative perspective of families with children. We have contributed to fill that knowledge gap by the design of our study. The data was gathered through in-depth interviews together with a complementary survey, providing a subjective and qualitative view. By using that perspective as a basis for the analysis the results are founded in the families themselves.

In the introduction we also presented an aim with the thesis. It was to explore and illustrate the willingness and preconditions of families to live without a private car. This was fulfilled by addressing the three research questions (RQ1-3) that we formulated with the aim and knowledge gaps in mind:

1. What are the enabling and restraining factors for families to live without a private car in Guldheden?
2. What causes and effects related to car use or non-car use can the families of Guldheden see?
3. Which stakeholders are relevant in affecting car free living for families in Guldheden?

These questions were answered by using several different methods. The subsections below will discuss the main findings from these methods related to the research questions and knowledge gaps.

#### 5.1.1 Research Question 1

The first research question concerned factors influencing families in Guldheden to live car free. This was answered through an affinity diagram that brought up relevant themes and qualitative insights together with two force field mappings that highlighted and quantified influencing factors.

The six themes affecting willingness to live car free were identified in the qualitative analysis of this study. The themes were *shopping, mindset, alternative transport, activity and leisure, safety* and *ownership*. The variety and difference in nature of the themes show that the issues of car dependence are affected by many factors and aspects. These groups are also to some extent consistent with the findings of McCarthy et al. (2017). Their study resulted in four different categories which influenced families' mode choice; *structural factors, psychosocial factors, household characteristics* and *features of young children's travel*. Despite the grouping being quite different, many of the aspects from this study are covered. E.g. structural factors according to McCarthy et al. include infrastructure, public transport, distances and cost of travel, all of which are covered in different themes in this report. However, one group of aspects that is not covered in this report is *household characteristics*, which includes e.g. income levels. This was not included as the intimate interview setup and small sample did not allow for such aspects to be considered.

When it comes to the most influencing factors, the results were derived from the combined force field mapping (see section 4.2.3). The enabling factors that scored the highest and occurred most frequently turned out to be *Public transport supply, Proximity to workplace and schools, Short distance to everyday activities, Environmental awareness* and *Economical savings*. For the most part, these factors are related to physical aspects of Guldheden and intrinsic motivation of the families.

Regarding the physical aspects, the proximity of Guldheden to other districts and locations in Gothenburg have shown to be an enabling factor for car free living. This was something which influenced the families to live car free and they also ranked it as an important factor when considering the need for a private car. This result is interesting since it is in line with the development plan of Gothenburg. It has a long term focus on densification which aims at enabling sustainable transport modes (Göteborg Stad, 2014b).

That environmental awareness acts as an important factor for decreasing car use is something which is in line with the report from Söderholm (2011). The focus of that report was households in Sweden instead of families. It shows that households have a high environmental awareness. Furthermore, Söderholm (2011) also describe a high awareness regarding the car's impact on the environment. This is in agreement with the results presented by this study. However, it also entails that even if a high awareness exists, it is not always the case that it leads to change. Thus, there is some uncertainty in how influential the factor of environmental awareness really is among the families in Guldheden. It may be the case that it is seen as a valid reason for living car free, but that it does not affect the choices correspondingly.

On the restraining side, the most influential factors had to do with *flexibility, weekday and holiday activities* and to some extent *older children's activities*. That activities may restrain a car-free lifestyle is also described by a study from Norway (Hjorthol and Fyhri, 2009). They state that the most typical transport mode for children's activities is the private car. Furthermore, they describe how the distance to children's activities is one of the most influencing factors where distances over 2 km often are covered by car. Hjorthol and Fyhri do not seem to differentiate between

weekdays and weekends, but merely states that trips over 2 km are chiefly made by car. However, the findings of this study show that family activities with long distances during especially weekends creates the need of a car.

Hjorthol and Fyhri (2009) also state that the amount of activities increases with the children's age. Since the study group in this thesis was limited and had a majority of younger children, this conclusion cannot be confirmed for the families in Guldheden. Nevertheless, older children's activities was one of the most influencing factor. This indicates that future activities for the children were a big reason why the families wanted a car already now or predicted that they would buy one in the future.

Moreover, this study found that norms (both positive and negative towards cars) was a factor that scored very low in the combined force field mappings, indicating that it is not very influential in this particular study. Contrarily, in a study from Austria by Sattlegger and Rau (2016), parents who chose to live without a car stated that they experienced social norms in favour of cars. This difference of results might be explained by uncertainty in the findings caused by the small sample. It may also have been hard for interviewees to think of and estimate how much norms effect and influence them.

### **Contribution to Knowledge Gaps**

The above presented discussion and the result of the force field mappings have contributed to fill the second knowledge gap (KG2). The knowledge gap, which was presented in the introduction, highlighted a lack of knowledge regarding families' motivations and barriers for sustainable transport modes. The findings from research question one present both enabling and restraining factors for the families in Guldheden. The findings are based on both occurrence and severity which provide two different perspectives. The occurrence provides insights to shared knowledge and factors which are on top of the families' minds. However, severity highlights the importance of the factors.

### **5.1.2 Research Question 2**

The second research question we defined regarded how families see cause and effect in relation to car use or non-car use. This was answered through a Causal Loop Diagram (CLD) that explains the relations that could be seen in the interviews.

The CLD depicts a complex map where many variables influence each other through causal chains and feedback loops. This demonstrated that it is a simplification to just illustrate individual enabling and restraining factors. The complexity and causality are a realistic result. In fact, reality is even more complex than what the diagram can show as it is limited to a few subjects and their own perceptions. If including factors which the families themselves are not aware of, the complexity would be enhanced. A study by Pooley et al. (2011) confirms the complex nature of sustainable mobility. Their case study of the area of Lancaster in the UK showed that the complexity is a major barrier for choosing sustainable modes of travel. In their case study the general picture of active transport, such as cycling and walking, was largely

positive. However, when it came to the usage it did not correspond to their views. According to Pooley et al. (2011) this is due to the complexity where many factors in the end affects the choice of transport. Their study specifically identifies the risk, image, households' routines and time pressure as complex variables which prevents utilization of active transport.

An interesting aspect of the CLD was the feedback loops which affects the system. One of the most interesting ones had to do with owning a car and the use of it. This loop indicated that a private car entails lazier habits and creation of unnecessary needs. Since the CLD was based on the interviewees' own perceptions, it implies that the families are actually aware of this fact. This reinforcing behaviour is supported by a Swedish study by Söderholm (2011). It shows that extensive car use creates habits which in turn may inhibit more sustainable travel modes. This finding is interesting as it informs us on how car use affects sustainable mobility practices. It indicates that acquiring a car can out-compete e.g. walking and biking. This is something that could be promoted by advocates of active transport means.

Another interesting result from the CLD was that spontaneity seems to play an important role in modal choice. It shows that families' attitudes towards spontaneity influence their choice between mostly private cars and carpools. This means that if families show high willingness to live car free they may also accept more planning and less spontaneity, and vice versa. On the other hand, Jain and Guiver (2001) state that the flexibility and spontaneity provided to motorists in the early days of the automobile era is nowadays not so evident. Large cities experience more and more traffic which leads to decreased speeds, delays and difficulties to find parking. This is an interesting addition to the findings in this study, and implies that this old view of the car as the fastest and most convenient transport mode is still widespread. It also highlights that human beings are prone to biases and that subjective views could differ from objective truths. However, the fact that it was brought up in the interviews of this study shows that spontaneity and flexibility still is important to many of the families, regardless of the actual benefits a car bring.

### **Contribution to Knowledge Gaps**

The causality, which the CLD illustrated, provides another contribution to the second knowledge gap, KG2, concerning barriers and motivations. The CLD adds a holistic approach to the identified factors and gives an understanding of how the interviewees see causality in the context of car free living. This finding together with the previous factors from RQ1 provides an understanding of influencing factors, their dynamics and motivations of the families in Guldheden. Therefore, this thesis has provided information and data that we identified as missing in current research.

### 5.1.3 Research Question 3

The third research question of this thesis (RQ3) addressed relevant stakeholders for car free living in Guldheden. We answered it by identifying and mapping the stakeholders that emerged during the interviews, resulting in nine different stakeholders on different levels.

Out of the nine stakeholders identified, only two had an active and outspoken aim to facilitate car free living; Västtrafik and the City of Gothenburg. The public transport provider Västtrafik is important for a car free living and showcases a relation with the families based on needs. On the other hand, the City of Gothenburg did not seem to have any direct relation to the families. This lack of connection could have several explanations and the connection might exist even if was not raised in this study. However, the study made by Söderholm (2011) also shows that the connection between the municipalities and the society in Sweden has room for improvements. It points out that clearer signals from the municipalities regarding the transport field could lead to a decrease in car use. This largely supports the findings of a missing link between the families and the City of Gothenburg. To increase the willingness to live car free in Guldheden, a more direct connection between these two stakeholders could be a first step towards action. This connection is something that could make more families aware of the strategies which the City tries to implement.

#### Contribution to Knowledge Gaps

The third knowledge gap which we identified in the introduction, see section 1, regarded stakeholders that affect the car use of families. By utilizing a stakeholder onion diagram we identified relevant stakeholders from the families' perspective. In doing so we have contributed to the identified knowledge gap, KG3. However, further research could include stakeholders outside the families' view and could include e.g. a power-interest matrix. This would contribute with another valuable aspect to the gap.

## 5.2 Limitations of the Study

This study is, as most other, subject to limitations. The limitations can be seen on three levels; overarching methodology, analysis methods and finally data gathering and sample. These limitations are presented and discussed below.

### 5.2.1 Limitations of the Methodology

The chosen approach was a qualitative and inductive one through a case study of an area in Gothenburg. The reason for this was the exploratory nature of the aim and it provided an enhanced and deep understanding. However, this understanding is limited to a smaller group of people and is based upon interpretations of their subjective views. In order to address this issue, quantitative elements were added to support and balance the qualitative interpretations. The use of quantitative elements strengthens the findings but also brought some limitations. The nature of

qualitative findings is hard to capture quantitatively, and the results may therefore be misleading if mixed (Brannen, 2017). The results should therefore be seen as different but complementary.

To reach the aim and answer the research questions a methodological choice of including several different methods and analysis tools was made. This might give the impression of an unfocused thesis. However, the methodological choice of using a variety of approaches facilitated a wider understanding of the families. Each method complemented previous ones with new information and aspects and thus contributed to a holistic and exploratory picture.

Another methodological aspect was that all the methods were based largely on the perception of the families. If the time frame of the thesis would have allowed, the analysis and its results could have been presented to the families and other relevant stakeholders. This could have allowed for an even more iterative and inclusive process with more aspects being brought up. Such a process could also have confirmed or rejected the findings but is left for further research on the subject.

The use of the Stakeholder onion diagram provided a clear way of presenting the involved stakeholders. However, for a better understanding it would have been preferred to also connect the stakeholders to the casual loop diagram. This would have been a natural step and could have connected the different methods in a better way. However, the scope did not allow for it at the same time as it also was deemed as superfluous and something that could have confused rather than clarified.

### 5.2.2 Limitations of the Analysis Methods

In addition to the limitations of the overall methodology, the methods used also exhibit inherent drawbacks and limitations. The use of the Affinity diagram was a good way of sorting the high amount of qualitative data. However, it is very arbitrary in how the themes and the factors were selected. Others might have sorted the statements differently, leading to other results. The method of using an affinity diagram is based on an iterative process between several individuals (Holtzblatt and Beyer, 2017). In this thesis a slightly simplified version was used in order to adapt the method to the number of researchers. This may have affected the grouping but not the selection of themes.

The force field mappings (FFM) provided a beneficial way of analysing the qualitative data. At the same time, the method inherently contributes to a simplification of reality. FFMs are static in their nature and present enabling and restraining factors as they are at the moment whereas in reality they affect each other and change over time. Moreover the method quantifies qualitative data, meaning that subjective statements are interpreted and compiled. This results in a simplification of statements that could be both enabling and restraining as well as generalizing context specific statements. These limitations implies, once again, that the FFMs should be viewed as a complement to the qualitative data.

To include the influence and the dynamic behaviour, the causal loop diagram (CLD)

filled an important gap. However, when the interviews were conducted, the exact design of the system mapping was not determined. The decision of depicting the interviewees' perspective in a CLD was decided late in the process, after all the interviews were conducted. This means that more casual statements could have been identified with more attention and more follow-up questions during the interviews. Furthermore, several perceived relationships arose when creating the CLD but these were not supported by the transcripts and thus not part of the illustration. Despite this, it was chosen to illustrate the cause and effect through a CLD since it provides a good complement to the force field mappings.

The use of the Stakeholder onion diagram provided a comprehensible illustration of the involved actors. However, it contains a great simplification of reality and also contains high degree of interpretation. In reality, the domains and the levels where stakeholder act might be more complex than just three different categories. In addition, they even might be able to move across borders and influence a car free living in different ways. It was also restraining to categorize the relationships between different stakeholders on the basis of three connections. The stakeholders involved may have a different opinion on the presented connections. If the time scope would have allowed, the result could have been presented for the stakeholders. This could have created a more accurate analysis of the involved stakeholders.

### **5.2.3 Limitations of the Data Gathering**

The fact that the interviews for the study were semi-structured might have resulted in limitations to the study. An unstructured approach might have provided more flexibility and exploratory aspects to the interviews. However, by using a semi-structured approach information gathered from literature could be combined with the openness of an unstructured approach which was beneficial and led to interesting data.

#### **Sampling Method**

Regarding the data sampling the interview subjects for this study were chosen through convenience sampling. This means that generalization from the sample is limited as it might not be representative for the whole group families with children. However, the selection of interview subjects was done in a way that the ratio between women and men, age spans and car ownership was somewhat balanced and inclusive. Therefore, even if the drawbacks of the sampling method were not entirely compensated, the validity of generalization is improved.

#### **Sampling Size**

Another possible limitation to the sample is the size of it. Six interview subjects are a relatively low number for a qualitative study. Dworkin (2012) states that 5 to 50 participants are considered suitable for such research. However, in-depth interviews were applied which meant that a larger sample would have resulted in vast amounts of data to be analysed. Furthermore, theoretical saturation of data

could be seen even after six interviews. The theoretical saturation implies that even if some information is missed, it will have a low impact on the analysis and the result (Glaser and Strauss, 2017). That a saturation had occurred could also be seen in the FFM later on in the process, where the factors were more or less evenly distributed. This indicates shared knowledge and opinions among the families. Therefore, the six interviews were considered to be sufficient for the aim and scope of this thesis.

### **Critical Users**

In addition, the interview selection showed a lack of critical car users amongst families with children. Only one out of six interviewees had children over ten years, all families had one to two children and none were divorced or single-parents. This is an important limitation as these groups do exist and can be assumed to be more car dependant than those represented in this study. In a study by Hjorthol and Fyhri (2009), it was shown that families with children in the age between 6-12 years use cars significantly more than others. The reason for this is according to Hjorthol and Fyhri largely due to the increasing amount of activities among older children. Similarly, it can be assumed that the number of children is correlated to the number of total activities for the families. Furthermore, families with divorced parents may also be subject to an enhanced mobility need if the children are to travel between the two parents. Single-parent households may experience time pressure which could make them more prone to car ownership. To account for this limitation this study could have been delimited from looking into critical subgroups. However, these subgroups were not encountered until after the initial phase. Therefore it can be noted that there is a need for further research on the subject.

### **5.3 Contributions and Further Research**

This thesis has contributed to the issues brought up in the introduction in two ways. Firstly, we have identified influencing factors and causal chains connected to car free living. This provides insight into which aspects the families themselves find restraining or enabling and the causes of them. These results could then form the basis for strategies and interventions aimed at reducing car use amongst a promising but largely overlooked group. Actors that could use the findings are policymakers such as the City of Gothenburg as well as mobility service providers from both the public and private sector.

Secondly, we have mapped stakeholders that are relevant to the families in Guldheden. It is not an exhaustible mapping of all the stakeholders that affect families on all levels but indicates which ones that are closest to the families. The mapping is therefore relevant to consult by policymakers or other convening actors to assemble stakeholders in joint efforts aimed at facilitating car free living for families. Joint efforts are of importance in our opinion since the issue is of a complex nature and therefore require cooperation and holistic solutions to be tackled.

### **Further Research**

In addition to the contributions mentioned above the study has highlighted that more research on car free living with families is needed. A study on a larger scale could help determine if the findings from this study on e.g. the role of proximity is true for other city areas. That way generalization based on the results would be more well-founded. Furthermore, this study, together with others before, has shown that the age and number of children in a family influence their travel patterns. A study, or several ones, that determine these differences would be of importance to further discern and understand reasons for the current car dominance. Lastly, to further understand the importance and potential of families within cities it would be useful to delve deeper into the differences between them and other groups in society. A study of that kind could persuade policymakers to target families specifically. It could also shed light on what kind of impacts targeted actions might have for other currently car depending groups, as well as for future generations.



# 6

## Conclusion

The introduction of this report outlines the drawbacks of extensive automobile use and describes that families with children is a group with promising potential to adopt more sustainable travel habits. However, this group seems to be overlooked in qualitative research. The aim of this study was therefore to explore and illustrate families' willingness and preconditions to live without a private car. In order to do so, a qualitative and inductive research approach was adopted, and three research questions were formulated; one concerning influencing factors, another regarding cause and effect and the final one targeted relevant stakeholders. In addressing the aim and questions several methods for both gathering and analysing data were used. Qualitative data was gathered through in-depth semi-structured interviews followed by a complementary survey sent out to the interviewees. The data was analysed and grouped according to an affinity diagram, which then formed the basis for two force field mappings. Subsequently a dynamic system mapping was created through a causal loop diagram and finally an onion diagram was used to map and describe relevant stakeholders. These methods resulted in several findings and insights, but the main ones are listed below:

- Several influencing factors that restrains and enables a car free living were identified. The enabling ones were to a high degree linked to the physical aspects of Guldheden as a district as well as intrinsic motivation of the families. These factors were facilitating a car free living during weekdays. The most influencing restraining factors were on the other hand connected to the need of a car during weekends and activities.
- Cause and effect related to car use and non-car use of families can be understood as a dynamic complex system. Many variables were identified and they reinforce or balance each other through loops. It is therefore not enough to address individual variables, but a holistic approach is needed.
- The stakeholder analysis identified nine stakeholders which affect car free living in Guldheden. However, out of these nine stakeholders only two are actively working with projects and strategies regarding car free living, namely *Västtrafik* and *the City of Gothenburg*. Moreover, schools and workplaces were the two stakeholders which seem to have the strongest connections to the families.

Based on the above main findings, two important contributions are made. Firstly, the influencing factors and causality provides insights for strategies and interventions which policymakers such as the municipality, the City of Gothenburg, can implement. Secondly, it contributes by identifying stakeholders which are relevant to

## 6. Conclusion

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consult in order to jointly address the complexity of car free living. Thus, this thesis contributes to the issue at hand with an increased understanding of an overlooked but promising group; families with children.

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# Appendices

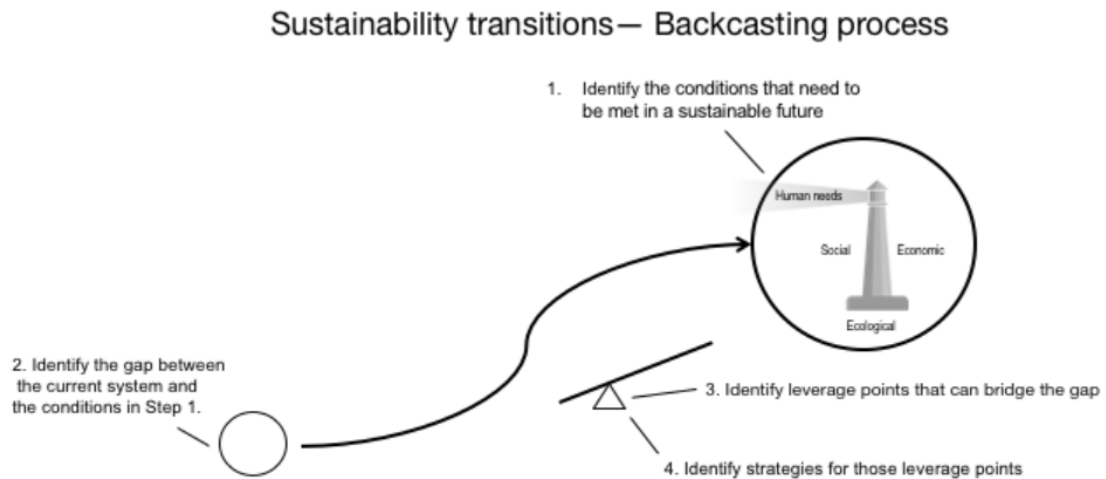


# A

## Initial Phase of Challenge Lab

The first four weeks of the master thesis was spent jointly among all admitted students in the Challenge lab. The aim of this phase was to generate a contextual understanding of the sustainable challenges which the region of Västra Götaland is facing. The phase also identified possible leverage points where research questions could be formulated later on. The phase was following the steps of a method called the *Backcasting method*. The backcasting method differs from the more well-known forecasting method since it ignores ongoing trends and only consider a future state (Hickman and Banister, 2014). Furthermore, it provides a tool for analysing future requirements regarding sustainability as well as facilitating strategies based on these requirements (Alänge and Holmberg, 2014). The backcasting method is used in complex problem where long term interests and several aspects are present (Dreborg, 1996).

In Challenge lab, this method was used to create a pathway to reach a sustainable future. See figure A.1 for a visualization of the steps taken in the backcasting method.



**Figure A.1:** Visualization of the backcasting method and the including steps (Holmberg and Larsson, 2018)

### Step 1- Identify the conditions that need to be met in a sustainable future

Two days off the initial phase was spent on developing conditions and requirements which must be met in order to reach a sustainable future. The requirements were

developed specifically for a future mobility perspective. The conditions and requirements were defined jointly in the Challenge lab and was based on the values of the students. To be able to visualize the future, the framework of the sustainable lighthouse was used. It focuses on four pillars and dimensions in sustainability, namely *Human needs and wellbeing*, *Social*, *Economic* and *Ecological* (Holmberg and Larsson, 2018). In each of the four dimensions three conditions were created. See the result in figure A.2.



**Figure A.2:** The defined requirements of the future, visualized in the lighthouse framework

### Step 2- Identification of the gap between the current system and the future conditions

To be able to find and understand the gaps between the current system and the defined future, there was a need to also understand how the current system worked (Holmberg, 1998). This was done by combining all students' backgrounds in different study areas together with stakeholder dialogues (Larsson and Holmberg, 2018).

The dialogues were organized after three different areas within mobility and featured various actors from the region of Västra Götaland (VGR). The dialogues were conducted as a conversation between the students and the stakeholders with the aim to understand the current system regarding mobility. Aspects such as political governance, business models and ongoing project was discussed. See the participating stakeholders and the three different areas in table A.1.

**Table A.1:** Participating stakeholders in the dialogues

Area within Mobility	Participating stakeholders	
	Name	Organization
Transport of People	Marco Adelfio	Chalmers University - Urban Development
	Anna Gustafsson	GR - Environment and Urban planning
	Line de Verdier	VGR - Public transport and Infrastructure
Transport of Goods	Josefin Darlington	Closer/ Drive Sweden
	Björn Södahl	Urban Water Truck
Tourism	Jörgen Larsson	Chalmers University - Consumption
	Kristina Lindström	Gothenborg University - Tourism

The dialogues were then processed to find gaps between the current system and the conditions for a sustainable future (Larsson and Holmberg, 2018). In this step analysis methods such as *System thinking* and *System mapping* were used to get an initial understanding of current mobility systems. Here the first choice was made as to which direction and area within the theme Mobility the further work would take. This thesis took place within the subject area **Transport of people**. In this subject area, the following gaps were some of the identified ones.

- Current system with cars take up a lot of space in the cities
- Current system risk creating social exclusion
- People in Sweden have the mindset of wanting a private car
- People are affected by car norms in today's society
- People want to live a city life in the rural areas

### Step 3 – Identify leverage points that can bridge the gap

This step was about finding leverage point where some of the identified gaps could be reduced. By leverage point is meant areas with potential, where smaller intervention could drive larger changes to happen (Meadows et al., 1997). In this step it was important to have a broad approach, since the leverage point is not to be described in detail but instead open the mind for new possibilities (Holmberg, 1998). Therefore the leverage point should not be seen as a research question but instead an area where the questions later can be defined.

We identified *Car free society and private car free living* as an interesting leverage point for this thesis. It was chosen since many of the identified gaps was related to the disadvantages of cars and specifically privately owned ones. It could also be noted that the private cars did not fit well with the defined sustainable conditions of the future, see figure A.2. The requirements *Social inclusion*, *Balanced human interactions*, *Maintaining a healthy environment* and *Behaviour patterns* were all affected by today's system. A more car free living would meet the requirements in a better way.

**Step 4 - Identify strategies for the leverage points**

Step four of the backcasting method represents, in this thesis, the process of creating and addressing research questions. This is addressed in the main text of the thesis.

# B

## Interview Guide

### Opening

- Present ourselves and the study thoroughly Idea is to have a relaxed conversation, feel free to wander off
- Explain that the results will be published anonymously, and that we are not in any way evaluating them as a person
- Ask if it's ok if we record and transcribe the interviews
- I will be performing the interview and my colleague will focus on take notes  
If you feel uncomfortable, just let us know! Any questions before we begin?  
How do you feel?

### General questions: (Ice breaker/warm up)

- How did you get here/have you been out today?
- Where do you live? How long have you lived there? What do you think of your neighborhood?
- With your own words and in as much detail as you would like, could you describe your family?
- What is your occupation at the moment?

### Transport needs

- Could you describe a typical day in your family's life?
- How would you generally describe your family's mobility needs? Could you separate these into regular and irregular? (both in terms of frequency and distance?)
- How did your child/children affect your everyday life?
- Can you recall any extraordinary day within the last few weeks, and how did that affect your mobility?

### Car ownership

- About cars, why do you/don't you own one?
- Do you see any benefits with owning a car/not owning a car? How about drawbacks?

### Car free living

- How do you feel about living without a private car? How compatible do you think your life is with living car free?
- How do you see your family's transport use in the next 5-10 years?

### Closing

- Thank you so much for your participation, it means very much to us.
- The next step is to analyse and compare the data gathered
- Would you be willing to be contacted about an eventual follow-up interview?
- Would you like to double-check the transcripts?

## B. Interview Guide

---

- Feel free to contact us with any comments/questions

# C

## Online Survey

## Car Preferences of Families with Children

Hi!

We are two Chalmers students, Niklas & Jakob, who are writing our Master's Thesis on car preferences of families with children in Guldheden. Our aim is to understand and explore how families with children think about and prioritize car use.

The whole survey takes between 5-10 minutes to answer. It is divided into three parts, one with general information about you and your family and the two others with a questions and a number of factors to consider.

The information will be used and published in our thesis through Chalmers, but your answers are fully anonymous!

If you are filling in this survey on your smartphone you might have to rotate your phone to the horizontal mode to see all text and alternatives correctly.

Thanks for helping us in our Thesis work!

(Om du föredrar att svara på enkäten på svenska använd denna länk:

<https://forms.gle/RbkMs1sR4KW11xAV6>)

*\*Required*

Part 1/3

This part concerns some general information about you and your family.

1. Do you currently own a car? \*

*Mark only one oval.*

Yes    *Skip to question 10*

No    *Skip to question 4*

No, but we use a car pool/rental car if needed    *Skip to question 4*

2. How many children do you have? \*

*Mark only one oval.*

- 0
- 1
- 2
- 3 or more

3. How old are your children? \*

Tick one box per child/pair of twins, if none tick "0".

*Tick all that apply.*

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18+

Part 2/3

This part consists of a question and a number of factors to consider.  
If you feel you miss a factor you have the opportunity to add that in the end.

## C. Online Survey

---

4. How important was/are the following factors for your family's choice to not own a car? \*

Answer with the alternative that best correspond to your view of the factor. If a factor does not concern you at all, choose the alternative in the middle.

Mark only one oval per row.

	Very important	Important	Neither important nor unimportant	Unimportant	Very unimportant
E-commerce and home delivers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concern about the climate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People's negative attitudes towards cars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good supply of public transport within the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Goof supply of public transport outside the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health benefits from e.g. walking or biking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Short distance to school and work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Short distance to everyday activities such as gym or hobbies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low cost of public transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs related to owning a car	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having to service/maintain a car	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Easier travel with infant (by e.g. train)                             

---

5. Are you missing any factor relevant to the question above? If so, please describe it below.

---

6. If you added another factor, please state how important it is for the question above.

*Mark only one oval.*

- Very important
- Important
- Neither important nor unimportant
- Unimportant
- Very unimportant

Part 3/3

This part consists of a question and a number of factors to consider.  
If you feel you miss a factor you have the opportunity to add that in the end.

## C. Online Survey

---

7. How important are the following factors for your family when considering to buy a car? \*

Answer with the alternative that best correspond to your view of the factor. If a factor does not concern you at all, choose the alternative in the middle.

Mark only one oval per row.

	Very important	Important	Neither important nor unimportant	Unimportant	Very unimportant
Grocery shopping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Future living situation or house purchase	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transporting bulky items	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People's positive attitudes towards cars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bad supply of public transport inside the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bad supply of public transport outside the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Topography of Guldheden (Hills)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High price of public transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to visit friends and family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to go on trips and family activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to a car in case of an emergency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to be	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

flexible and  
spontane

---

Continuous bad  
weather

---

Not having to  
bring/install car  
safety seat

---

8. Are you missing any factor relevant to the question above? If so, please describe it below.

\_\_\_\_\_

9. If you added another factor, please state how important it is for the question above.

*Mark only one oval.*

- Very important  
 Important  
 Neither important nor unimportant  
 Unimportant  
 Very unimportant

*Skip to question 16*

Part 2/3

This part consists of a question and a number of factors to consider.  
If you feel you miss a factor you have the opportunity to add that in the end.

## C. Online Survey

---

10. How important was/are the following factors for your family's choice to own a car? \*

Answer with the alternative that best correspond to your view of the factor. If a factor does not concern you at all, choose the alternative in the middle.

Mark only one oval per row.

	Very important	Important	Neither important nor unimportant	Unimportant	Very unimportant
Grocery shopping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Future living situation or house purchase	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transporting bulky items	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People's positive attitudes towards cars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bad supply of public transport inside the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bad supply of public transport outside the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Topography of Guldheden (Hills)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High price of public transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to visit friends and family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to go on trips and family activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to a car in case of an	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

emergency

---

Ability to be  
flexible and  
spontane

---

Not having to  
bring/install car  
safety seat

---

Continuous bad  
weather

---

11. Are you missing any factor relevant to the question above? If so, please describe it below.

\_\_\_\_\_

12. If you added another factor, please state how important it is for the question above.

*Mark only one oval.*

- Very important  
 Important  
 Neither important nor unimportant  
 Unimportant  
 Very unimportant

Part 3/3

This part consists of a question and a number of factors to consider.  
If you feel you miss a factor you have the opportunity to add that in the end.

## C. Online Survey

---

13. How important are the following factors for your family to consider not to own a car? \*

Answer with the alternative that best correspond to your view of the factor. If a factor does not concern you at all, choose the alternative in the middle.

Mark only one oval per row.

	Very important	Important	Neither important nor unimportant	Unimportant	Very unimportant
E-commerce and home deliveries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concern about the climate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People's negative attitudes towards cars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good supply of public transport within the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good supply of public transport outside the city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health benefits from e.g. walking or biking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Short distance to school and work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Short distance to everyday activities such as gym or hobbies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low cost of public transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs related to owning a car	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having to service/maintain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

a car

---

Easier travel with  
infant (by e.g.  
train)

---

14. Are you missing any factor relevant to the question above? If so, please describe it below.

---

15. If you added another factor, please state how important it is for the question above.

*Mark only one oval.*

- Very important  
 Important  
 Neither important nor unimportant  
 Unimportant  
 Very unimportant

Thank you for participating, please submit you answers with the button below!

Thank you so much for participating in our study!  
Your answers are of great value to us.

If you wish to see the final report when it is published please write an email to:

[wjakob@student.chalmers.se](mailto:wjakob@student.chalmers.se)

If you want to send us some feedback feel free to write it in the textbox below.

Thanks again and have a good one!

Best regards,  
Jakob & Niklas

16. Feedback on the study/survey

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**Thank  
you for  
showing  
interest!**

Thank you so much for showing interest in the study, however, we are looking at residents in Guldheden with children, and as you answered that you do not live in Guldheden or that you don't have any children, you are not part of our target group.

If this was a mistake and you live in Guldheden with children, go back to the survey and correct your answer.

If not, submit the answers as they are by pressing the button below.

Thanks for showing interest in the study and have a good one!

Best regards,  
Jakob & Niklas

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# D. Affinity diagram with raw data from interviews

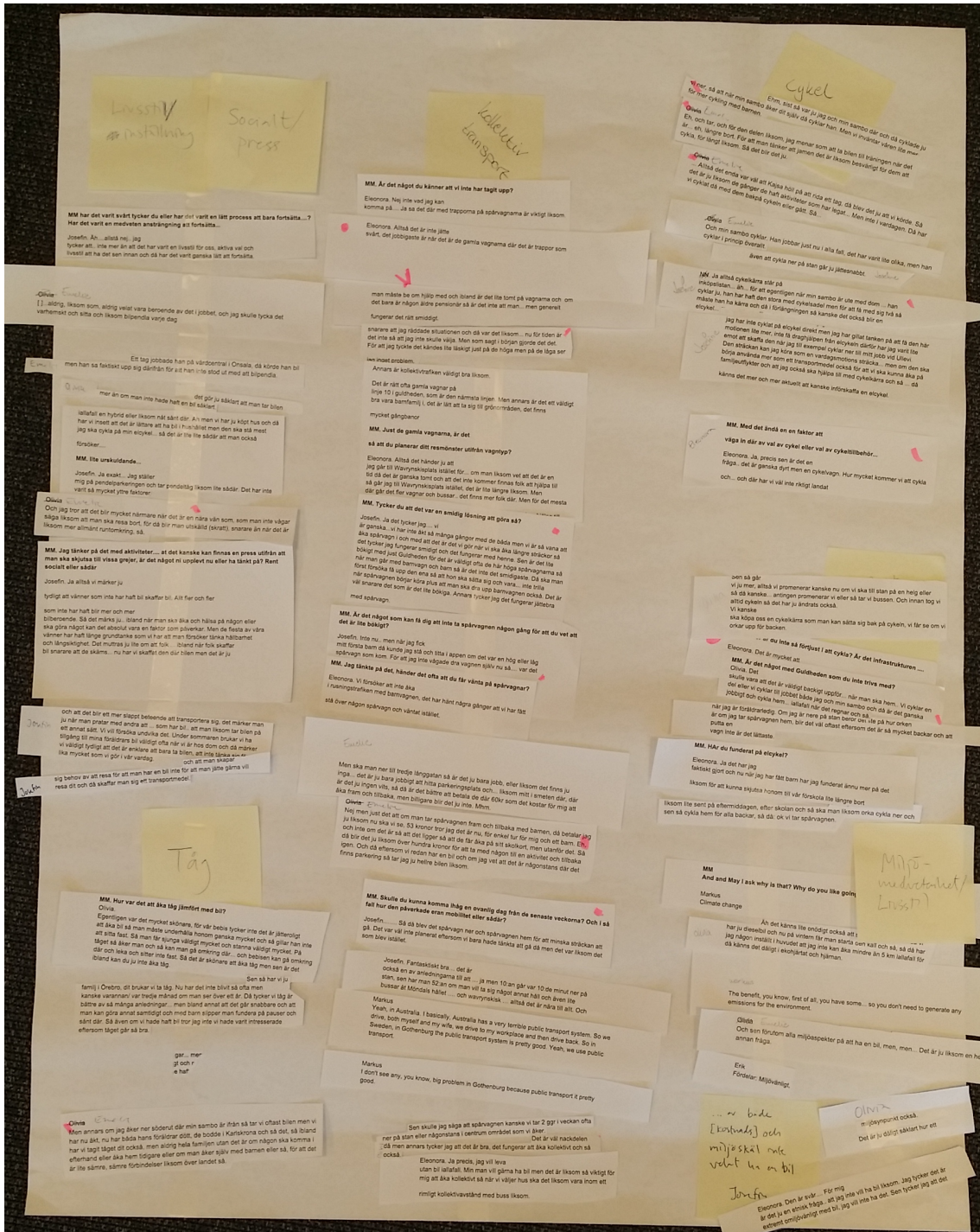


Figure D.3: Affinity diagram with raw data from the interviews, part 3

