Chair of Urban Structure and Transport Planning
Prof. Dr.-Ing. Gebhard Wulfhorst

Technische Universität München

MASTER'S THESIS

M.Sc. in Civil Engineering

Evaluation of the Mobility Station in Domagkpark, Munich - Development and Test of a Methodology for the Impact and Process Evaluation of Sustainable Mobility Measures in the Framework of the ECCENTRIC Project

Author,

Alarcos Andreu, Ginés Álvaro

Matriculation Number: 03662148

Supervisor:

M.Sc. Montserrat Miramontes

Munich, July 31, 2017

Abstract

The Mobility Station of Domagkpark opened on May 31, 2016 with many members already registered at its main provider, STATTAUTO München. One year later, the number of registered members has doubled and the effects of the measure are visible in the district.

It is a small private mobility station that provides the inhabitants of the district of Domagkpark with car-sharing and bike-sharing services, promoting electro mobility through the use of electric vehicles.

The present thesis has evaluated the Mobility Station of Domagkpark, considering its impact on selected key performance indicators. The findings show that a private mobility station can have a significant impact on car ownership reduction and vehicle kilometres travelled. Also, it can influence positively the travel behaviour of the inhabitants of a district.

Through an impact and process evaluation regarding the framework of the CIVITAS initiative co-financed by the European Commission, positive findings have been made that support further similar sustainable mobility measures. The impact evaluation consisted on a survey conducted among the inhabitants of the district between the months of April and May, 2017. For the process evaluation, different interviews with stakeholders of the project were done as well as a learning history workshop.

Acknowledgements

Table of Contents

List of Abbreviations

ICT	Information and Communication Technologies
BBSR	Bundesinstitut für Bau-, Stadt- und Raumforschung
DB	Deutsche Bahn
GHG	Greenhouse Gas
KPI	Key Performance Indicator
KVR	Kreisverwaltungsreferat
LEM	Local Evaluation Manager
LHM	Landeshauptstadt München
ML	Measure Leader
MVG	Münchner Verkehrsgesellschaft mbH
MIT	Motorized Individual Transport
PEM	Project Evaluation Manager
PT	Public Transport
SC	Site Coordinator
TDP	Traffic Development Plan
TUM	Technische Universität München
UITP	Union Internationale des Transports Publics
VKT	Vehicle Kilometers Traveled
WA	Wohnanlage

1 Introduction

Growing population has set several new challenges regarding the improvement of city transport networks from an environmental and sustainability point of view. Over 54 per cent of the people across the world were living in urban areas in 2014, making our world increasingly urban (International Organization for Migration, 2015). The current urbanization patterns are causing unprecedent challenges to urban mobility systems (United Nations, 2013), making accessibility to places and services more difficult. Increasing urbanization also implies traffic congestions and environmental pollution (Wulfhorst, G., Priester, R. & Miramontes, M., 2013).

To deal with these issues, new mobility forms are being developed focusing on sustainability and reduction of car ownership. These are based on a gradual change in the consumption culture towards more using and less owning, and supported by Information and Communication Technologies (ICT) like internet platforms and smartphone applications (Miramontes, M., Pfertner, M., Sharanya Rayaprolu, H., Schreiner, M. & Wulfhorst, G., 2016). According to Moss and O´Neill (2012), car ownership may be less necessary in cities where alternatives to private automobile ownership exist, including car-sharing and public transport (PT).

New forms of mobility include mobility stations, which are multimodal connection points where different transport modes, such as car-sharing, bike-sharing, PT and parking facilities are connected (BBSR, 2017). Mobility stations influence travel behavior towards multimodality, reducing car ownership and total vehicle kilometers traveled (Miramontes et. al, 2016).

1.1 Background

The city of Munich has a wide offer of sharing mobility services, including station-based and free-floating car-sharing. Also, some providers offer bike-sharing services like the Münchner Verkehrsgesellschaft mbH (MVG, English: Munich Transport Corporation).

The first multimodal mobility station in the city operates since 2014, located in Münchner Freiheit. It is a public mobility station consisting of PT, bike- and car-sharing services as well as taxi stands and parking facilities. It also provides an additional information pillar with real-time information and charging infrastructure for electric car-sharing vehicles (MVG, 2015). This station is a pilot project that will help the city to decide if it should continue investing in these multimodal mobility platforms.

Located in the north of the city, the new district of Domagkpark will provide about 1600 households until 2017 in a previous military zone. Additionally, the concept of building a sustainable district according to the guidelines of Munich´s Urban Development Plan (LHM,

2012) has the goal to reduce the motorized individual transport (MIT) and promote a "sharing economy" based on sharing mobility services. Also, the district aimed to reduce the number of parking places per residence, making those more economic (Ruttloff, 2014).

To satisfy said purposes, the private E-Sharing Mobility Station of Domagkpark (referred as the Mobility Station in this work) opened in Mai 2016. It is the first electro mobility station in the city, providing the inhabitants of Domagkpark with station-based car-sharing and bike-sharing services, as well as bicycle parking facilities (Domagkpark e.G., 2017a). Electro mobility is a key aspect of the station, providing the users with one electric car and several electric bicycles and scooters.

In the incoming years, the district will take an active part in the mobility measures of the ECCENTRIC project as part of the European initiative CIVITAS in Munich. The CIVITAS initiative, co-financed by the European Union, aims to promote a cleaner and better transport in cities, testing mobility measures and solutions in over 80 Living Lab cities across Europe (CIVITAS, 2017a). The measures to be implemented and tested in Domagkpark include, among others, two new mobility stations.

1.2 Goals and Objectives

The goal of the present thesis is to evaluate the performance of the Mobility Station in Domagkpark, and to deliver recommendations for its future development as well as for the implementation and evaluation of further mobility solutions in the study area.

With this goal in mind the following objectives are defined:

- To evaluate the impacts of the Mobility Station on selected Key Performance Indicators (KPI), including the acceptance and perception of the Mobility Station by the users.
- To carry out a process evaluation of the Mobility Station considering the different stages of planning, implementation and operation.
- To deliver recommendations for the future development of the Mobility Station.
- To deliver recommendations for the impact and process evaluation of comparable measures to be implemented in the framework of the ECCENTRIC project.

These results aim to serve as a basis for the development of the additional mobility services in Domagkpark as well as for the development of evaluation plans for the impact and process evaluation.

1.3 Structure of the Thesis

In the following chapters, the theoretical background as well as the results of the empirical investigation are presented.

- Chapter 2 provides an insight into integrated multimodal mobility services.
- Chapter 3 presents the study area, including the district of Domagkpark and the Mobility Station. Also, the ECCENTRIC project and its measures for the city of Munich are presented here.
- Chapter 4 gives the theoretical background for the evaluation of mobility projects, focusing on the framework for evaluation of the CIVITAS initiative and the impact and process evaluation.
- Chapter 5 presents the process of the evaluation. Here, the empirical investigation consisting on an impact and process evaluation is detailed, and serves as basis for the presentation of the results.
- Chapter 6 provides the results of the empirical investigation, both for the impact and the process evaluation.
- Chapter 7 discusses the limitations of this research and delivers recommendations based on the previous results.
- Chapter 8 presents a summary of the results and conclusions. Also takes a future look to the new mobility stations to be implemented in the area.

2 Integrated Multimodal Mobility Services

This chapter provides an insight into the concept of integrated multimodal mobility services. It explains the definitions of multimodality and intermodality in travel behavior and presents the mobility stations as integrated multimodal mobility services, paying attention to their most important sharing components.

2.1 Integrated Multimodal Mobility Services

Integrated multimodal mobility services result from the integration of different mobility offers, like sharing services and PT. A mobility station is a node, or location, where some of these services are integrated, usually along with ICT to provide the users with travel information. Mobility stations, have the potential to promote a more sustainable transport (Luginger, 2016).

This section will provide a brief introduction to new mobility concepts and to some of the components of integrated multimodal mobility services.

2.1.1 New Mobility Concepts and New Mobility Offers

A consequence of the growing population in urban areas is the increase of urban mobility needs. Not only does this lead to a high dependency on private vehicles, but also increases the demand of existing infrastructures and PT in our cities. New mobility concepts aim to influence the travel behavior towards a sustainable transportation while meeting the mobility needs of the population. Sustainable transportation means the provision of mobility services and infrastructures to satisfy the needs of the population without compromising the opportunities of future generations. It is critical, because it drives sustainable development, influencing many aspects of the society and the economy (United Nations, 2016).

According to Luginger (2016), there is not a definition for new mobility concepts. We can state that new mobility services together with new drive technologies and ICT conform what we understand under new mobility concepts.

New mobility concepts include sharing services, such as car-sharing and bike-sharing, as well as so called peer-to-peer services, where private owners make their vehicle available to a community of members via an internet platform. This new mobility offers have primarily arisen in the major cities and metropolitan areas of industrialized countries (Lenz, B., Fraedrich. E, 2016). They also offer potentials for companies in the fields of public mobility services, individual mobility services and services for commercial providers (Horváth & Partners GmbH, 2017).

Horváth & Partners provides a possible categorization of new mobility concepts in table 2.1:

New Mobility		
Public Mobility Services	Individual Mobility Services	Services
Improvements to interconnected mobility services	Stationary car-sharing/ pick & drop car-sharing/ ride/ lift-sharing	Tracking/ active fleet management
Communal network concepts (smart city approaches)	Provision of urban electric vehicles	Energy-related services
Innovative parking garage concepts	Provision of networked mobility concepts	Supervision of charging stations, intelligent route planning etc.

Tab. 2.1 Possible categorization of new mobility concepts. Own elaboration, source: adapted from Hovárth & Partners.

Regarding mobility offers, we can differentiate between *classic* and *new mobility offers* (Luginger, 2016). The following figure was retrieved from Luginger (2016) and is based on the study by Krismanski (2015).
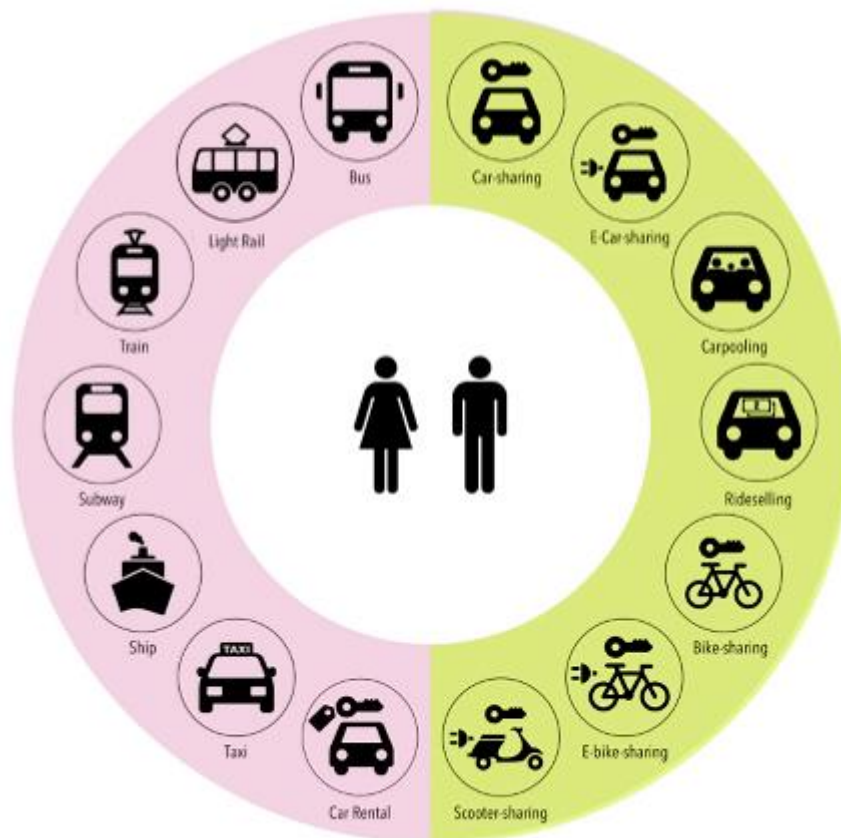
Figure 2.1 New and Classic Mobility Offers. Source: Luginger (2016), Krismanski (2015).

2.1.2 Multimodality and Intermodality in Travel Behaviour

Multimodality and intermodality are both terms related to the travel behavior of individuals. According to Nobis (2013), multimodal travel behavior has been an increasing important topic in the last years, seen as an alternative to one-sided use of private cars. In opposition to monomodal persons, multimodals use different transport modes to supply their mobility needs. Difference between multimodality and intermodality lies in the time when these modes are used.

Multimodality is defined as the use of at least two modes of transportation - bicycle, car or PT transportation – at least one time in a week. *Intermodality*, on the other hand, implies the use of different transport modes during a single trip. (Nobis, C. 2013). It is clear after this definition, that travelers in the category of intermodality also belong to the group of multimodal behavior. Multimodality is often seen as a rational and resource conserving travel behavior, in which the appropriate travelling mode is chosen depending on the situation (Luginger, 2016).

The following table provided by Nobis (2013) defines monomodality in contrast with multimodality and intermodality.

	Definition	Reference unit	Characteristic of the reference unit	Characteristic of the travel behavior
Monomodality	Exclusive use of a single transport mode for all trips in a definite period of time	Period of time	Use of a single transport mode	No variation between transport modes
Multimodality	Use of different transport modes during one or more trips in a certain period of time	Period of time	Use of different transport modes	Variation between transport modes
Intermodality	Use and thereby combination of different transport modes during a single trip	Trip	Use of different transport modes	Variation between transport modes

Tab. 2.2 Categorization of travel behaviours. Own elaboration and translation, source: Nobis, C. (2013)

In words of Spickermann, A., Grienitz, V. & Von der Gracht, H.A. (2014) multimodal mobility has the potential to solve some of today´s urban mobility challenges by combining private and public transport modes and capitalizing of the benefits of various systems.

2.1.3 Car-sharing Services

Although present in Germany since 1988 (Bundesverband Carsharing, 2017a), car-sharing has become increasingly popular in the last years. An article from 2013 published in the German newspaper "Der Spiegel" stated based on several studies that car-sharing is becoming increasingly attractive in German cities, especially among young people (Hüetlin, T., 2013). According to this article, the number of automobiles in Germany will halve by 2050, verifying the changing trend in the travel behavior.

Some automobile manufacturers have their own car-sharing brands. This is the case of Daimler AG (car2go) and BMR Group AG (DriveNow), both present in the city of Munich.

Car-sharing can be defined as the organized, communal use of automobiles, open to everybody without discrimination and with regulated transparent conditions for its use (Bundesverband Carsharing, 2017b). Cars can be booked at any time with help of ICT as mobile apps, and the fee for the use is calculated over the time usage or the kilometers driven. After a registration, the user is provided with an access medium like a card or a smartphone application to book the vehicles. According to the Bundesverband Carsharing, car-sharing complements and strengthens the PT and has a positive impact on the environment. In Munich, the ratio of car-sharing automobiles per 1000 inhabitants is 0,98 (Bundesverband Carsharing, 2017c).

There are two types of car-sharing; *station-based car-sharing* and *free-floating car-sharing*. The difference lies in the booking procedure of the cars. While by a *free-floating car-sharing* company any user can book a car at any place, and leave it where the trip ends inside of a certain area where the company delivers its service, by *station-based car-sharing* the start and end of the trip occur at one of the stations or parking places of the company. The car must therefore be brought back to its original place after the use.

Several studies show a positive impact of car-sharing in reduction of car ownership, kilometers traveled with private automobiles and environmental pollution. Martin, E., Shaheen, S. & Lidicker, J. (2010) carried a study about car-sharing users in North America over a large population, showing that car ownership for car-sharing members had been reduced to a degree that is statistically significant (from 0,47 to 0,24 vehicles per household). Another study, conducted by Martin, E. & Shaheen, S. (2011) estimated the reduction of greenhouse gas (GHG) emissions resulting from participants in car-sharing organizations within North America in -0,82 t GHG/year. This study also reports a decline in the vehicle kilometers traveled (VKT) per household and year within these participants of 27%.

2.1.4 Bike-sharing Services

Bike-sharing started in Amsterdam in the 1960s. Although this mobility service had a slow start, the improvements in technology and advanced tracking methods gave birth to a rapid expansion of bike-sharing throughout Europe (DeMaio, P., 2009). Bike-sharing schemes offer rentable bicycles in public spaces (BBSR, 2015). This rental is temporary and rental and return locations are automated and work without employees. The rental fee is determined usually by the time usage.

Germany counts with two major bike-sharing operators; Call-a-Bike, brand integrated in the Deutsche Bahn (DB) and NextBike. In Munich, the MVG also offers his own bike-sharing service, called MVG-Rad. The bikes can be booked over an app and brought back at any of the stations of the MVG. They also can be left in open public spaces inside the operation area

delimited by the app (MVG, 2017a). Prices for MVG-Rad vary between 5 and 8 cents per minute with a maximum daily fee of 12€.

According to Midgley (2009), bike-sharing systems provide the missing link between existing points of public transportation and desired destinations, offering a new form of mobility that complements the existing PT systems. They have a profound effect in creating a larger cycling population (DeMaio, 2009). The impact of a bike-sharing system not only relates to the travel behavior, but also has a quantifiable influence on reduction of CO_2 emissions (Lippelt, J. 2013),

The city of Munich is making great efforts to promote the cycle modal share through its initiative "Radlhaupstadt München". The goals of this initiative are, among others, the reduction of CO_2 and noise emissions in the city, to achieve a positive impact on the health of the population and place saving from automobiles (LHM, 2017).

2.2 Mobility Stations

Integrating mobility services into one location to promote multimodality and meet the mobility needs of the population can be achieved through mobility stations. These are a relatively new concept where different transport services are available at a single location, usually complementing the PT.

This section provides an insight into mobility stations and the so-called levels of integration of the mobility station as a success factor based on the study by Luginger (2016).

2.2.1 Mobility Stations

According to the Bundesinstitut für Bau-, Stadt- und Raumforschung (2015), the main characteristic of mobility stations is the connection of different transport modes in a location combined with a marketing message of promotion of environmental-friendly transport. Here, the connection is designed so that the interchange between transport modes is facilitated through their concentration in a single location.

This characteristic emphasizes in the promotion of environmental friendly transport as one of the goals of mobility stations. It does not imply how many transport modes must be connected. In fact, according to Jansen, H., Garde, J., Bläser, D. & Frensemeier, E. (2015), mobility stations can exist in different sizes and offer different services. A bimodal mobility station might offer only two different transport modes connected and still be considered as a mobility station. Nevertheless, bimodal mobility concepts like park and ride, where automobile parking places are connected with PT, or train stations, where different PT offers are connected, cannot be directly regarded as mobility stations if the promotion of environmental-friendly transport is not recognized in them (BBSR, 2015).

The first mobility stations in Germany started in Bremen in 2013 (BBSR, 2015). The concept was not applied and payed attention in other German cities until almost ten years later. Cities like Hamburg (2012), Munich (2014), Offenburg (2015) and Leipzig (2015) have integrated or are integrating this concept in their transport offers. Most of the mobility stations are integrated with the PT network as well.

2.2.2 Levels of Integration

Integrated multimodal mobility services as a concept emphasizes in the integration of the different transport offers. Integration is a key factor for the success and efficiency of a mobility station. Based on the study by Luginger, L. (2016), eight different levels of integration are presented in table 2.3.

Levels of integration	
Physical integration	Refers to the intersection of the different modes at a given location. Intends to shorten distances between connections and facilitate the usage.
Marketing	Mobility stations, corresponding platforms and marketing concepts should be recognized as one system and receive the same corporate design.
Integrated information	Information about the offer (services included, prices, how to use it) should be available on-site and via an online platform.
Integrated registration	Integrated registration process for all offers should be provided to reduce entry barriers for potential users.
Integration of trip planning	Information about trip planning should be offered on-site or online.
Integrated booking	Booking of the different offers should be possible via one platform.
Access integration	An integrated access medium like mobility cards or smartphone applications should be provided.

Billing integration	Every offer should be billed separated, having the advantage for the user to address the corresponding provider directly.

Tab. 2.3 Levels of integration, own elaboration. Adapted from Luginger, L. (2016)

According to Luginger, L. (2016), integrated billing is associated with some difficulties, such as the requirement of a central institution for its processing. Therefore, it is recommended to bill each service separately through the providers itself.

3 Study Area

This chapter introduces the district of Domagkpark, regarding its history, structure and location. Also, the mobility concept of Domagkpark and the Mobility Station are presented, and some back-end data from the official operator are provided. The third section provides information about the ECCENTRIC project, mentioned in the introduction, and its measures affecting the district of Domagkpark.

In the year 2014, a study about the future inhabitants of Domagkpark and their current and future mobility behavior was conducted by Tobias Ruttloff for his Master´s Thesis. His work serves as basis for the present thesis and provides baseline information and comparable results. Some of them are summarized in this chapter and considered in chapter 6.

3.1 Introduction to Domagkpark

The Mobility Station provides its offers to all the inhabitants of the new district of Domagkpark. To evaluate the performance of the Mobility Station, it is therefore important to know its context and the district where its located. This section will introduce the reader to Domagkpark.

3.1.1 Location and Structure

The district of Domagkpark is located in the north of the city of Munich, Germany. It is part of the district of Schwabing. Domagkpark borders west with the highway Munich-Nüremberg and north with the street Frankfurter Ring. In the south, it is delimited by the Domagkstraße street.

The district comprehends an area of 24,3 hectares (LHM, 2012). Two streets provide access from the Domagkparkstraße street and the Frankturter Ring street to the internal part of the district, the Max-Bill-Straße street and the Gertrud-Grunow-Straße street. The district is connected through PT, including two bus routes, a tram line and the subway station of Alte Heide, which is almost one kilometer away.

Until 2018, around 1.600 residences are planned to be constructed, along with social facilities and a public park (LHM, 2012). 18.000 constructed square meters are reserved for commerce and services. About 50 percent of the apartments are social promoted residences (LHM, 2012). Other facilities include, among others, 4 children day nurseries, a school and a student's residence. The center of the district is reserved for green spaces, including playgrounds and parks. The following figure shows the district of Domagkpark and its surroundings.

The following figures show the location of the district in the city of Munich and a closer view of Domagkpark.
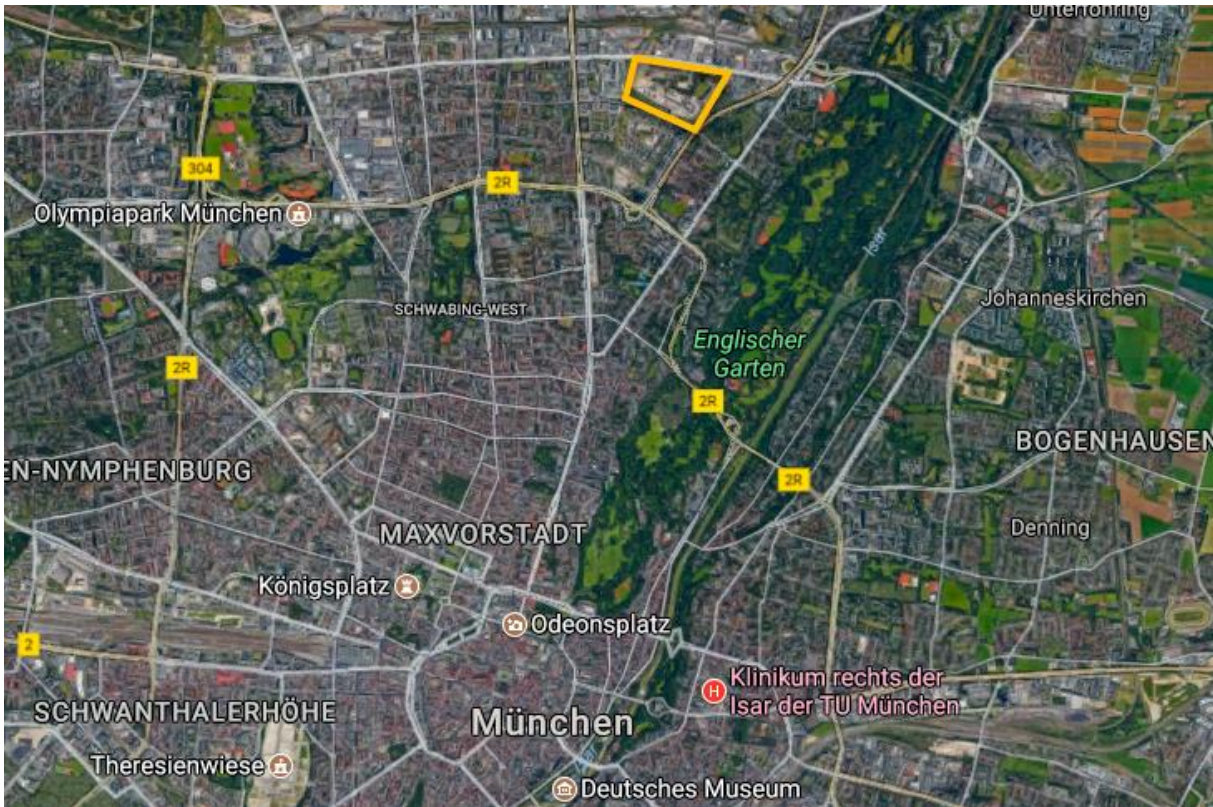
Figure 3.1 Location of Domagkpark in Munich. Source: Google Maps
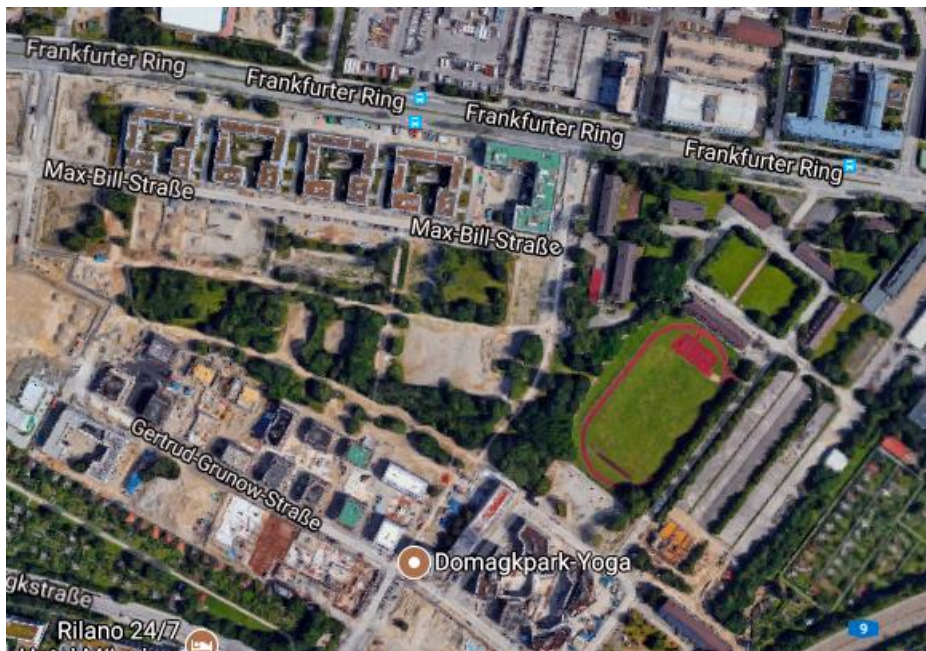
Figure 3.2 Surroundings of Domagkpark. Source: Google Maps

The construction of the residences involves a consortium of different "Wohnungsgenossenschaften" (English: cooperative building associations), "Baugemeinschaften" (English: building joint ventures) and the city cooperative building association GEWOFAG. The communication and integration between all parts for the design and care of the district is promoted by the "Charta der Quartiersvernetzung" (English: Charter for the Networking in the District" (Ruttloff, 2014). The result is expected to be a sustainable district basing on cooperation and integration between the neighbors and a sustainable mobility concept that serves as example for the development of new sustainable districts in Munich. The consortium was also responsible to coordinate the mobility concept of the district.

The following figure shows the structure of the different building sites in Domagkpark divided into "Wohnanlagen" (WA, English: residential complex) from WA 1 to WA 17.

Figure 3.3 Distribution of residences in Domagkpark. Source: Domagkpark e.G.

The main actors present in the district regarding cooperative building associations and building joint ventures are, according to Domagkpark e.G. (2017b):

- <u>GEWOFAG</u>: WA 1, WA 2, WA 3, WA 13, WA 14 and WA 15. GEWOFAG is a cooperative building association attached to the city of Munich and constructs social promoted residences. It was created in 1928 (GEWOFAG, 2017).

- WOGENO e.G.: WA 10 and WA 12. WOGENO e.G. is a cooperative building association that promotes self-administered, social and ecologic residences, created in 1993 (WOGENO e.G., 2017). It is also the main promoter of the mobility concept and the Mobility Station in Domagkpark.
- Wagnis e.G.: WA 11. Cooperative building association created in year 2000. It promotes social residences under the principles of self-administration, participation and community organization (Wagnis e.G., 2017).

The cooperative building association FrauenWohnen e.G. is located in WA 12 together with WOGENO e.G. WA 8 and WA 9 are occupied by building joint ventures and WA 4, WA 5, WA 6 and WA 7 are reserved for private initiative.

The district intends to integrate different cultural offers and organized events in its community life. Goal is to promote the integration and participation of the inhabitants in the design, care and day life of the district. There exist also different cafés and event rooms. The Domagpark e.G. is the neighborhood association that promotes the community life and different activities. They are also responsible for the web site and communication in the district (Knorre, M., 2017).

Figure 3.4 Logo of Domagkpark e.G.

3.1.2 Brief History of Domagkpark

The district of Domagkpark was occupied by barracks constructed between 1936 and 1938. After World War 2, these barracks were occupied by the U.S. Army and used as center for refugees until 1955, when the barracks went under property of the German Army (Domagkpark, 2017c).

In the 1990s, the area became a center for artists, using the barracks for workshops, clubs, events and studios. Domagkpark became the biggest artist colony in Europe at that time, DomagkAtelier GmbH, grouping after 1993 about 300 studios. After the planning for the new district, in 2011, the city saved around 100 studios for economic rental to the artist colony and renovated the building "Haus 50" for this purpose, with an investment of 5,35 million Euro (LHM, 2013).

Today, the district is an example of social and sustainable living, with an innovative mobility concept and a community life that fosters social integration and culture.

3.2 Mobility Concept

This section presents the mobility concept for the district of Domagkpark, including the Mobility Station. Also, the design process is briefly introduced and the different mobility options available in Domagkpark apart from the Mobility Station are described

3.2.1 Domagkpark and Sustainable Mobility

The mobility concept of Domagkpark came from the cooperation between the consortium Domagkpark and the INZELL-Initiative, a mobility forum involving BMW and the city of Munich (Ruttloff, 2014). The guidelines for the new mobility concept for the district were presented in February 2014 according to Munich´s traffic development plan (TDP) from year 2006.These included plans for a strong reduction of car ownership and parking places, focusing on share mobility services (Ruttloff, 2014).

According to Volker, N. (2014), the consortium was responsible for the design of the mobility concept with the support of the Kreisverwaltungsreferat (KVR, English: Department of Public Order) of the city and the involvement of the station-based car-sharing company STATTAUTO, responsible to provide its logistic. The same document summarizes the requirements from the inhabitants of Domagkpark and the offers for the mobility concept.

One of the goals of the new mobility concept was to reduce the number of constructed parking places and thereby to save construction costs. According to Munich´s Stellplatzsatzung (English: rules for parking facilities) as mentioned by Ruttloff (2014), new constructions need to comply with 1,0 parking places per residence. In 2011, the consortium requested the Bezirksausschuss (English: district committee) to be allowed to construct with a lower ratio of parking facilities per residence. This was sustained by previous experiences of the members of the consortium, where it was demonstrated, that for social promoted residences with the involvement of car-sharing services, half of the parking places were not used (Ruttloff, 2014). Therefore, the district committee allowed the consortium Domagkpark to build with a lowered ratio of 0,5 parking places per residence.

The mobility concept for Domagkpark includes, among other initiatives (Domagkpark, 2017d):

- The Mobility Station, also called E-Sharing Station, emphasizing the electro vehicles available, or simply Mobilitätszentrale (English: mobility central).
- Photovoltaic system to provide energy to the electric vehicles, installed in the WA 10 (Fritz-Winter-Straße 3).
- PT offers, including bus lines, tram lines and subway
- MVG-Rad bike-sharing scheme operating in the area with three stations
- DriveNow and car2go car-sharing offers operating in the area
- Promotion of the peer-to-peer platform flinc in the district

- Promotion of the ParkU-App, that provides flexible parking places per rental and contact between owners and users, and two for the residents available parking places integrated in the system

3.2.2 Public Transport Offers and Connections

Domagkpark offers its inhabitants with forms of sustainable mobility through its Mobility Station. Also, the district offers a wide number of PT facilities to promote its use. The car-sharing companies car2go and DriveNow are present in the zone, as well as MVG-Rad through three different stations. The PT and sharing-services in the zone are showed in the following figure provided by Domagkpark.

Figure 3.5 Public transport and MVG-Rad bike-sharing stations in Domagkpark. Source: Domagkpark, e.G.

The three MVG-Rad stations are marked by green circles with the word "Rad" (English: bike). The tram line 23 connects the western part of the district with the mobility station of Münchner Freiheit, closer to the city center.

The closest subway station is Alte Heide (Line U6), that connects Domagkpark with the city center in 10 minutes (MVG, 2017b). The station lies 950 meters far away from the southern part of the district.

Two bus lines stop at Domagkpark, line 177 heading to the north, and line 50 in direction east-west.

3.2.3 The Mobility Station

The Mobility Station of Domagkpark opened in May 31, 2016, located in the Fritz-Winter-Straße street number 3, at the WA 10 (WOGENO e.G.). It is the first e-sharing station in the city of Munich and offers a wide variety of cars (including one electric car) and several e-bikes, e-cargo bikes and e-scooters (Domagkpark, 2017a).

The station has two different parts, one above-ground and one underground. The above-ground part is where all the bicycles, cargo bikes and scooters are located, along with bicycle docks. Here, there are also the charging points for the e-vehicles and the box containing the keys to make use of them. This part is showed in the following photograph, obtained from Domagkpark e.G.

Figure 3.6 Above-ground part of the Mobility Station. Source: Domagkpark e.G.

The cars are parked in the underground garages of WOGENO e.G. and Wagnis e.G. (WA 10 and WA 11). In the garage from the WA 10, there are parked 4 conventional cars and one electric car with two charging spots. Other 2 conventional cars are parked in the garage from the WA 11.

The Mobility Station does not provide a direct connection with the PT. Regarding the two characteristics proposed in section 2.2 according to the BBSR (2015), the Mobility Station of

Domagkpark provides a location where different transport modes are connected, and promotes environmental-friendly transport through the focus on electro mobility and the provision of sharing-services. Therefore, although being a bimodal small private station (if bikes and scooters are considered together as a group), it can be considered as a mobility station.

Due to the conditions and size of the Mobility Station, a precise analysis of the different levels of integration proposed by Luginger, L. (2016) was not considered in this work. Concepts like trip planning do not apply to the Mobility Station and marketing integration has a small, private ambit in this case. Although if the rest of the levels of integration are fulfilled, it is caused because it is a small mobility station with only one main operator for all offers.

3.2.3.1 Mobility Options at the Mobility Station

The variety of offers at the Mobility Station include (STATTAUTO München, 2017a, Domagkpark, 2017a):

- One electric car (model Nissan Leaf)

- One minicompact car (model Toyota Aygo)

- Two subcompact cars (model Ford Fiesta)

- Three mid-size cars (models Renault Kangoo and Renault Megane)

- One e-cargo bike

- Two e-scooters (max. 45 km/h, driver license needed)

- Two e-bikes (max. 25 km/h)

- Several bicycle pitches

- Three PT monthly tickets (only available for members from WOGENO, will not be considered in this evaluation)

3.2.3.2 Actors Involved

For the properly performance of the Mobility Station, the following actors with different responsibilities are involved:

- <u>STATTAUTO München</u> is the main operator, responsible for the maintenance and offer of the cars and for the integrated booking system. All vehicles are booked directly from their platform. STATTAUTO München is a car-sharing provider, founded in 1992. It has about 12.500 members and 450 vehicles located in over 115 stations (STATTAUTO München, 2017b).

- WOGENO e.G. is the owner of the bicycles and promoter of the mobility concept.

- Dynamo Fahrradservice Biss e.V. is responsible for the maintenance and reparation of the bicycles. Their shop beneath the Mobility Station, also at the Fritz-Winter-Straße, provides their services to the users. Dynamo Fahrradservice Biss e.V. is a social enterprise dedicated to sell, repair and recycle bicycles. They focus on providing jobs and formation to persons with handicaps to find a work, like migrants and long-term unemployed workers, promoting their social and job market integration (Dynamo Fahrradservice Biss e.V., 2017).

Figure 3.7 Logos from STATTAUTO München and Dynamo Fahrradservice Biss e.V.

Together with the neighbor association Domagkpark e.G., the users of the Mobility Station have 4 different contact partners in total. All actors coordinate and work together to assure the performance of the Mobility Station.

3.2.3.3 Operation

As stated in section 3.2.3.2, all vehicles can be booked at the platform from STATTAUTO (Domagkpark, 2017d). Therefore, users need to be registered at STATTAUTO and must sign a contract with them. Only users with driving license have access to the cars and e-scooters. However, users without driving license can also register for the use of the rest of the offer.

The car-sharing offer from STATTAUTO is open to all the clients of the company, regardless if they live in Domagkpark or not. Bike-sharing services and the rest of the offers, in opposition, are only available for residents in Domagkpark.

Once registered, the user is provided with a personal card and can start booking the vehicles. In the platform from STATTAUTO, the user can choose the desired vehicle and time for the booking. The personal card with a personal code opens the box at the mobility station where the keys are located, once a previous booking has been done. The booking of the vehicles is also available per telephone and via app.

When registered at STATTAUTO, the user pays once an admission fee of 25 Euro and a deposit of 250 Euro (Domagkpark, 2017d). The monthly quote is of 7 Euro, and the prices are calculated for every type of vehicle. The e-bikes, e-scooters and e-cargo bikes are calculated per number of hours booked, while the prices for the cars are calculated per number of hours booked and number of kilometers driven.

There is the possibility to register only for the use of the e-bikes and e-cargo bike, without the need of a driving license. In this case, the user pays the admission fee of 25 Euro but not the deposit (Domagkpark, 2017d). This option was chosen by 16 of the 102 users that were registered in January 2017 (15,7%) (Rau, O., 2017). There also exist other different options for the registration depending on the cooperative building association of the user and special tariffs.

3.2.3.4 Back-end Data

In order to facilitate the evaluation of the Mobility Station, STATTAUTO provided the back-end data required.

The following figures show the number of members, the number of registrations and the number of users leaving the system from June 2016 to March 2017. The total number of users in December 2017 was reported to be 102. Considering the number of registrations and cancelations, it is obtained a total number of 108 users in March 2017 and 60 persons who were already users of STATTAUTO before the implementation of the mobility station.
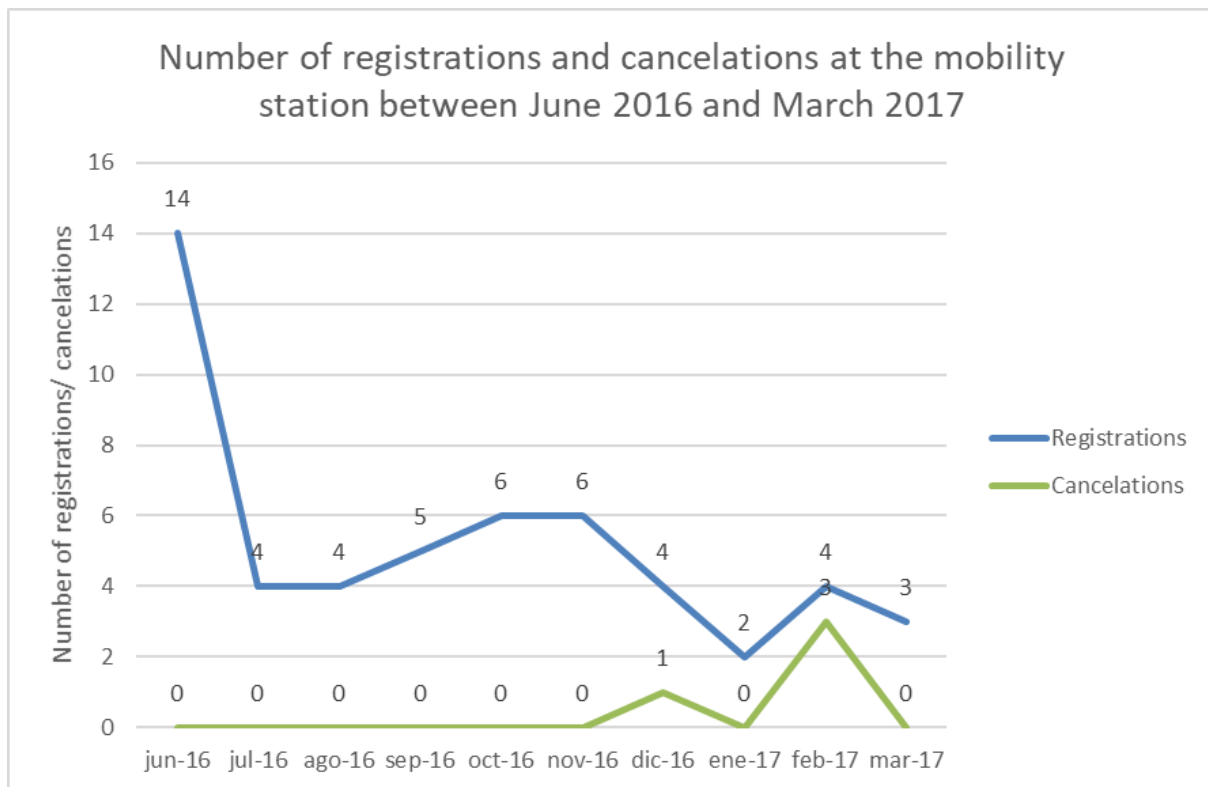
Figure 3.8 Number of registrations and cancelations at the Mobility Station between June 2016 and March 2017. Own elaboration, data source: STATTAUTO München.

There have been 4 cancelations in almost one year of operation. Regarding the number of registrations, it was remarkably high right after the opening of the mobility station and has been slowing down since then.
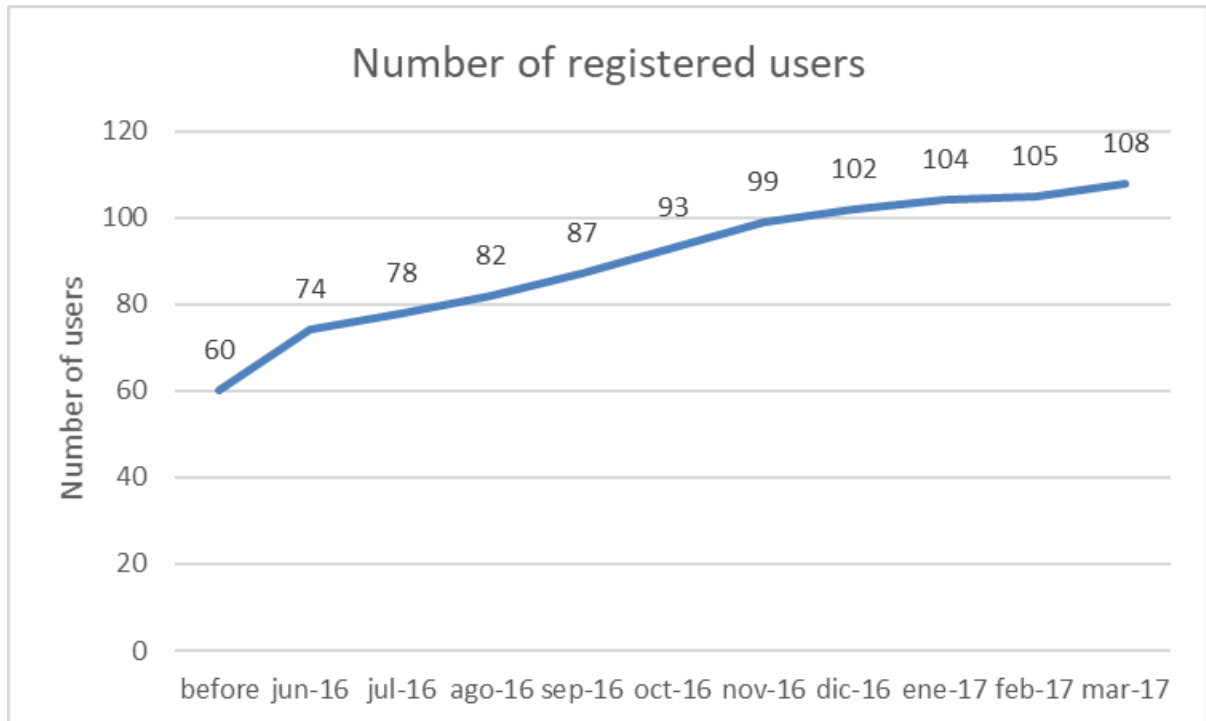
Figure 3.9 Number of registered users until March 2017. Own elaboration, data source: STATTAUTO München.

As seen in figure 3.9, the number of users has almost doubled in less than a year (180%). On the other hand, the rate of new incoming users has been slowing. Nevertheless, the last official reported number of registered users by STATTAUTO was from 121 for June 2017 (12% more in 3 months). During this time, survey and informative events took place, helping to promote Mobility Station.

The following figure shows the number of rentals for all vehicles between June 2016 and March 2017. Data have been added for the different groups, and correspond therefore to several vehicles.
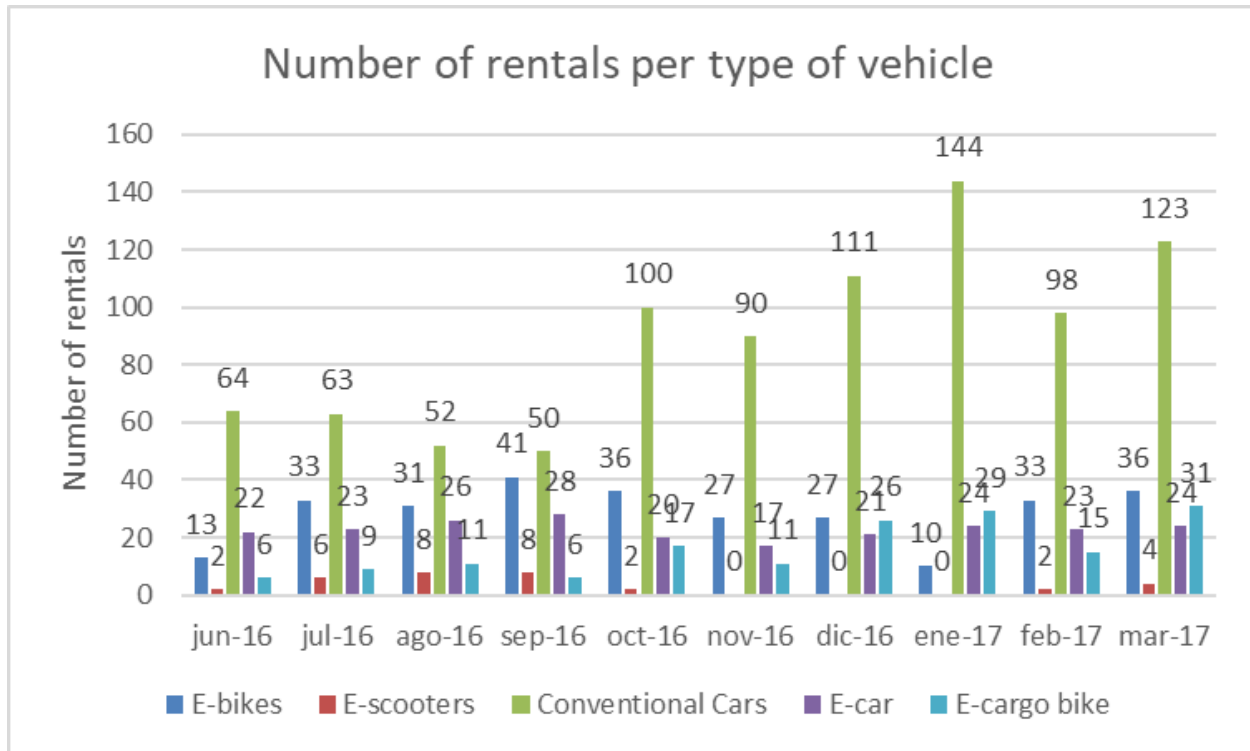
Figure 3.10 Number of rentals per type of vehicle between June 2016 and March 2017. Own
                elaboration, data source: STATTAUTO München.

Figure 3.10 shows an increase in the number of rentals for the conventional cars. Number of
rentals for e-bike has remained similar and shows only small variations for specific months.
The e-car shows an almost constant number of rentals every month, and the number for the
e-scooters show the low usage of the vehicles. E-cargo bike shows also an increasing trend.

It is shown that cars in all their types are the most rented vehicles, with an increasing trend. In
the last months, the e-cargo bike has increase its number of rentals matching and even
surpassing the number of rentals for the two e-bikes combined in the months of December,
January and March. It is also important to consider that better weather conditions associated
to the summer months does not seem to have an impact on the e-bikes and e-cargo bikes
except for the number of e-bikes rental in January 2017. The number of rentals for the e-cargo
bike has been increasing regardless of this consideration and it would be interesting to analyze
the data for the incoming summer months in 2017.

In almost one year, e-scooters have been booked 32 times. The low usage of this vehicles
was topic of discussion during the interviews with the stakeholders and will be also considered
in the chapter 7. Considering the different cars, the data show the following trend:
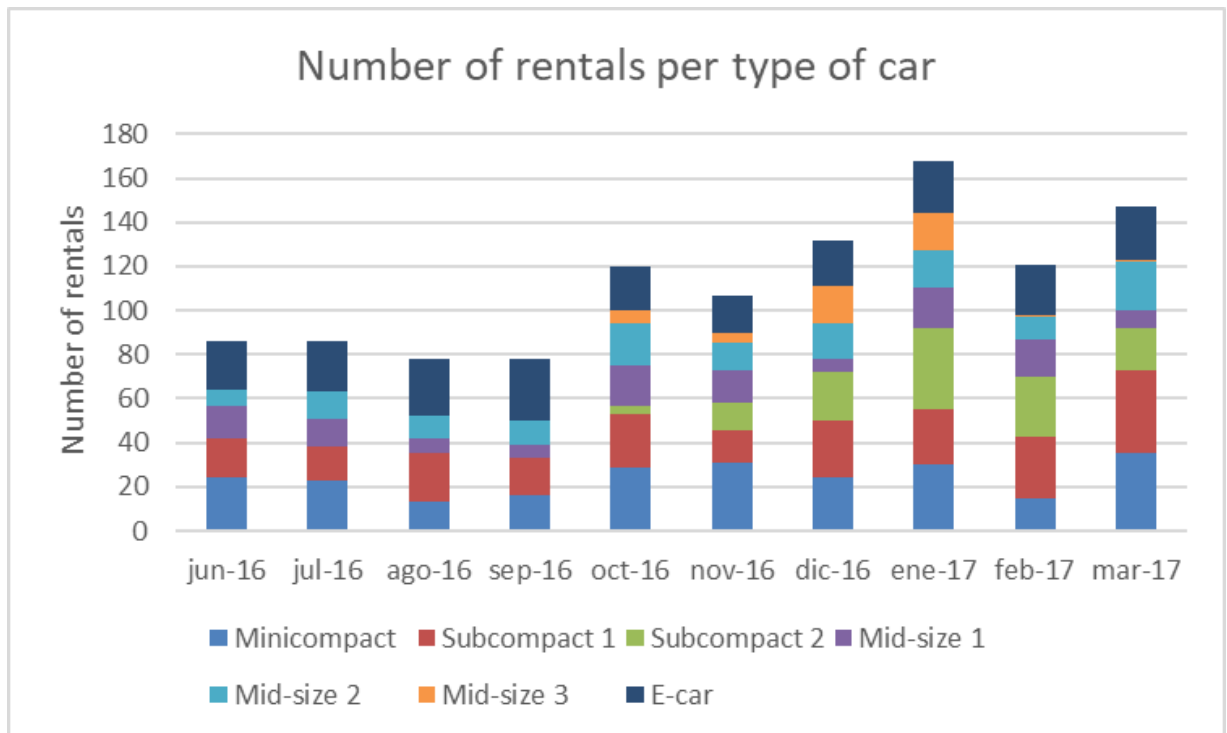
Figure 3.11 Number of rentals per type of car between June 2016 and March 2017. Own elaboration, data source: STATTAUTO München.

Figure 3.11 shows a regular use of the minicompact car, the e-car and the first subcompact car. In fact, these are the three most used vehicles as well as vehicle types. It must be noticed, that the mid-size car 3 was rented for a long period in February and March 2017, and therefore only 1 rental appears. The total number of rentals are presented in table 3.1.

Total number of rentals (June 2016-March 2017)	
Minicompact	240
Subcompact 1	228
Subcompact 2	121
Mid-size 1	123
Mid-size 2	136
Mid-size 3	47
E-car	228

Tab. 3.1 Total number of rentals between June 2016 and March 2017. Own elaboration, data source: STATTAUTO München.

The following figure shows the number of hours booked for every car.
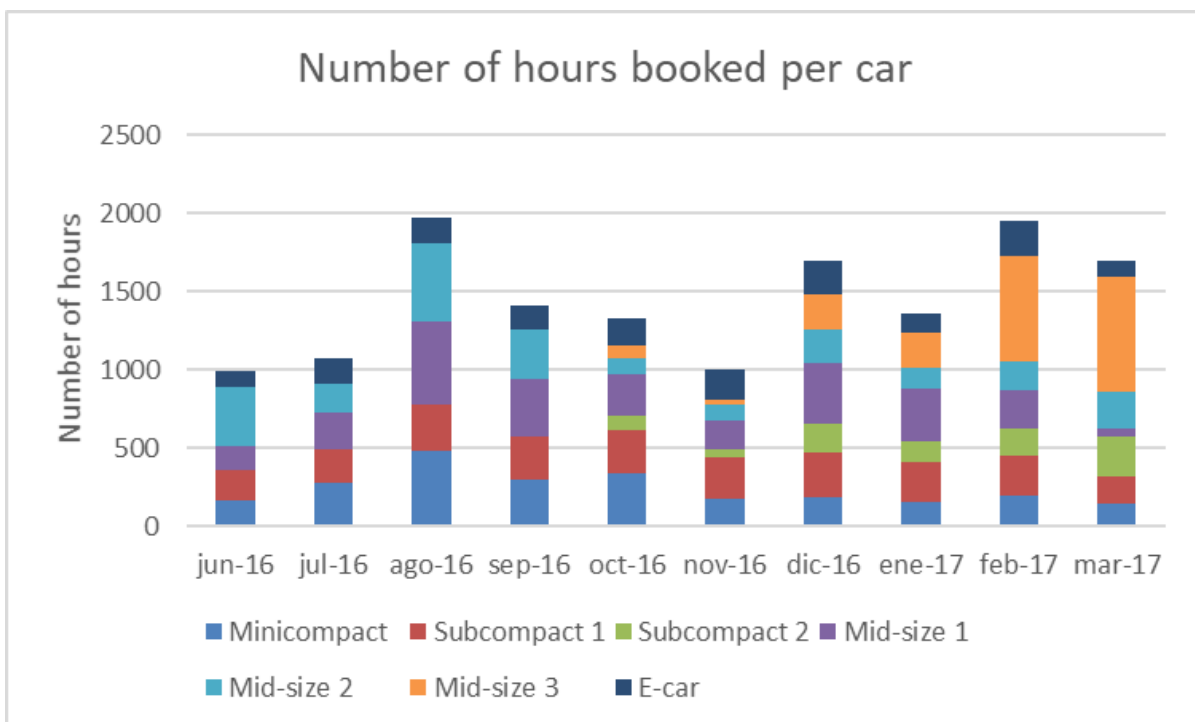
**Figure 3.12** Number of hours booked per car. Own elaboration, data source: STATTAUTO München.

Figure 3.12 shows the impact of mid-size cars in the number of hours booked, indicating a longer use for these vehicles than for the rest. The electric car is the second one with less hours used.

In the table below, the data for the total number of hours booked are presented.

Total number of hours booked (June 2016-March 2017)	
Minicompact	2402
Subcompact 1	2493
Subcompact 2	896
Mid-size 1	2755
Mid-size 2	2362
Mid-size 3	1976
E-car	1619

Tab. 3.2 Total number of hours booked between June 2016 and March 2017. Own elaboration, data source: STATTAUTO München.

The monthly occupancy of the cars is provided in the following figures. Regarding the occupancy, this was calculated for the 24 hours of a day, even if the cars are usually not booked during the night. The data for the daylight hours was not available, and thus the occupancy values are low. Nevertheless, they provided data to compare with the previous results.
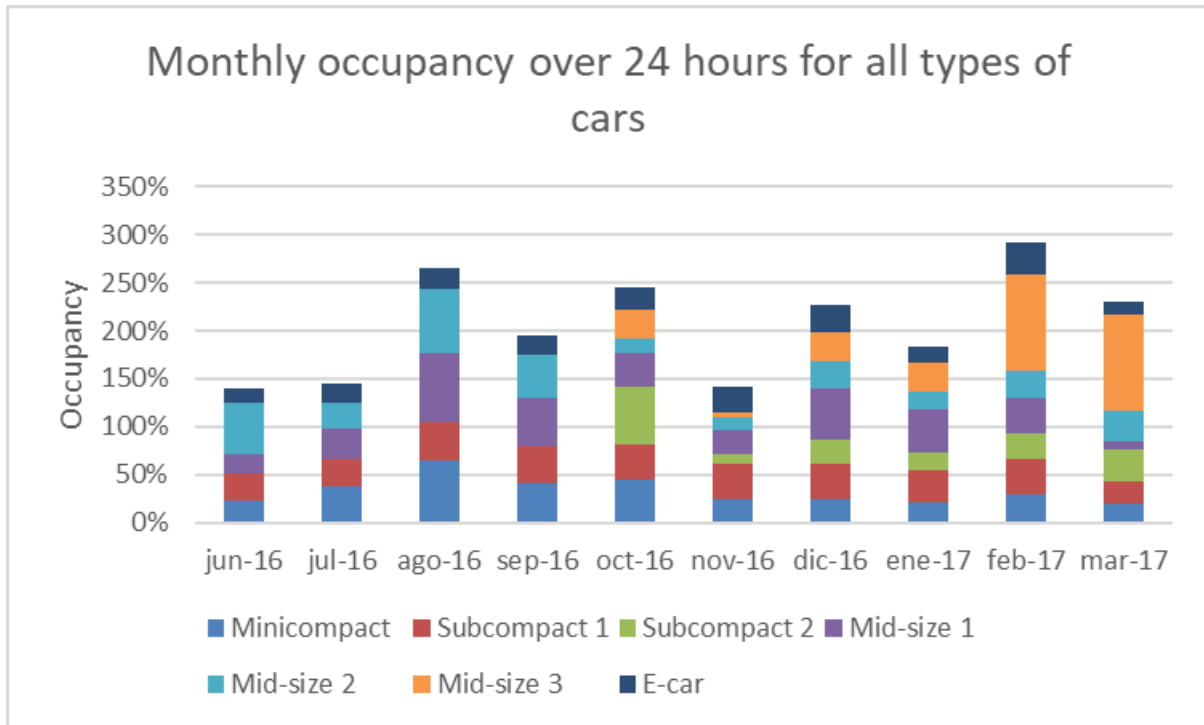
Figure 3.13 Monthly occupancy over 24 hours for all types of cars. Own elaboration, data source: STATTAUTO München.

The mean data for the period between June 2016 and March 2017 are provided in table 3.3. It must be considered that the high mean occupancy for mid-size car 3 can be explained regarding the months of February and March, when it was rented for the whole month. Occupancy data are similar for the rest of the vehicles regardless of the number of rentals, except for the e-car.

It is also important to consider that subcompact car 2 and mid-size car 3 where not available until October 2016. Therefore, it is appropriate to consider a comparison between minicompact, subcompact 1, mid-size 1, mid-size 2 and the e-car. The smaller types of cars (minicompact, subcompact and e-car) show the highest number of rentals, but similar number of hours booked and occupancy to the larger-size vehicles. Only the e-car shows a lower occupancy and number of hours booked than the rest, regardless of its high number of rentals. This data will be further discussed in chapter 7.

Monthly occupancy over 24 hours	
Minicompact	33%
Subcompact 1	34%
Subcompact 2	29%
Mid-size 1	38%
Mid-size 2	32%
Mid-size 3	49%
E-car	22%

Tab. 3.3 Mean values for the monthly occupancy over 24 hours between June 2016 and March 2017. Own elaboration, data source: STATTAUTO München.

3.3 The ECCENTRIC Project and Domagkpark

This section introduces the ECCENTRIC project as part of the CIVITAS initiative. It includes a summary of the different measures for the city of Munich, especially those affecting Domagkpark, as well as an overview of the project.

3.3.1 CIVITAS ECCENTRIC

CIVITAS is a network of cities dedicated to the promotion of cleaner and better transport in Europe (CIVITAS, 2017a). It started as an initiative from the European Commission in 2002 and has implement over 800 sustainable mobility measures in more than 80 European cities since then. The cities are also called "Living Labs". In these, the measures are tested, evaluated and compared with other cities.

The initiative works on 10 different areas related to sustainable transport mobility: Car-Independent Lifestyles, Clean Fuels & Vehicles, Collective Passenger Transport, Demand Management Strategies, Integrated Planning, Mobility Management, Public Involvement, Safety & Security, Transport Telematics and Urban Freight Logistics.

The initiative is co-financed by the European Union (CIVITAS, 2017b) and its measures are reaching approximately 54,2 million citizens. The initiative has promoted the following projects for the moment:

- CIVITAS I (2002-2006): grouping the projects MIRACLES, TELLUS, TRENDSETTER, VIVALDI

- CIVITAS II (2005-2009): grouping the projects CARAVEL, MOBILIS, SMILE, SUCCESS
- CIVITAS PLUS (2008-2012): grouping the projects MIMOSA, RENAISSANCE, ELAN, ARCHIMEDES, MODERN
- CIVITAS PLUS II (2012-2016): grouping the projects DYN@MO, 2MOVE2
- CIVITAS H2020 (2016-2020): grouping the projects ECCENTRIC, PORTIS, DESTINATIONS

The CIVITAS Initiative provides the evaluation framework for its projects which has to be followed during the evaluation of the measures. The evaluation framework for the CIVITAS initiative is described in chapter 4.

Figure 3.14 Logo of CIVITAS 2020

3.3.2 The ECCENTRIC Project

The ECCENTRIC project focuses on sustainable mobility measures in suburban districts and innovative urban freight logistics (CIVITAS, 2017c). The aims of this project, according to CIVITAS are:

- To demonstrate and test innovative sustainable mobility in peri-central areas, combining new policies, technologies and soft measures.

- To demonstrate and test innovative urban freight in urban centers, based on a close cooperation with the research and private sectors.

- To contribute to the knowledge base and capacity building on effective mobility solutions with the goal to replicate solutions in other cities.

- To increase the impact of ECCENTRIC through communication, networking and promoting the successful commercial concepts developed.

Together with Munich, other 4 European cities participate in the ECCENTRIC project; Madrid (Spain), Stockholm (Sweden), Turku (Finland) and Ruse (Bulgaria). The city of Madrid is set as the coordinator of the Project. The project duration will be between 2016 and 2020 and it is granted with 17,4 million Euros from the European Community from a total budget of 19,3 million Euros (Valiente, P., 2017).

The evaluation framework to be released for the ECCENTRIC project is called SATELLITE (Support Action Towards Evaluation, Learning, Local Innovation, Transfer & Excellence). All the measures of the project have to evaluated according to this framework. The Technical University Munich (TUM) is in charge for the coordination of the evaluation of the measures in the city.

The Living Lab for the city of Munich will be the north of the city as shown in figure 3.14. More specifically, the district of Domagkpark will serve to test most of the measures of the project.
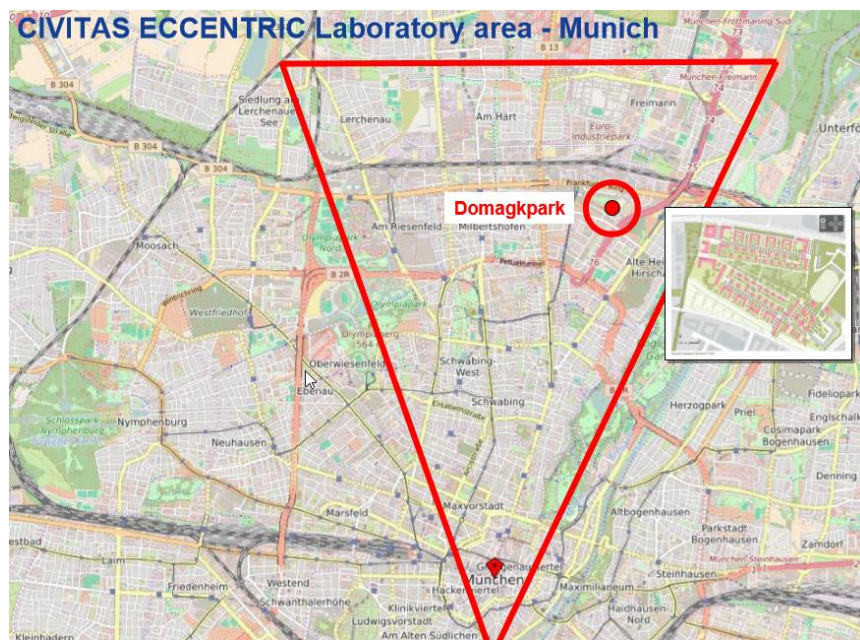
Figure 3.15 Living Lab area in Munich. Source: Belter, T. (2016).

For the city of Munich, a total of 11 different measures will be implemented. Those are divided into Working Packages. The following table shows an overview of the measures to be carried in the city.

ECCENTRIC measures for Munich		
Working Package name	Measure name	Brief description
Inclusive urban planning and mobility management	Neighbourhood oriented marketing of sustainable multimodal mobility services	Marketing campaign for all persons living, working or going to day-care in Domagkpark to ensure adaptation and acceptance of existing offers and services.
	Community information and participation portal	Establishment of the community portal www.domagkpark.de as a central platform for communication and participation in the area, including mobility information.
	Transfer, exchanging ICT for everyday mobility between generations	Students and young people teach senior citizens about the use of internet, smartphones and apps related with sustainable mobility
Mobility as a service for all	Mobility as a service app	Create one app for all multimodal mobility services focusing on special needs
	CityLifta: Ridesharing service	Online app for shared use of cars between users
	Intermodal E-Mobility stations at Domagkpark	Two new e-mobility stations in Domagkpark (located west and north of the district)

Enabling safe walking and cycling	Software controlled safety management of the road network	Develop of a new software-controlled safety management concept to reduce accidents.
Efficient and clean public transport solutions	Smart E-mobility concepts for public transports	Development of an e-mobility concept for Munich and integration of e-bikes in bike-sharing schemes like MVG-Rad.
Promoting the uptake of clean vehicles	Adaptive city mobility	Integration of new e-light-weight vehicles in the mobility offer
Towards better and cleaner urban freight logistics	Concierge system Domagkpark	Use of e-cargo bikes to transport packages and leave them at site managers with storages facilities for the inhabitants to pick them up there.
	Sustainable city logistics	Combine cargo-bike-delivery-systems with a flexible package system.

Tab. 3.4 Brief description of the ECCENTRIC measures in Munich. Own elaboration, source: Chair of Urban Structure and Transport Planning, TUM.

## 3.4 Previous Results from the Survey of 2014

The survey carried in 2014 by Tobias Ruttloff contains comparable results that serve as a baseline for the evaluation of the Mobility Station. This section summarizes the most relevant from them for the present study. Chapter 6 will discuss the results and compare them with those from 2014. All data contained in this section belong to Tobias Ruttloff and can be found in his study.

3.4.1 Vehicle Ownership and VKT

The survey from 2014 reached 217 households and 573 persons belonging to them. The future inhabitants of Domagkpark were asked about their car ownership and future plans to buy or sell a car after moving to the district. It was encountered that 89,7% from all persons over 18 years old had a driving license.

The total number of in 2014 owned and planned cars, bicycles and e-bikes for the households can be seen in figure 3.16.
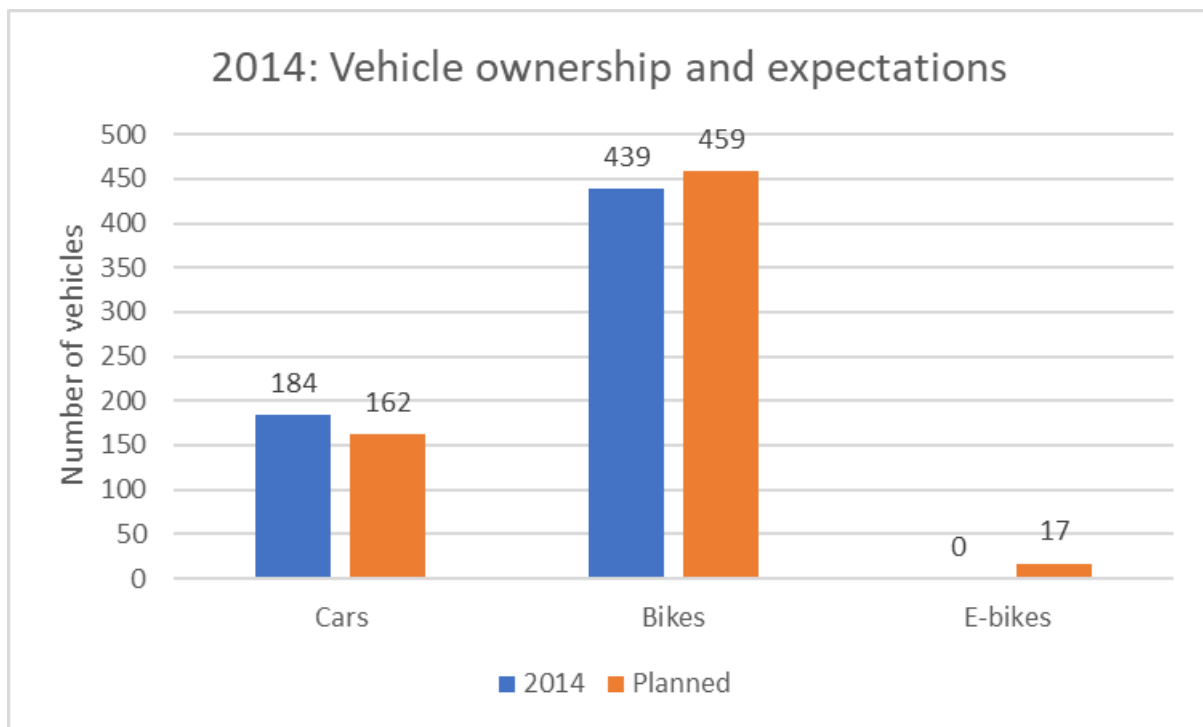

Figure 3.16 Vehicle ownership in 2014 and future expectations. Own elaboration, data source: Ruttloff, T. (2014)

The number of cars was expected to decrease in a 11,9%, reducing the number of cars per household from 0,85 to 0,75. 30% of the households owned no cars in 2014. This number was expected to increase up to 36%. The future inhabitants from Domagkpark planned in total to sell 25 cars and to buy 3 new cars, leaving a result of 22 cars less.

Regarding the number of bicycles, it was remarkably higher than the number of cars. In total, there were 2,46 bikes per household. This ratio was expected to increase to 2,58 bikes per household. Number of houses with no bikes was expected to sink from 12,4% to 6,4%. The increase for total bicycles was expected to be of 4,9%. There were no e-bikes reported in 2014 for the households participating in the survey. The respondents planned to buy 17 from these vehicles after moving to Domagkpark.

It was found by Rutloff, T., that households with only one member had the lower number of cars and were expected to be the ones most reducing their car ownership, from 0,58 cars per household to 0,42. Car ownership was encountered to be higher in households with children. The presence of children in a household was pointed out by Ruttloff, T. as a factor for a lower expected reduction in car ownership. Figure 3.17 shows the relationship between number of children and expected reduction in cars per household.
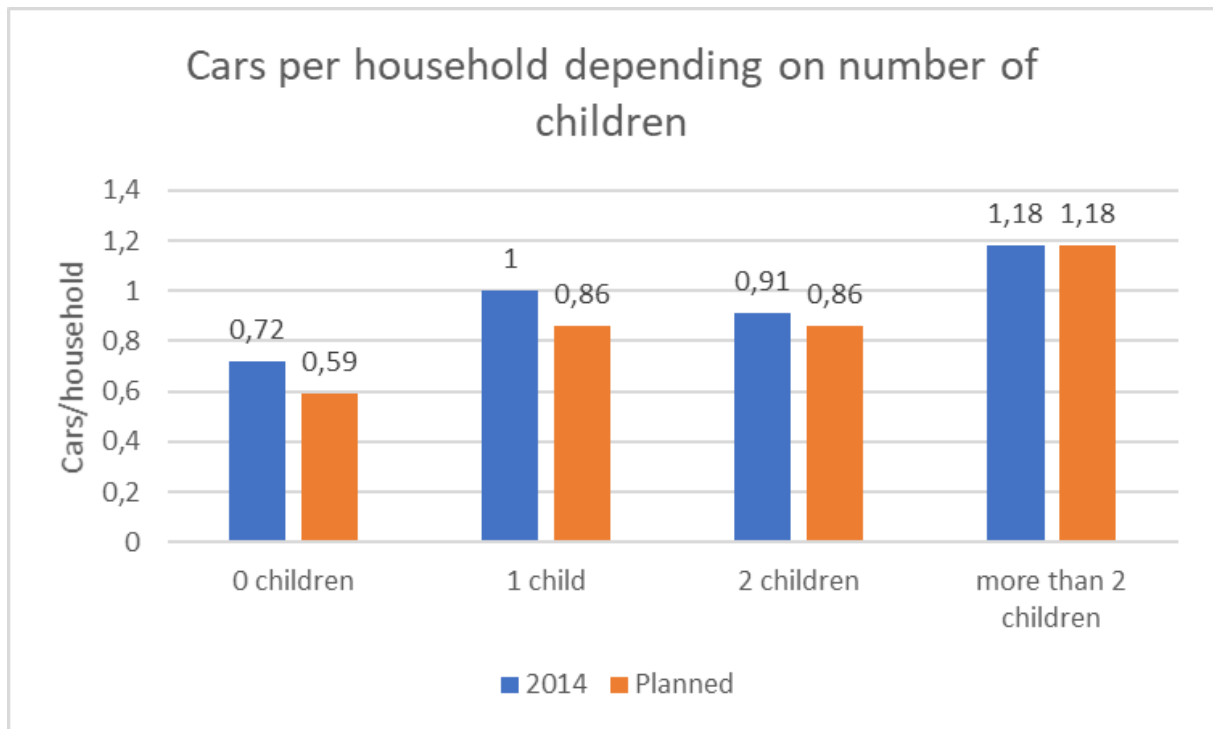
Figure 3.17 Cars per household depending on the number of children. Own elaboration, data source: Ruttloff, T. (2014).

The age of the children was also encountered to be an important factor. Households with small children (0-5 years old) were the ones with lower expectations of car ownership reduction.

Households were also asked about the VKT for their cars. It was encountered that 68% of the second and third cars for households with more than one vehicle travelled less than 10.000 kilometres per year. Also, 62% of the first vehicles travelled between 5.000 and 15.000 kilometres.

Ruttloff, T. stated based on data from STATTAUTO München, that for all these vehicles a car-sharing offer would be more economic for the household. It was also regarded the VKT for vacation trips, obtaining that 42% of first cars travelled between 2.000 and 5.000 kilometres per year, whereas 87% of second and third cars travelled less than 1.000 kilometres per year. The households where asked about their expectations for the future VKT per year 2 years after moving to Domagkpark, obtaining that 57% expected to reduce their yearly VKT with a consequent reduction in the total number.

According to the findings of Ruttloff, T., households belonging to building joint ventures showed big differences in their car ownership towards cooperative building associations. Only 8% of the building joint venture households had no cars, whereas the total percentage for cooperative building associations was 43%. Cooperative building associations showed therefore a car per household ratio of 0,61, versus 1,18 cars per household for the building joint ventures, almost

the double. These ratios were expected to reduce for both groups after moving to Domagkpark, but again, the higher reduction was expected for the cooperative building association households: 0,52 against 1,1.

3.4.2 Modal Split

Ruttloff, T. studied the modal split of the future inhabitants of Domagkpark asking them to describe their travel route to their working places in 2014 and the expected route after moving to Domagkpark. For combination of transport modes during the itinerary he described the main transport mode. The data provided by Ruttloff, T. were divided in the main transport modes and in detail travel routes including combination of transport modes. The second one is showed in figure 3.18.
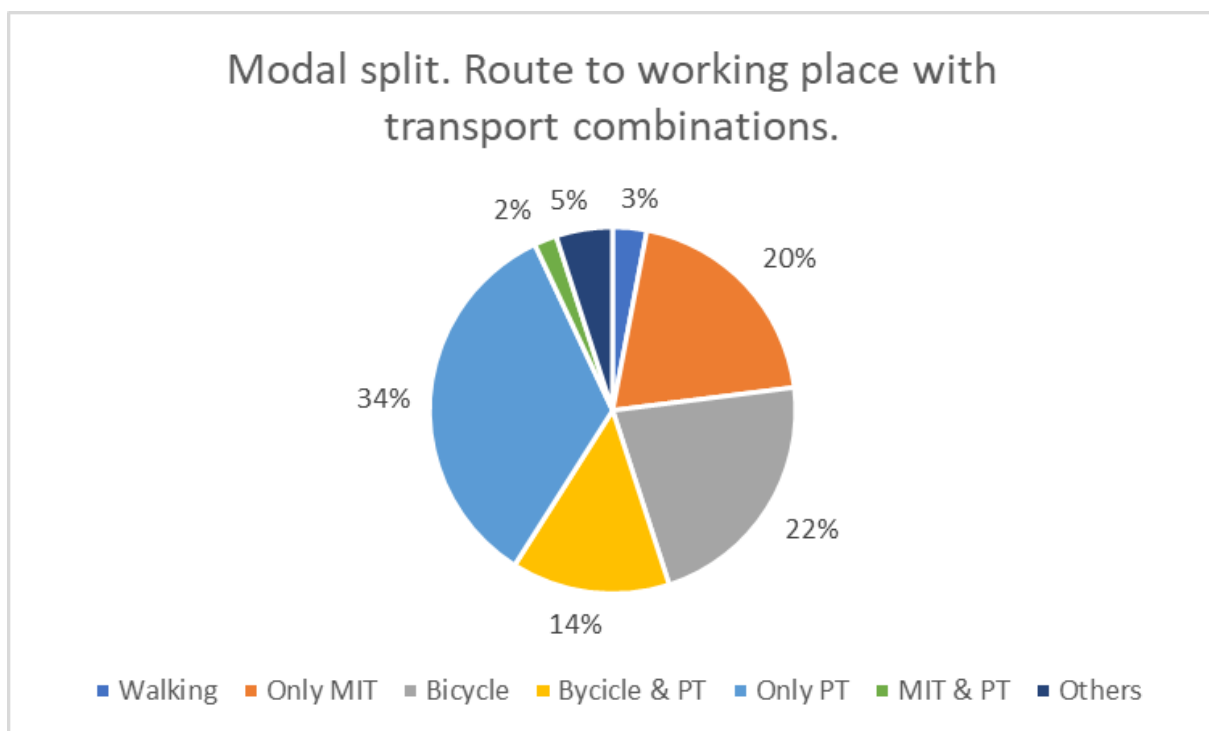
Figure 3.18 Route to working places with different transport combinations. Own elaboration, data source: Ruttloff, T. (2014).

The data show a high use of the PT (48% in total) and the bicycle (36%). The 5% included in "others" make use of different transport combinations, like PT & car-sharing and MIT & bicycle. A conclusion for the present work, not stated by Ruttloff, T., is that only 17% of the respondents showed an intermodal travel behaviour.

The data for the modal split after moving to Domagkpark showed that no real changes were expected for the total modal shares. For the most important transport modes the shares were expected to be almost equal as before. The use of car-sharing under the group "others" was

expected to be only of 0,4%. Nevertheless, Ruttloff, T. showed that there were expected some changes in the individual behaviours, but not for the whole sample.

Other significant results were that 26% of the MIT users were between 40-59 years old. This group also showed the lower use of PT. Only 4% of respondents between 18 and 29 years old had MIT as main transport mode to reach their working places. PT was preferred transport mode for this group as well as for people over 60 years old.

3.4.3 Public Transport

Ruttloff, T., stated that the number of PT monthly tickets would increase for the households after moving to Domagkpark. The expectation was that the percentage of persons owning a PT monthly ticket would be of 50% for all persons over 6 years old.

3.4.4 Sharing Services

The results from Ruttloff, T. stated that the number of households with at least one car-sharing user would increase from 28 to 59%. The increase for households with at least one user of a bike-sharing scheme was expected to be of 25%, from 14% to 39%. Figure 3.19 shows these results.
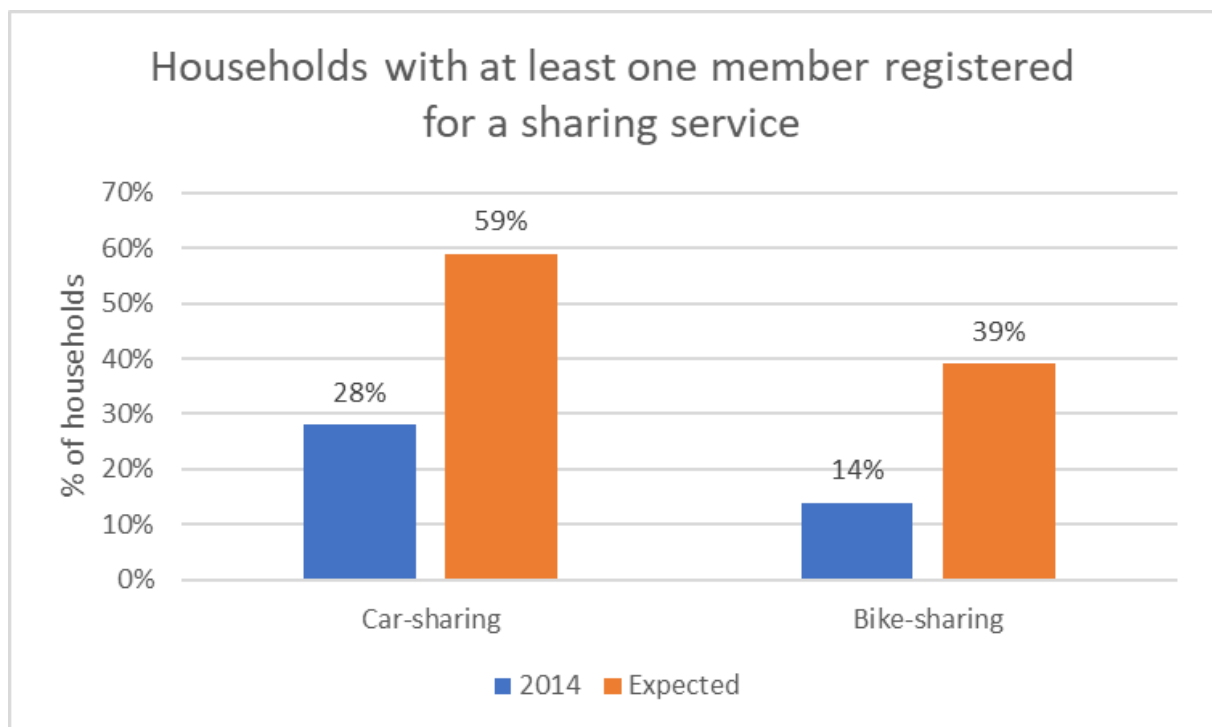
Figure 3.19 Households with at least one member registered for a sharing service. Own elaboration, data source: Ruttloff, T. (2014).

4 Theoretical Background for the Evaluation of Mobility Measures

This chapter provides an insight into the concept of evaluation of mobility measures, regarding the framework for the evaluation of measures of the CIVITAS initiative. More specific, it deepens into the concepts of "impact" and "process" evaluation, serving as a basis for the development of the evaluation plan for the mobility station in Domagkpark. The chapter bases on the documents Evaluation Matters (Dziekan, K., Riedel, V., Müller, S., Abraham, M., Kettner, S. & Daubitz, S., 2013) and CIVITAS WIKI (van Rooijen, T., Nesterova, N. & Guikink, D., 2013). Other evaluation standards were consulted for the development of the evaluation plan detailed in chapter 5 and are mentioned in the text as well.

4.1 Evaluation of Mobility Measures, Evaluation in the Framework of the CIVITAS Initiative

Evaluation is a key aspect of the design of mobility measures, involving not only the specific outcomes of a single measure, but its process from the first planning stages to the final implementation. It is the goal of the evaluation to know if a measure was successful or not, and what factors made it succeed or fail. It is also a helpful tool that allows us to learn and improve for future measures (Wehmeier, T., Bamberg, S., Beckmann, K.J., Dziekan, K., Gertz, C., Just, U., Kleinwächter, E., Motzkus, A., Mühlenbruch, I., Wieland, B., Wilke, G., Würdeman, G. & Wulfhorst, G., 2012). Evaluation makes use of empirical social research, providing documentation based on observations and developing calculations and models (Beuermann, C., Böhler, S., Koska, T., Reutter, O., 2010).

The framework for the evaluation developed for CIVITAS has set the working structures along which all local urban evaluators have taken place since 2002, when the first CIVITAS projects (CIVITAS I) started (Dziekan, K. et al, 2013). The last framework released is CIVITAS WIKI (2013) conceived for the program CIVITAS PLUS II (2012-2016).

Evaluation is defined as a systematic determination of a measure´s merit and significance, using criteria governed by a set of standards (Dziekan, K. et al, 2013). It conforms a continuous cycle with planning and implementation of measures until these are completed. It can help to improve measures during their implementation by looking for ways to optimize the processes. It also helps to optimize the allocation of resources by standardizing procedures and learning from previous experiences.

Three different phases can be distinguished in mobility measures: *planning*, *implementation* and *operation*. An evaluation of a measure should be performed along the three phases, parallel to them (Dziekan, K. et al, 2013), accompanied by a monitoring of the outcomes.

Evaluation must be then regarded as a continual development process where we become feedback and outcomes, and develop future strategies. It can help us to further improve the measures while implementation and find weaknesses in the concept that allow us to increase the effectivity of a single measure (Wehmeier, T. et al, 2012).

Evaluation must be considered as soon as possible in the planning of a measure (Wehmeier, T. et al, 2012). The first stage for every measure cycle is the assessment of the needs (Dziekan, K. et al, 2013). This is part of the so called ex-ante evaluation and is followed by the selection of the measures that fit those needs. The ex-ante evaluation implies to make a forecast of the measure´s expected performance. After this initial step, it is needed to identify the objectives of the measure, the Key Performance Indicators (KPIs) and the appropriate evaluation design. Also, the baseline data must be provided for the later comparison.

For each CIVITAS measure implemented in a city, both impact and process evaluation should be carried and fully reported (Van Rooijen, T., et al, 2013).

- Impact evaluation includes the evaluation of a wide range of technical, social, economic and other impacts of the measures resulted from the implementation.

- Process evaluation involves the evaluation of the processes of planning, implementation and operation of measures, including the roles of information, communication and participation.

Regarding the evaluation of mobility measures, besides the process and impact evaluation, a cost effectiveness analysis must be carried (Beuermann, C. et al, 2010).

Many different stakeholders are involved in the evaluation process and must be previously identified for a successful process evaluation (Beuermann, C. et al, 2010). A stakeholder is defined as an individual or a group with an interest in the project, because they are involved in the work or affected by the outcomes (Association for Project Management, 2017).

For a mobility measure, different stakeholders might be:

- Politicians and decision makers

- Managers of the measure

- People who implement the measure

- Measure target groups

- Other stakeholders and experts

4.2 Organization of the Evaluation Process

The CIVITAS evaluation framework involves different roles with different responsibilities in the evaluation process (Van Rooijen, T. et al, 2013):

- Project Evaluation Manager (PEM): Person responsible for the final result of all the evaluations and the support for the cities during the process.

- Local Evaluation Manager (LEM): Person responsible for the evaluation of the measures in his/her city.

- Measure Leaders (ML): Persons responsible for the preparation, implementation and operation of the measures in the corresponding cities.

- Site Coordinators (SC): Persons responsible to provide a general supervision of the evaluation process from a city perspective and to provide support if required by the LEM or the ML.

The cities involved in CIVITAS have the responsibility to undertake the evaluation, collect information and report the results for each individual measure (Van Rooijen, T. et al, 2013).

4.3 Quality of the Evaluation

With the goal to assure the quality of an evaluation process, the "Deutsche Gesellschaft für Evaluation" e.V. (DeGEval, English: German Association for Evaluation) formulates standards that must be accomplished when developing the evaluation of a mobility measure (Finke, 2009). These standards are divided into usefulness, feasibility, fairness and accuracy. These are to be regarded through all phases of the project.

Usefulness standards must guarantee that the evaluation follows the goals agreed and that the users of the results get the necessary information for their work. Therefore, it must be clear who are responsible for the evaluation and who are concerned with it, so that their information needs are met.

Feasibility standards must guarantee that the evaluation is well planned, realistic, economic and diplomatic. Time and monetary costs of the plans for the evaluation must therefore be bound to these rules. The evaluation has also the need to be diplomatic, that means, points of view from all members should be considered.

Fairness standards must guarantee the proper and respectful cooperation between evaluators and concerned actors. Also, they must guarantee the proper handling of the results. Fairness standards also guarantee that both weaknesses and strengths of a project are regarded and reported, and none of them is decreased to make the other part more visible.

Accuracy standards must guarantee that the results and information of an evaluation respond to the accorded goals and objectives. Therefore, an evaluation must be as extensive as necessary to assess all aspects of the project considered to be important.

4.4 Impact Evaluation

This section introduces the concept of impact evaluation for mobility measures. It is the first part to be regarded to assess the performance of a measure. The selection of KPIs for a measure and the data collection as well as other important aspects are presented here.

4.4.1 Goals and Objectives

Impact evaluation is an assessment or estimate of the impacts or effects of a measure on the target groups that are affected (Van Rooijen, T., et al, 2013). It is performed by the cities (LEM and ML) with support from the PM and the SCs. Unlike in outcomes monitoring, impact evaluation sets a comparison between data from selected indicators before (baseline, ex-ante) and after (ex-post) the implementation of a mobility measure (Dziekan, K. et al, 2013). Hence, it can be evaluated if the measure had any effect on the target groups. For a proper impact evaluation, two aspects must be taken into consideration:

- Clear definition of the objectives

- Finding of the corresponding indicators to evaluate the impacts

The ideal steps of an impact evaluation, as defined by Dziekan, K. et al, (2013), are the following:

1. Identify high level and measure specific objectives

2. Identify achievable objects at the measure level

3. Reflect on cause and effect relations

4. Select relevant indicator

5. Select evaluation design and methods of data collection

6. Collect before-data

7. Analyze, discussion and interpretation of the before-data

8. Collect ex-post-data

9. Analyze ex-post-data, compare to before data and interpret results

In the CIVITAS framework, the objectives of a measure must be defined by the evaluation team after consulting the steering group responsible for evaluation of the program involved (Dziekan, K. et al, 2013). There are also two types of objectives, the long-term level ones (for example improving air quality), assigned to a planned measure, and the short-termed ones, which are small steps towards the long-term ones. This gives two definitions: high-level objectives (expected outcomes) and measure-specific objectives (actual outcomes). For the selection of the objectives the well-known SMART criteria used in project management can be useful (Specific, Measurable, Achievable, Realistic, Time-bound).

Van Rooijen, T. et al, (2013) emphasize this approach dividing the levels of evaluation in measure level (evaluation of single measures) and project level (evaluation including transferability and cross-evaluation between participant cities). It is also important to focus the resources for evaluation in the most significant measures, referred then as focused measures. The selection of the focused measures is responsibility of the PM with the support of the LEM and the ML. The following figure illustrates the general outline of the evaluation framework for CIVITAS WIKI.

It is also important when considering the impacts of a measure to distinguish between the actual impact of the measure and other external factors that could have influenced the outcomes (Wehmeier, T. et al, 2012). The total outcomes can be described as gross effects and would then consist of the effects from the measure, the external effects and the effects derived from mistakes in the design of the evaluation method.

An important part of the impact evaluation, is to analyze what would have happened if the measure was not introduced (Dziekan, K., et al, 2013). This allows to know the actual effect of a measure. Therefore, "business-as-usual" scenarios can be built through forecasting from historical data, modelling or monitoring a control/group site. The following figure illustrates this approach.
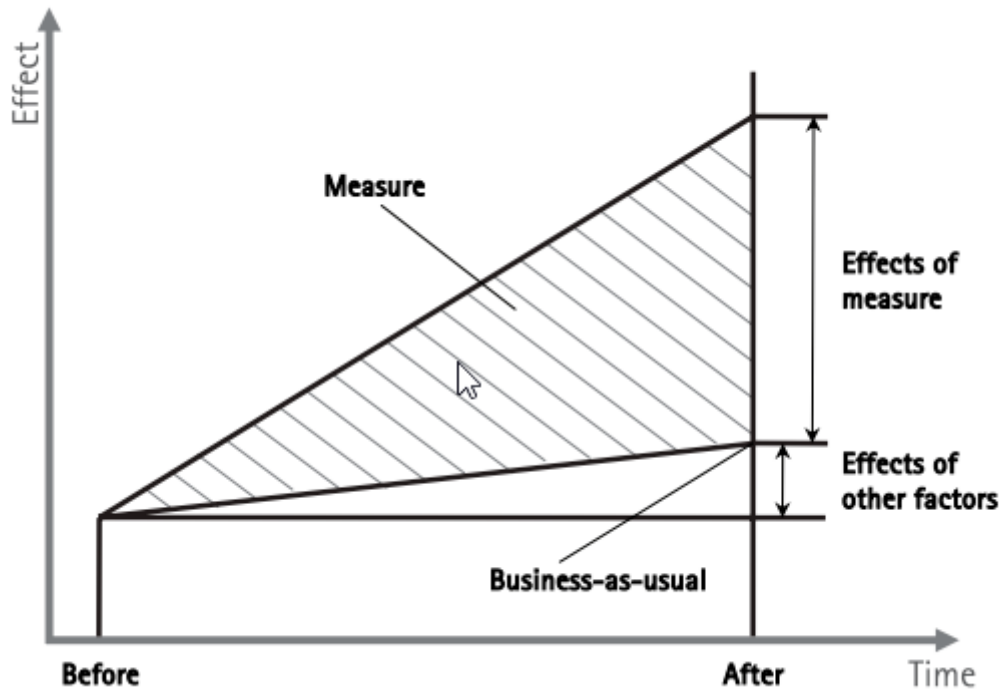
Figure 4.1 Baseline and business-as-usual scenario. Source: Dziekan, K. et al (2013).

4.4.2 Key Performance Indicators

According to Dziekan, K., et al (2013), the selected KPIs for a measure´s performance must accomplish three basic requirements:

- They must clearly reflect the performance or impact of the measure.

- They must match the objectives.

- They must be capable of reliable assessment using the measurements methods chosen.

The selection of the KPIs is also responsibility of the PM with the help of the LEMs. The main criteria for the selection of the indicators as presented by Van Rooijen, T., et al (2013) is:

- Relevance: each indicator must have a significant importance for the evaluation process.

- Completeness: the set of indicators should consider all aspects of the concept under evaluation.

- Availability: readily available for entry into the monitoring system.

- <u>Measurability</u>: capable of being measurable objectively or subjectively.

- <u>Reliability</u>: clarity of definition.

- <u>Familiarity</u>: easy to understand.

- <u>Non-redundancy</u>: indicators should not measure the same aspect of an assessment criterion.

- <u>Independence</u>: small changes in one indicator should not affect others.

The following table presents some of the Key Performance Indicators for the ECCENTRIC project, as provided by the Project Evaluation Manager in a meeting of the evaluation group in Munich in November 2016.

Category	Indicator
Travel patterns	Modal split
	Total vehicle-km
	Parking time
	System usage
Accessibility	Access to mobility
	Non-spatial accessibility
Safety	Number of fatalities and seriously injured
	Number of incidents
Performance of the public and multimodal systems	Congestion and delays
	Reliability
	Intermodal integration
Transportation supply	Sustainable mobility supply
Cars and traffic	Use of space for parking
	Private car ownership
Economy	Economic impact

	User/operator economic impact
Environmental	CO_2 Emissions
	NOx Levels
	Particle pollution Levels
	Energy efficiency
	Noise Hindrance
Society response	Awareness
	Acceptance
	Satisfaction
Governance	Number of initiatives
Costs	Capital costs
	Operational costs

Tab. 4.1 KPIs for the ECCENTRIC project. Own elaboration, source: López, H. (2016)

The indicators may adopt different definitions and units of measurement to adapt to the measure.

To allow the comparison between CIVITAS measures of other CIVITAS projects, the selection of the indicators must be consistent across all of them (Van Rooijen, T. et al, 2013). The same applies for the methods of measurement.

4.4.3 Data Collection

There are two different kinds of data that can be used for the impact evaluation (Dziekan, K. et al, 2013): *primary data* (self-collected data during the process) and *secondary data* (data already available). Secondary data can save costs and be used to verify primary data, but it is critical to ensure that these data are relevant and reliable.

4.4.4 Survey Conducting

For the primary data collection, surveys are the most frequently used method. It can be applied to a large group of respondents and it is easy to analyze (Dziekan, K. et al, 2013). An important aspect when conducting a survey, is the consideration of the required size of the sample. A statistical method for the evaluation of the sample data regarding the desired precision is given

by Dziekan, K. et al (2013). Considering a normal distribution of the target population and assuming this one is large enough, the necessary response rate can be calculated as follows:

$$n = t * t * P * \frac{Q}{d * d}$$

Where the coefficients represent:

- n = necessary response rate

- t = abscissa of the normal distribution for probability α

- P = expected population value of the proportion

- Q = (1-P)

- d = margin of error

Other important aspects by conducting a survey, as listed by Van Rooijen, T. et al (2013), are:

- <u>Relevance of data</u>: all data collected should be relevant and no essential data omitted.

- <u>Method of measurement</u>: includes how to deliver the questionnaire to the respondents.

- <u>Pilot test</u>: useful to identify problems of understanding/interpretation and of the method of conducting the survey.

According to Beuermann, C. (2010), important considerations when developing a survey to evaluate a measure involving bike-sharing systems are the general demographics of the users, the perception, awareness and valuation of the system by users and non-users and the valuation of the vehicles by the users.

Some of the secondary data that can be obtained from the operator and summarized by Beuermann, C. et al (2010), are:

- Number of rentals of the vehicles

- Rental description (including duration pro rental and mean duration pro rental)

- Number of rentals for different sectors of the target population (for example gender, age or residence)

4.5 Process Evaluation

This section introduces the concept of process evaluation, regarding the three different phases of a project; planning, implementation and operation. Also defines the concepts of barriers and drivers for a measure and gives some methods for the evaluation.

4.5.1 Barriers and Drivers

Process evaluation focuses on the internal dynamics and actual operations of a measure to understand its strengths and weaknesses (Dziekan, K. et al, 2013). It aims to identify success and failure factors along the process in its three different stages: planning, implementation and operation. It is especially conducted during the measure´s implementation phase and can provide useful information for improvement and future measures. Process evaluation also includes perceptions of people close to the measure about how things are going or went in the past.

The main goal of the process evaluation is to search for what are called "Barriers" and "Drivers" (Dziekan, K. et al, 2013). Process barriers are events or conditions that interfere with the measure during its development and avoid accomplishing the measure´s objectives. In opposition, process drivers are those events or conditions that help to achieve the measure´s objectives and stimulate the process. According to Dziekan, K. et al, types of barriers and drives can include:

- Political/ strategic
- Institutional
- Cultural
- Involvement/ communication
- Planning
- Organizational
- Financial/ technological

When analyzing barriers and drivers, it must be investigated what exactly happened, how it happened and which was the impact of the event on the measure. In the case of barriers, it is also interesting to know which actions were taken to overcome it, so it can be used to learn for future measures.

4.5.2 Methods for Process Evaluation

Dziekan, K. et al (2013) provide four different methods to develop a process evaluation in the framework of CIVITAS. All of them should be taken regularly and during all phases of a measure. The methods for process evaluation are:

- Standardized Forms: In this method, everyone involved in the measure can fill the forms regularly with the advantage of easy comparison between them. It is the most feasible method. Forms must include information about the person who has fulfilled them to address questions if necessary. The core of the forms is the documentation of the barriers and drivers encountered during the process and the actions undertaken to deal with them. This can be the task of the measure manager. The limitations of this method are the scope of information delivered and the limited capacity to communicate and transfer experiences to others.

- Learning Histories: A Learning History Workshop is the core of this approach It was developed by researchers of the MIT in the late 1990s (Dziekan, K. et al, 2013). The stakeholders reunite with the presence of a moderator and report the barriers and drivers they encountered during the process. This allows for an exchange of information and brings together a more comprehensive picture of what actually happened. This method should also be carried regularly during the development of a measure, especially when severe problems occur. It is not recommended that the number of participants exceed 10 persons (Dziekan, K. et al, 2013). During the workshop, the participants are asked to write down on sticky notes what barriers and drivers they encountered. After collection of the notes, these are put on a board and the findings are discussed. After the discussion, the barriers and drivers can be ranked by the participants with the help of the moderator to mark out the most important ones. After the workshop, it is also important to develop a report that must be sent to all participants for its validation.

- Focus group: Like Learning Histories, designates a small group of persons to discuss a specific topic.

- Interview: Face-to-face or by phone interviews with the different stakeholders and prepared questions to find barriers and drivers. Beuermann, C. et al (2010) recommend interviewing 6 stakeholders from the project at least two times (once at the beginning and once later during the project). Also, interviewing external actors to the project (like media or associations) is recommended to be considered. Stakeholders must be therefore previously identified.

As a common criterion for all 4 methods, the following considerations should be fulfilled (Dziekan, K. et al, 2013):

- Participation of as many people involved in the process as possible.

- Moderator or interviewer should be able to avoid influencing the answers given by others.

- Reasonable effort and dedication for preparing, conducting and reporting to avoid failure.

4.6 Up-Scaling of Results and Transferability

Up-scaling of results refers to the estimation of the effects of a measure (or group of measures) if it/they were applied at a larger scale (Dziekan, K. et al, 2013). This concept is related with another important concept of the CIVITAS initiative, the transferability and cross-over results between the participating cities. Before any of these procedures can be undertaken, some considerations need to be regarded.

Regarding the up-scaling of measures to a higher level, it must be considered first if the measure was successful at the first moment. Also, economic viability plays a role in up-scaling. A measure that has showed to be viable at a certain level does not necessary need to be viable at a larger scale (Dziekan, K. et al, 2013).

When defining the scale, it is important to take into account the technical, political and practical feasibility of bringing the measure to a higher level. Hence, a maximum size for the measure can be estimated. If up-scaling a measure implies changing some of the aspects of it, like changing the indicators of success, it is possible that the old assumptions and estimates are no longer applicable.

Up-scaling does not mean changing the target group, reinforcing a measure that has not shown enough success before or changing evaluation procedures in a next step. It provides with guidance about the potential for further deployment of a measure and can be achieved through extrapolation (Dziekan, K. et al, 2013).

Transferability refers to the extrapolation of measures to other cities or areas. These measures need to be successful in the first place, not only regarding their impact, but also their process. This is an important concept in CIVITAS, as many cities take part in the projects and learn from each other´s conclusions.

When transferring a measure from one city to another, the specific original conditions under which the measure was implemented need to be regarded (Dziekan, K. et al, 2013). Transferability then refers to how a measure correspond to a city context and under which conditions it can be applied with a comparable degree of success elsewhere. For assessing the transferability of a measure, the information of the impact and process evaluation must be collected and disseminated, looking at all levels of its objectives. This information must be then compared with external aspects and conditions under which the measure was implemented.

4.7 Evaluation Framework for the ECCENTRIC Project

Although an actual report has not been yet developed, CIVITAS SATELLITE (Support Action Towards Evaluation, Learning, Local Innovation, Transfer & Excellence) will be the common guideline supporting CIVITAS projects between 2016 and 2020 (UITP, 2017), including the ECCENTRIC project.

The evaluation for ECCENTRIC will start by defining a common evaluation framework and the proper indicators for the measures (López, H., 2016) until February 2017 and will be followed by the presentation of the evaluation plans in April 2017.

The impact and process evaluation plans will then be performed during the measures lifetime to end with an evaluation at project level.

5 Methodology

This chapter describes the evaluation process since its beginning until the obtaining of the data that conforms the analysis of the performance of the Mobility Station. The goal of the thesis was not only to evaluate the Mobility Station, but to do it developing a methodology that approaches the ECCENTRIC framework, so that recommendations can be delivered for the future measures of the project.

For this purpose, both an impact and a process evaluation were carried. Throughout this evaluation process, every step and decision was consensual with the already existing working group for the evaluation of the Mobility Station. The group was formed by the following stakeholders of the project:

- Johanna Schäfer and Christian Stupka from WOGENO e.G.
- Maria Knorre from the association Domagkpark, e.G.
- Olaf Rau from STATTAUTO München
- Anette Eggart from Dynamo Fahrradservice Biss e.V.
- Torsten Belter and Christoph Helf representing the city of Munich as part of the traffic group from the KVR

This working group is responsible for the evaluation of the Mobility Station and integrated the present thesis in their working plans. They are also involved in the ECCENTRIC project and the future measures that will be adopted in Domagkpark.

Starting in January 2017, several meetings with the working group took place to discuss the impact and process evaluation. The method for the impact evaluation was chosen to be a survey for the inhabitants of Domagkpark. For the design of the survey, previous questionnaires in the field of the evaluation of mobility stations were used as example, further developed and adapted to the specific case of this evaluation. These were the questionnaires for the evaluation of the mobility stations in Offenburg (Heller, E., 2016), the evaluation of mobility stations in Würzburg (Pfertner, M., 2016) and the evaluation of the Mobility Station in Münchner Freiheit (Miramontes, M., forthcoming).

A summary of the methodology used to write this work is:

- <u>Empirical investigation</u> on integrated multimodal mobility services, evaluation of mobility measures, the district of Domagkpark and the Mobility Station.

- <u>Impact evaluation</u> for selected KPIs through a survey and secondary data.

- <u>Process evaluation</u> including interviews with different stakeholders and a Learning History Workshop.

Also, several on-site visits were carried to Domagkpark to learn about the Mobility Station and see on firsthand how its working procedure and its components.

5.1 Previous Considerations

Some aspects limit the scope and the procedures regarding the theoretical background exposed in chapter 4 for the evaluation process.

Since the Mobility Station had been operating for an entire year when the evaluation started, there was no possibility to perform an evaluation during the three main phases of the project. This was especially important when considering the process evaluation. The methods proposed in chapter 4 were used, but in a simplified and limited way. Also, there was no ex-ante evaluation or business-as-usual scenario. To overcome this, the results from the previous study from Tobias Ruttloff (2014) were taken as baseline and considered throughout the process.

5.2 Impact Evaluation

The goal of the impact evaluation was to evaluate the performance of the mobility station on selected KPIs. The decided methodology for it was to develop a survey for the inhabitants of Domagkpark. Secondary data available were the results from Tobias Ruttloff (2014) and the back-end data delivered by STATTAUTO München. These were:

- Number of monthly rentals between June 2016 and March 2017 for all vehicles

- Monthly occupancy in percentage on 24 hours basis between June 2016 and March 2017 for all vehicles

- Monthly booking hours for all types of cars between June 2016 and March 2017

- Number of monthly driven kilometers for all types of cars between June 2016 and March 2017

- Number of registrations and cancelations at the Mobility Station between June 2016 and March 2017

5.2.1 Definition of the Target Population

The first meeting with the working group took place in January 2017. The goal was to explain the plans for the evaluation to the working group and to set up a timeline for the evaluation. In February 2017, a second meeting took place to define the structure of the survey and the target group.

The questionnaire of 2014 was destined to the future inhabitants of the residences belonging to the WA 8 and WA 9 (building joint ventures), WA 10 (WOGENO e.G.), WA 11 (Wagnis e.G.) and WA 12 (FrauenWohnen e.G. / WOGENO e.G.). In total, it addressed 350 from the total 388 households belonging to these groups.

For this survey, it was decided to address the same group to have a solid base to compare with the results from 2014.

Asking the residents of the northern part of the district (WA 1-7) was decided to be unnecessary and inefficient due to logistic and sociological reasons. The distance to the Mobility Station was considered too long and most of the residents in the north zone are migrants with language barriers to fill up the survey. Regarding this population, future approaches must be taken into consideration to reach them for the future mobility measures. This is also topic of discussion in chapter 8. STATTAUTO München reported that only 4 users of the Mobility Station live in this area.

Asking the residents from the southern part of Domagkpark apart from the target population was considered inviable, because the inhabitants living in these WA arrived at the district less than one year before the evaluation. The association of Domagkpark also reported that some of them were moving in while the survey was being carried. Therefore, this sector of the population had unlikely the opportunity to get to know about the mobility station.

5.2.2 Structure of the Survey

For the impact evaluation, one single survey with filters for the different groups of inhabitants considered was developed. The main groups addressed in the survey are:

- Users of the mobility station

- Non-users of the mobility station who were aware about its existence

- Non-users of the mobility station who were not aware about its existence

Respondents from the three group are also considered according to another two filters not corresponding to the main three groups. The first filter divides the respondents in those who took part in the survey of 2014 and those who did not. This allows a more accurate comparison with the baseline. The second filter categorizes the answers regarding if the respondent lives at a cooperative building association or at a building joint venture.

Figure 5.1 shows the basic idea of the division between the three different groups.
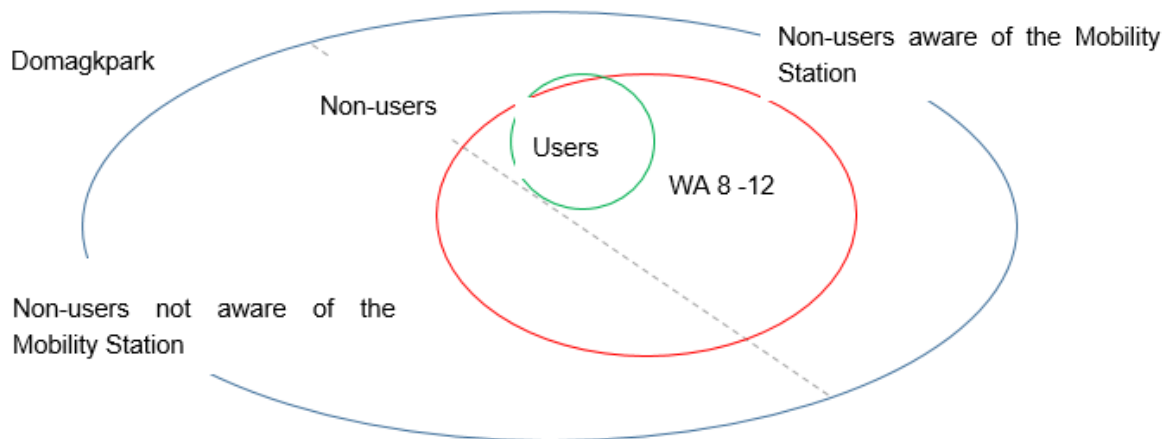
Figure 5.1 Three different groups of the target population. Own elaboration.

The final structure of the survey is described in figure 5.2. The final filters are:

- <u>First filter</u>: Did your household took place in the survey of 2014? (Division for the comparison with the baseline)

- <u>Second filter</u>: How do you live in Domagkpark? (Division between cooperative building associations and building joint ventures)

- <u>Third filter</u>: Are you registered at the Mobility Station? (Division between users and non-users)

- <u>Fourth filter</u> (only among non-users of the Mobility Station): Had you ever heard about the Mobility Station before this questionnaire? (Division through awareness about the Mobility Station)

Survey Domagkpark 2017
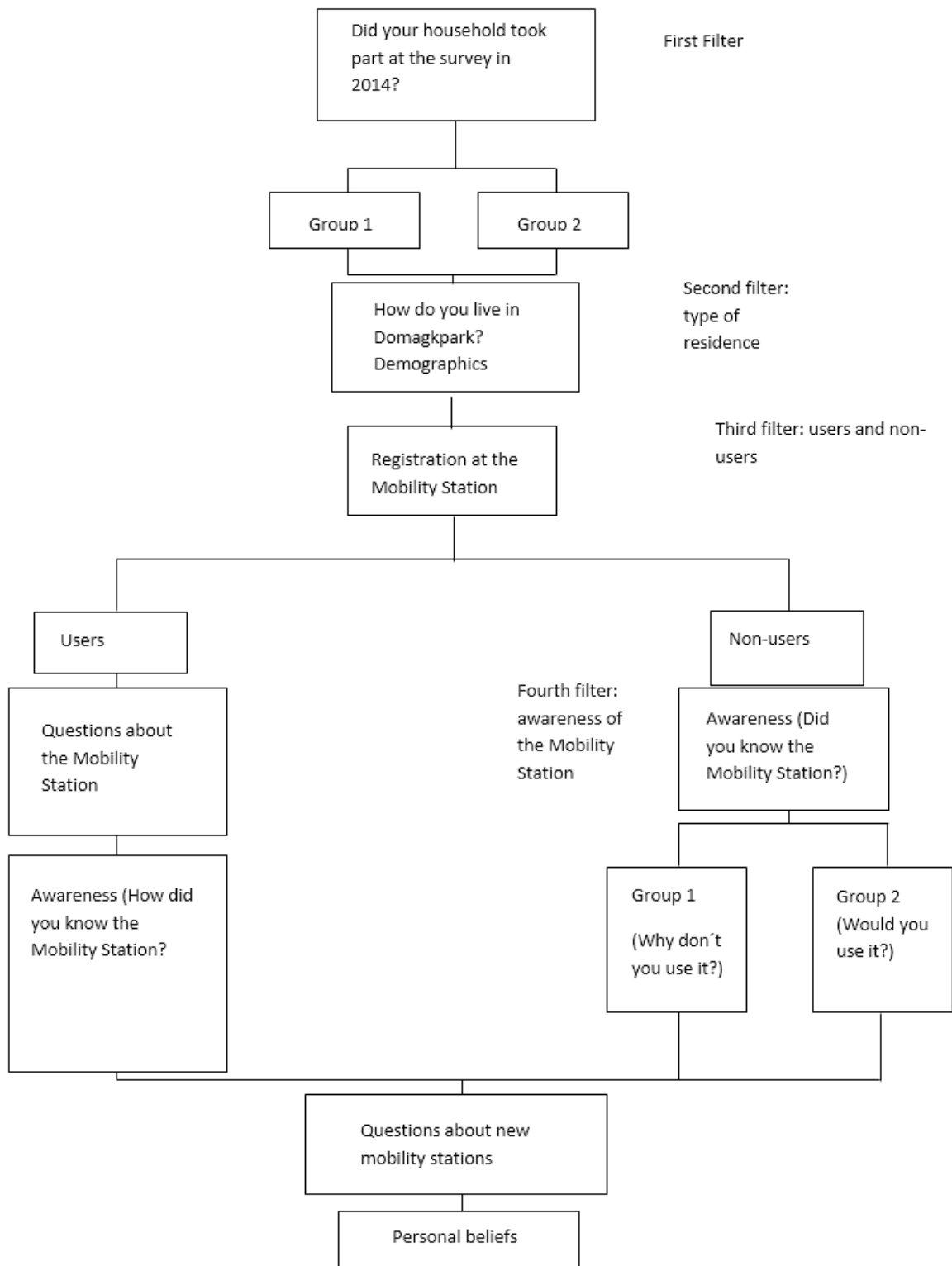
Figure 5.2 Final structure of the survey. Own elaboration.

5.2.3 Selection of the Key Performance Indicators

The selection of the Key Performance Indicators was done according to the ones proposed by the Project Evaluation Manager for the ECCENTRIC project (López, H., 2016). Table 5.1 presents those KPIs.

Impact	Indicator
Travel patterns	Modal split
Performance of the system	Reliability
Cars and traffic	Private car ownership
Society response	Awareness
	Acceptance
	Satisfaction

Tab. 5.1 KPIs for the impact evaluation.

With these indicators, the following questions are addressed:

- Do the mobility services have an impact in the modal split of the inhabitants of Domagkpark and thereby support multimodal mobility behavior?

- Do integrated multimodal mobility services have a positive impact on the reduction of car ownership?

- Does the Mobility Station lead to an increase in the use of sharing services?

- Is the population of Domagkpark aware of the Mobility Station?

- Have the users of the Mobility Station noticed any problems during the use or booking of the vehicles?

- Are the users of the Mobility Station satisfied with the different aspects of the service?

- What is the positioning of users and non-users towards new mobility services?

Also, not regarding the ECCENTRIC indicators, but also addressed in the survey are the following questions:

- What are the reasons for non-users to not use the services at the Mobility Station?

- What can be done to reach non-users and foster the Mobility Station?

The questions on the survey focused on addressing these indicators, but not only. Also, not all of them were comparable with the baseline data, since the first study (Ruttloff, T., 2014) was carried 2 years before the opening of the Mobility Station.

One important consideration is, that as in 2014, it was important to get the data from the households regarding for example the car ownership, but also from the single persons in every household. Therefore, the internal structure of the questionnaire was divided in two parts:

- Household data

- Personal data

Under the assumption, that usually if there is a user of a mobility service in a household, it is likely that other members of that household also use the service, and regarding the small size of the sample, a secondary survey including only the questions from the personal data part was developed. Thereby, other users and non-users from every household could be addressed without doubling the results of the household data part.

The first version of the survey was delivered early March to the working group in PDF format. A third meeting took place one week later to address their commentaries and suggestions.

5.2.4 Determination of Survey Resources and Selection of Survey Tool

The survey was carried online due to the limitation of resources and because of the facility to handle the data from an online survey. The working group also proposed the survey to be as short as possible and thereby avoid overwhelming the population of Domagkpark. The inhabitants of Domagkpark will be possibly asked in the future about the measures of the ECCENTRIC project. Therefore, expecting other surveys to come in the future, this one had to be as easy and short as possible.

The survey was designed in German and launched on the online platform SurveyMonkey. This platform allows to design survey in different ways. Also gave the possibility to design different surveys with two different links to address not only one person in every household but also other members of those households who wanted to answer the questionnaire.

Figure 5.3 Logo of SurveyMonkey

For every single answer, the IP-direction of the computer is saved. Therefore, even using the same link, two different answers from the same household could not be doubled and the household data are unique. It also implies that in case that more than two members in a household want to do the questionnaire with the second link, only the last answer would be saved if the same computer was used. Regarding the number of responses and the objectives this was decided to be precise enough. The effort to implement a third and a fourth link for further members in a household with more than 2 participants could have been inefficient and could have led to misunderstandings when delivering the survey.

The account in SurveyMonkey to design and deliver the survey was provided by WOGENO e.G, and it is the same that was used in 2014. The second version of the survey, which was the first online version, was delivered to the working group in April 2017, followed by a fourth meeting with the to improve the final design.

The final version of the survey consists of 42 questions regarding some of them doubled due to the filters. The shortest survey route (for non-users that were not aware of the mobility station) consists of 25 questions. The longest survey route (for users of the Mobility Station) consists of 38 questions. Tests showed that the survey could be finished within 15 minutes.

5.2.5 Pilot Survey

The survey was tested many times during the process by the working group. Also, before the launching, a small group of persons was asked to fulfill it and report any misunderstanding or nonconformity. Some recommendations from the test group were considered.

5.2.6 Field Implementation

The survey was launched on April 24, 2017. The target population was addressed directly through the Domagkpark association, making use of its e-mail distributor. This method was regarded to be efficient and non-invasive, since every household could be reached and the petition to do the survey came directly from the association.

The e-mail included a brief explanation of the goals of the survey and an invitation to do it. Also, it contained information about future events related with the Mobility Station promoted by WOGENO e.G. and STATTAUTO München.

To increment the number of responses, the participants had the possibility to win the following prices looking also to promote the Mobility Station.

- For users of the Mobility Station: 5 prices consisting in an entire day of free use of any electric vehicle (e-bikes, scooter, e-car...)

- For non-users of the Mobility Station: 5 prices consisting in a test registration at STATTAUTO for 3 months without any monthly fees, and 4 free hours of use of any electric vehicle.

The planned time for the survey was of 3 weeks until May 14. However, as the number of answers were initially lower than expected, it was decided to extend the time until the end of May. On the 22 of May, information sheets were distributed in Domagkpark during the neighborhood market that took place that day.

5.2.7 Data Preparation and Analysis

The survey was closed on May 31, 2017. The results could be followed one by one in real time thanks to the online tool SurveyMonkey. Surveys were considered if they were completed at least for the first part (household data). Uncompleted questionnaires were not considered in the evaluation. Some responses were found to be completed, but appeared as uncompleted. This occurred because some respondents forgot to press the finish button after the last questions. Nevertheless, their answers were considered as well.

The data were analyzed and are presented in chapter 6. The final form of the survey can be found in the Appendix 2.

5.3 Process Evaluation

A process evaluation regarding the framework of the ECCENTRIC project was performed. However, this approach had to be necessary limited. The evaluation involved only an ex-post analysis of the process regarding its three main phases: planning, implementation and operation. Therefore, the methodology tried to evaluate the process in all three phases even though the project was already in the operation phase.

5.3.1 Methodology

The methods selected for the process evaluation were:

- Personal interview with different stakeholders

- Learning History Workshop

In both methods, the main objective was to find project barriers and drivers that could have influenced the process, and also to learn from them. It was not possible to consider the method of standardized forms, since it has no possibility to be implemented only at the end of the project.

The selection of the stakeholders was done with the help of the working group. Since this is a small project, the stakeholders are mostly the persons inside the working group. All of them

are the responsible person for this project in their different organizations, and therefore there was not the opportunity to choose someone else.

To guarantee the quality of the process evaluation, all stakeholders were informed about the process, but none of them took part in the design of the interviews or workshop, neither knew the topics of the interviews in advance.

The selected stakeholders for this project were:

- Olaf Rau from STATTAUTO München (main operator)

- Maria Knorre from the association Domagkpark (representing the community of Domagkpark)

- Christian Stupka from WOGENO (principal promoter of the Mobility Station, representing the cooperative building associations)

- Anette Eggart from Dynamo Fahrradservice Biss e.V. (operator responsible for the maintenance of the cycles)

- Torsten Belter from the KVR (political representative, promoter of the Mobility Station)

The possibility to select a stakeholder from the building cooperatives participating in the project was considered but not done. The involvement of the building cooperatives in this project has been reported to be secondary and therefore it was decided that WOGENO was enough representation for the consortium.

Not all stakeholders were involved through all three phases. Therefore, there was of important consideration to analyze their contribution and responsibility in the project before designing the methodology.

Stakeholder	Phases involved
WOGENO e.G.	Planning, implementation, operation
STATTAUTO München	Planning, implementation, operation
KVR	Planning, implementation
Dynamo e.V.	Planning, implementation, operation
Domagkpark e.G.	Implementation, operation

Tab. 5.2 Stakeholders and phases of the project.

5.3.2 Interviews

The first selected method was a personal interview with every stakeholder. The interviews took place between May and June with at least one day between interviews. All of them lasted about one hour and followed a similar procedure. The protocols for the interviews are attached in the Appendix 1.

All interviews were audio recorded for a better analysis with the previous permission of the interviewed persons.

The protocols for the interviews were taken from Beuermann, C. et al (2010) as adapted by Miramontes for the evaluation of the mobility station in Münchner Freiheit (Miramontes, M. forthcoming). These were further adapted to the scale of the project for its evaluation and regarding the particular involvement degree of every stakeholder in the project.

The interviews were divided into four parts:

- Role and Motivation: stakeholders were asked about their role in the project and their motivation to take part in it.

- Goals and expectations: stakeholders were asked about their personal beliefs towards the project and the outcomes expected when they started.

- Barriers and drivers: stakeholders were asked to identify barriers and drivers for the three phases of the project. They were also asked to value that barriers and driver and about how those influenced the project.

- Future perspectives: stakeholders were asked about their future expectations and possible new projects.

For the interviews, a list of adapted questions was used as a guide. Nevertheless, the interviews had to be fluent with less intervention from the moderator and the prepared questions were not necessarily asked exactly as reported here. The search for specific barriers and drivers in this project motivated other questions that emerged spontaneously during the interviews. The prepared questions are listed in table 5.2.

Part	Question
1	Why does your organization take part in this project?
	What is the function of your organization in the project?
	What are your personal expectations and motivations to take part in this project?
	Have you or your organization taken part in comparable projects in the past?
2	What effects do you expect from this project?
	What are your personal beliefs about the success or failure of the project?
	Which innovative ideas are involved in the project from your perspective?
3	Which barriers did you encounter at the implementation of the project? (Political, organizational…)
	How did the planning process work? Could you bring your ideas to the project?
	How was the cooperation with the other actors involved?
	Could the barriers be solved and in that case how?
	Could the cooperation problems be solved? / How would you improve the cooperation for this kind of projects?
	What were the main drivers of the project and how would you scale them up?
	Are there being any barriers in the operation phase and do you have any ideas to solve them?

4	What is your personal position after your experience towards the project?
	What should be changed?
	Are there any plans for future similar projects?
	How was the allocation of resources? Regarding time and budget, could this be improved?

Tab. 5.3 Questions for the personal interviews.

5.3.3 Learning History Workshop

The workshop took place on July 10, 2017. The stakeholders assisting were informed about the date two weeks before and received a second e-mail 3 days before with the last considerations. The place designated was the event room at the Chair of Urban Structure and Transport Planning. With permission of the participants the whole workshop was audio recorded.

The stakeholders assisting were:

- Johanna Schäfer from WOGENO e.G.

- Torsten belter from KVR

- Maria Knorre from Domagkpark e.G.

- Olaf Rau from STATTAUTO

- Anette Eggart from Dynamo Fahrradservice Biss e.V.

The steps followed, as recommended by Dziekan, K. et al (2013) were:

1. Participants were asked to write down on cardboards the barriers that they encountered during the process.

2. Then, those cardboards were collected and put on a board, dividing them into planning, implementation and operation.

3. In turns, the stakeholders explained the barriers they had wrote and they were discussed in group.

4. The moderator asked for other barriers encountered during the interviews and for the solutions encountered for those barriers and learnings for the future.

5. The process was repeated for the drivers of the project asking for ways to scale these drivers up and implement them in future projects.

6. After the discussion about the drivers, the stakeholders were asked to vote for the 3 most important drivers of the project for them, awarding the most important with 3 points, followed up by a discussion about the most influencing barriers.

7. Finally, stakeholders were asked about the workshop, their standing towards it and improvements for future workshops from their point of view.

The following figure shows photographs taken at the workshop and give an impression of the procedure.
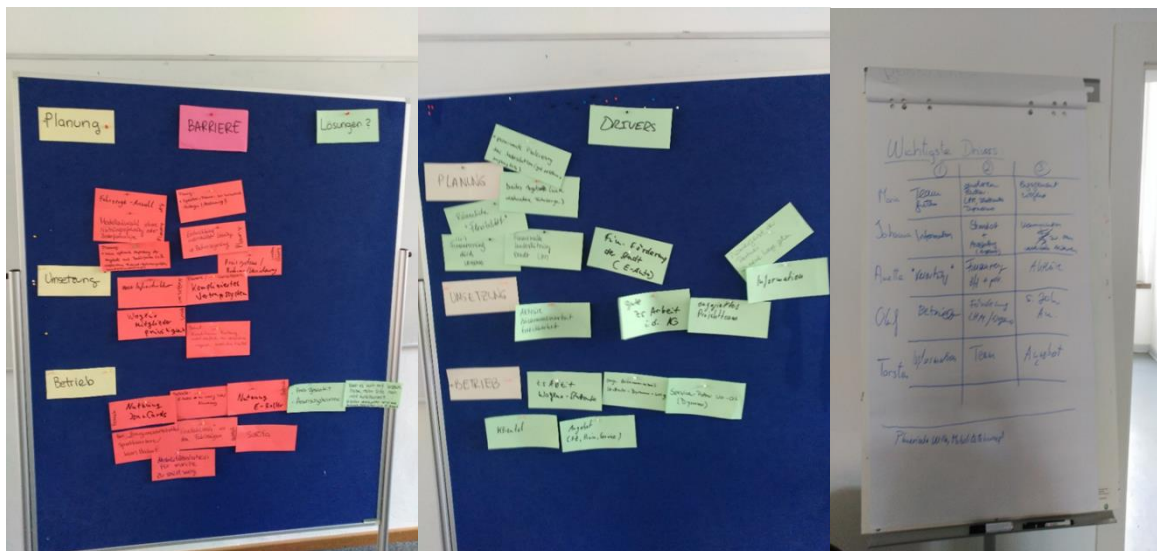
Figure 5.4 Photographs from the Learning History Workshop

5.3.4 Data Preparation and Analysis

The main results from the process evaluation are reported in chapter 6. All the protocols for the interviews and the workshop can be found in the Appendix A The main results from this process evaluation are expected to serve for future process evaluations in the framework of the ECCENTRIC project.

6 Results

This chapter presents the results of both impact and process evaluation carried for the Mobility Station in Domagkpark. It starts with the results from the survey, setting up the comparison with the results from 2014 from the study of Tobias Ruttloff and the consequent analysis. Then, the results of the user´s and non-user´s survey are presented. Last section introduces the results from the process evaluation.

The following results are the base for the recommendations in chapter 7.

6.1 Results from the survey

The survey took part between April 24th and May 31, 2017. Two different links were provided for the respondents. The first one contained the full version of the survey including the household questions and was intended to be answered only once in every household. The second link included the second part of the survey only for personal data and could be filled by other persons from the same household. The ratio of responses per week for both surveys are presented in figure 6.1.
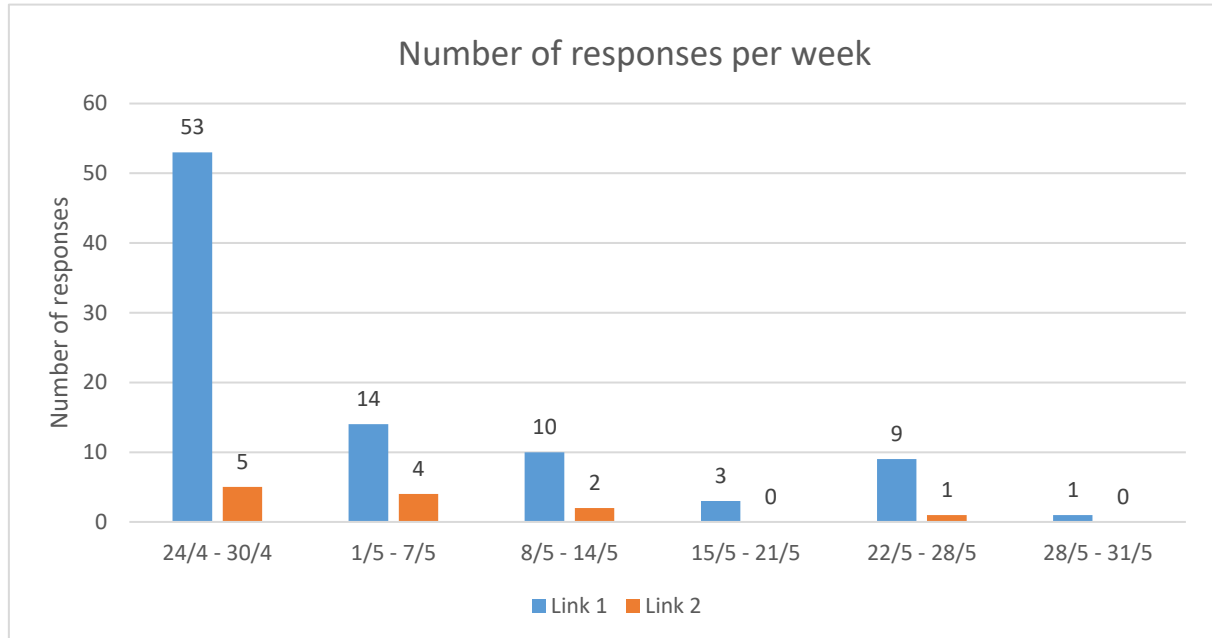
Figure 6.1 Number of responses per week. Own elaboration.

In total, link 1 obtained 92 responses from different households. Link 2 obtained 14 responses. For the first link, 2 of the responses where uncompleted and could not be used. 4 persons completed the first part regarding the household data but did not complete the second part.

Since the data for their households was complete, those data were used in the analysis. For link 2, 2 of the responses were uncompleted and could not be used.

These results give 90 valid responses from a total target population of 388 households. The response rate is therefore 23,2%. This response rate is lower than the response rate in 2014 (61%). In the personal interviews, it was reported by some of the stakeholders that the lower response rate could be caused by an overwhelming of the population of Domagkpark with questionnaires, event e-mails, invitations and other notifications. This result must be taken carefully into consideration when planning the evaluation for the future ECCENTRIC measures.

Regarding the response rate, it is enough for a statistical analysis and represents the target population.

6.1.1   Household Data

This section presents the data for the households. These data are compared if possible with the results from 2014 and allow us to evaluate KPIs like impact on car ownership and VKT.

6.1.1.1 First Filters

The first part of the survey focused on obtaining data from the households regarding different areas like car ownership. These data were compared with the data from 2014.

The first question was also the first filter of the survey for the evaluation. Households were asked if they took part in the survey from 2014 to avoid a big change in the target population.

54 households (60%) participated in both surveys. The other 36 (40%) did not participate in 2014. These 54 households represent the 24,9% of the households that participated in the survey from 2014 (217 in total). We can estate, that although the response rate was lower than in 2014, we did not change the target population, which is the most important aspect when considering the comparison. Comparisons between the results have a solid base.

The second question was a filter to divide the results into different types of households in Domagkpark. Households were asked to which group they belonged; cooperative building associations, building joint ventures or rental houses. 60 responses (66,67%) came from households belonging to cooperative building associations, 27 responses (30%) came from households belonging to building joint ventures and 3 (3,33%) responses came from rental houses.

Figure 6.2 shows this result.
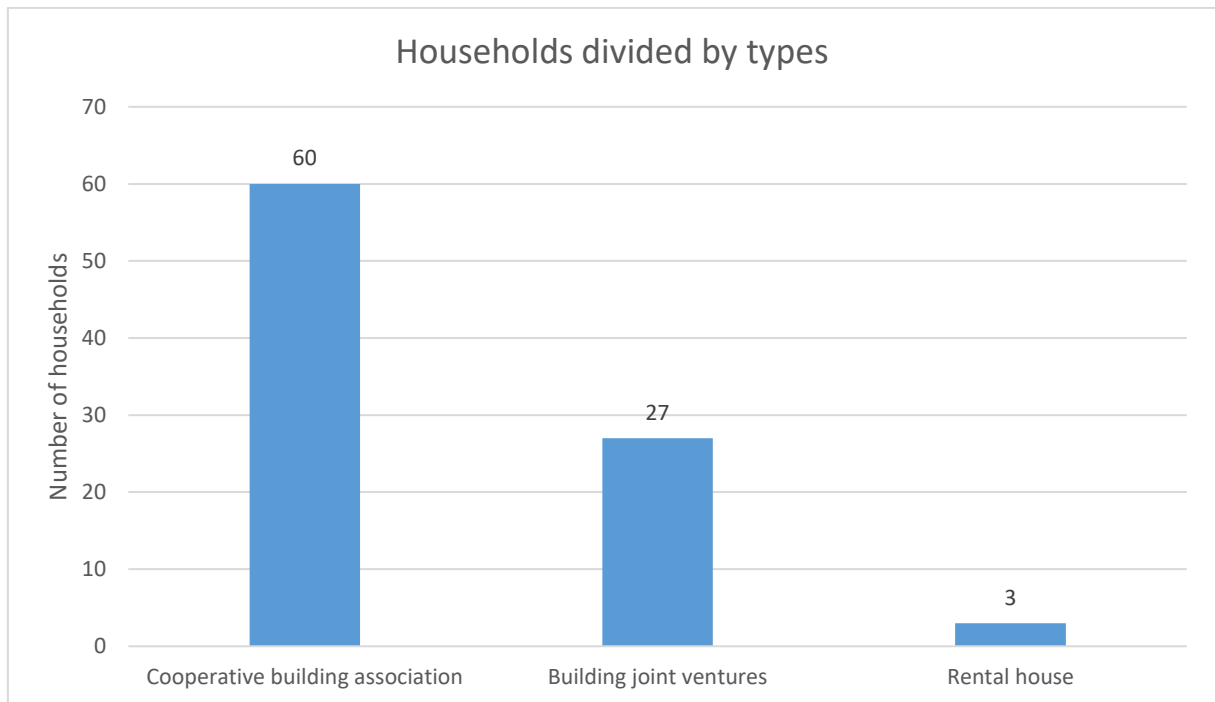
Figure 6,2 Households divided by type

This result does not bring any conclusion by itself, it is a filter for a later comparison between types of building associations in Domagkpark. The car ownership and other important data differs for both groups and it must be taken into consideration.

6.1.1.2 Composition of the Households

The households were asked for the number of persons living in them regarding different age groups. These data were used to obtain the number of households per number of members and the total number of persons divided in age groups. Households with more than 5 members had the answer option "5 or more". To obtain the total number of persons, it was assumed that in every household with 5 or more members lived exactly 5 persons. Regarding its low number, this does not have a significant impact on the analysis.

Figure 6.3 shows the percentage of households per number of members compared with the results from 2014.
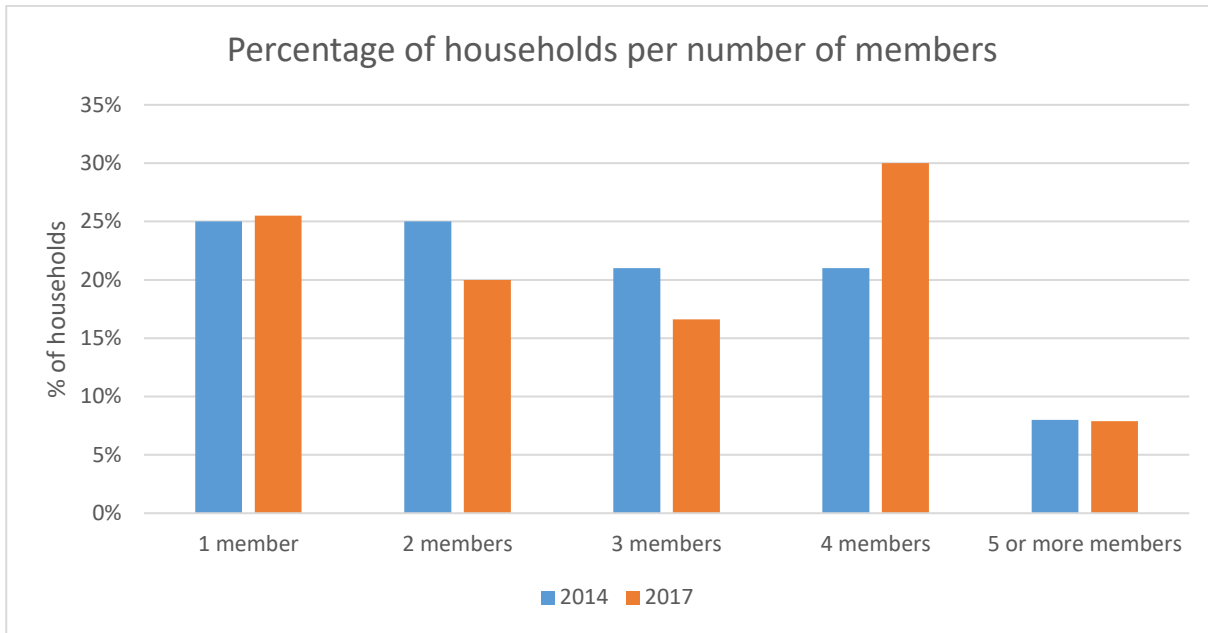
Figure 6.3 Percentage of households per number of members for 2014 and 2017. Own elaboration, 2014 data source: Ruttloff, T. (2014)

There are 23 households (25,5%) with only one member, 18 with two members (20%), 15 with 3 members (16,6%), 27 with 4 members (30%) and 7 with 5 or more members (7,9%). The figure shows a similar composition for the survey of 2014, only remarkably different for households with 4 members. The total population obtained from these data are 247 persons living in 90 households (2,74 persons per households against 2,64 persons per household for 2014). From this population, 52 persons (21%) are children under 6 years old, 25 (10%) are persons between 6 and 17 years old and 170 (69%) are adults.

The percentages of persons regarding the age group also match almost perfectly with the results from 2014. The number of adults for the sample in 2014 was 388 from 573 (67,7%).

The composition of the households is showed in figure 6.4. The division in types of households is based in the composition provided by Ruttloff, T. (2014) and therefore sets the comparison.
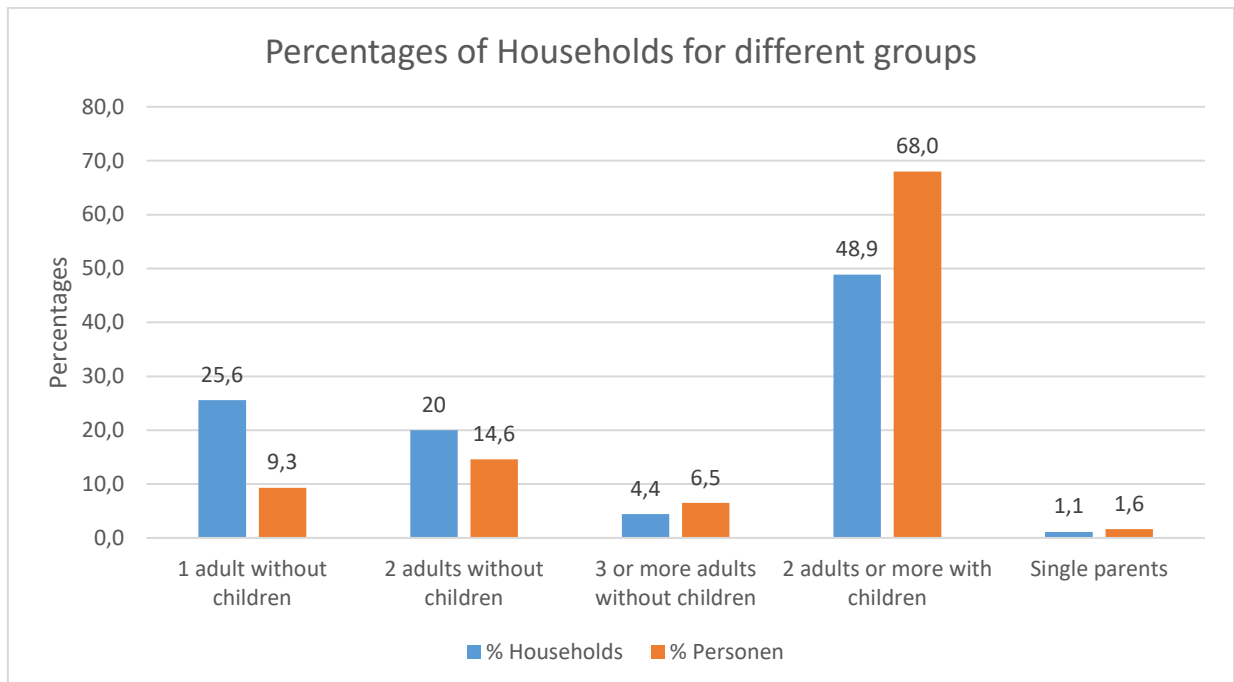
Figure 6.4 Percentages of households for different groups. Own elaboration.

The figure shows that in 25,6% of the households lives only one adult without children (25,3% in 2014). 9,3% of all persons live in these households (9,6% in 2014). The percentage of households with 2 adults without children is 20% (23% in 2014) with 14,6 of the persons living in them (17,5% in 2014). For households with at least three adults without children, the percentage is 4,4% (3,7% in 2014). The percentage of persons for these households is 6,5% (5,2% in 2014). The most common type of household is the one with two adults with children, with a percentage of 48,9% (42,9% in 2014) representing 68% of the persons (63% in 2014). The last type of household, single parents, represents only 1,1% of the households (5,1% in 2014) and 1,6% of the total population of the sample (4,5% in 2014).

Considering the demographics of the households, it is remarkable how similar the data from both surveys are, even if the sample size is different. We can estate that we have a good representation of the total population. These results support the comparisons from the data obtained with the baseline.

The next questions asked the households for the number of driving licenses. The results are showed in figure 6.5.
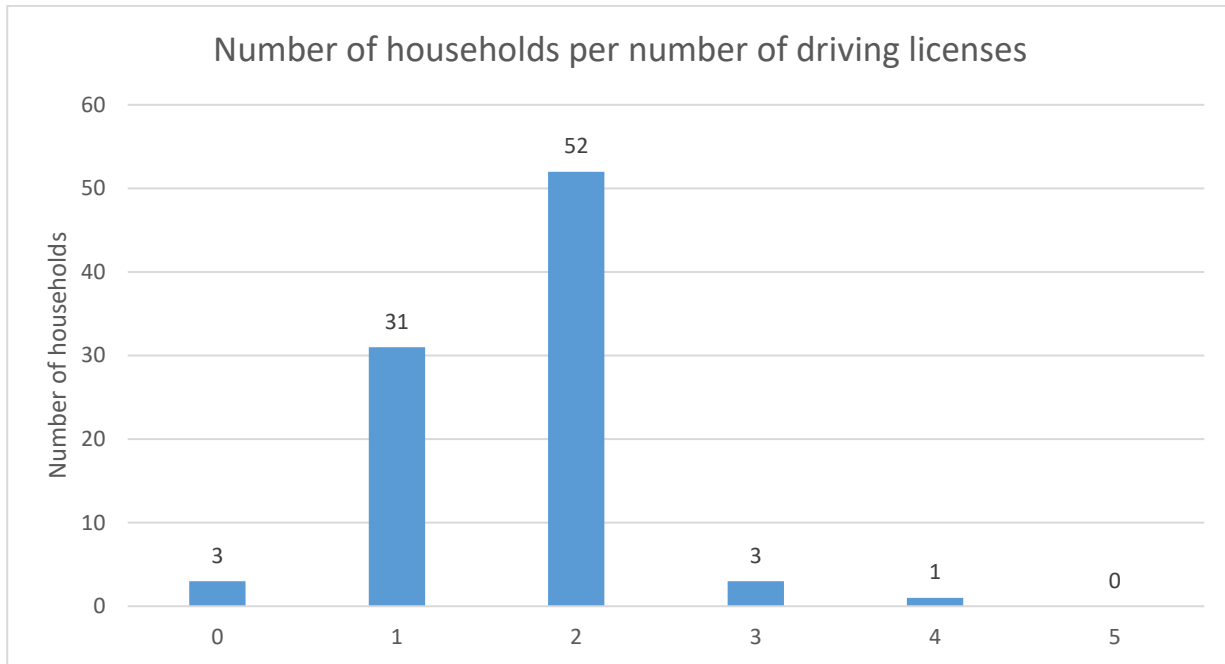
Figure 6.5 Number of households per number of driving licenses. Own elaboration.

Only in 3 households from 90 (3,3%) none of the members of the households owns a driving license. The total number of driving licenses obtained is 148 for a total population over 18 years old of 170 persons. This shows that 87% of the adults for the sample population own a driving license. Again, the results from 2014 are similar, with 89,7% of persons owning a driving license. This implies that almost the entire population has potential access to the complete offer of the Mobility Station.

6.1.1.3 Car Ownership

The next questions focus in determining the existing stock of vehicles in Domagkpark and the changes in this number since 2014. The main goal is to analyse the reduction of car ownership, which is one of the indicators selected to evaluate the performance of the Mobility Station. Therefore, households were asked about their number of owned vehicles, the changes in that number since 2014 and the influence that the mobility offers in Domagkpark had had in the decision to do that changes.

The households where asked for the number of several different vehicles, including a category called "others", where different vehicles like skateboards, transporters and others appeared. However, for the comparison with 2014 and for the representability of the data, only the main 4 categories will be shown and analysed. The analysis then focuses in the reduction of car ownership as the most important factor for the evaluation. Results from the actual vehicle ownership are showed in figure 6.6.
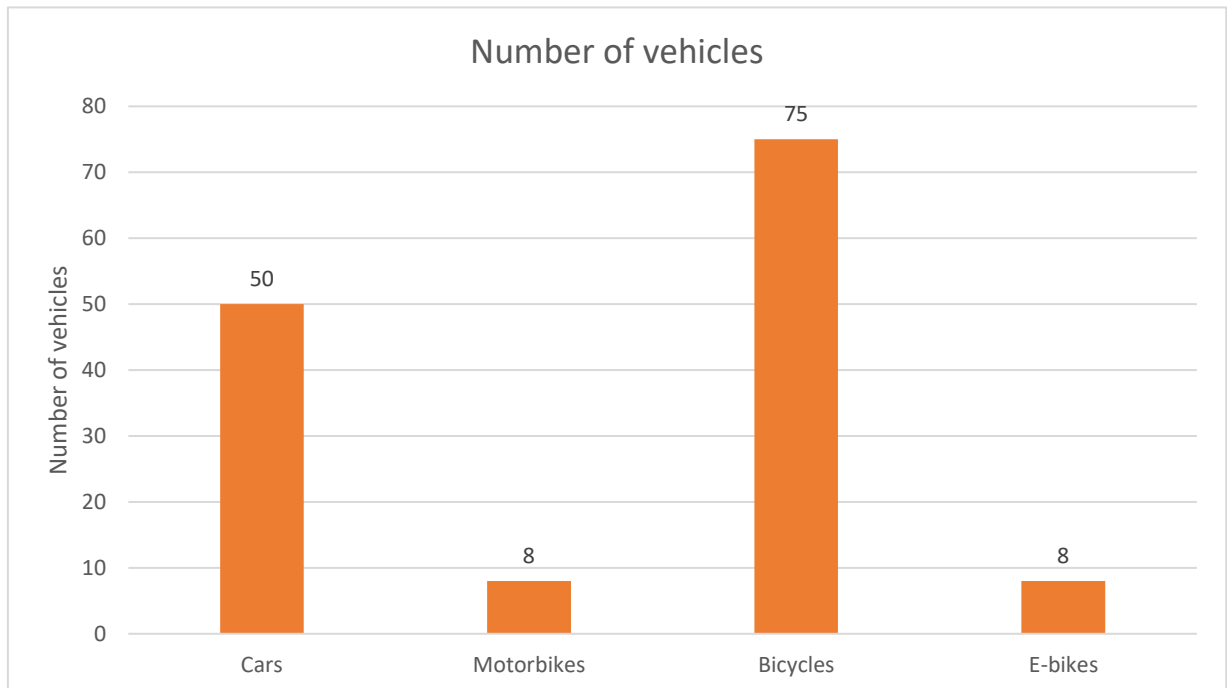
Figure 6.6 Actual number of vehicles for the sample. Own elaboration.

The total number of cars obtained for our sample population is 50 cars. This gives a ratio of 0,55 cars per household. The results from 2014 showed a car ownership of 0,85, expecting it to descend to 0,75 cars per household. The difference is remarkable, being the actual car ownership much lower than the expected. This result is showed in figure 6.7.
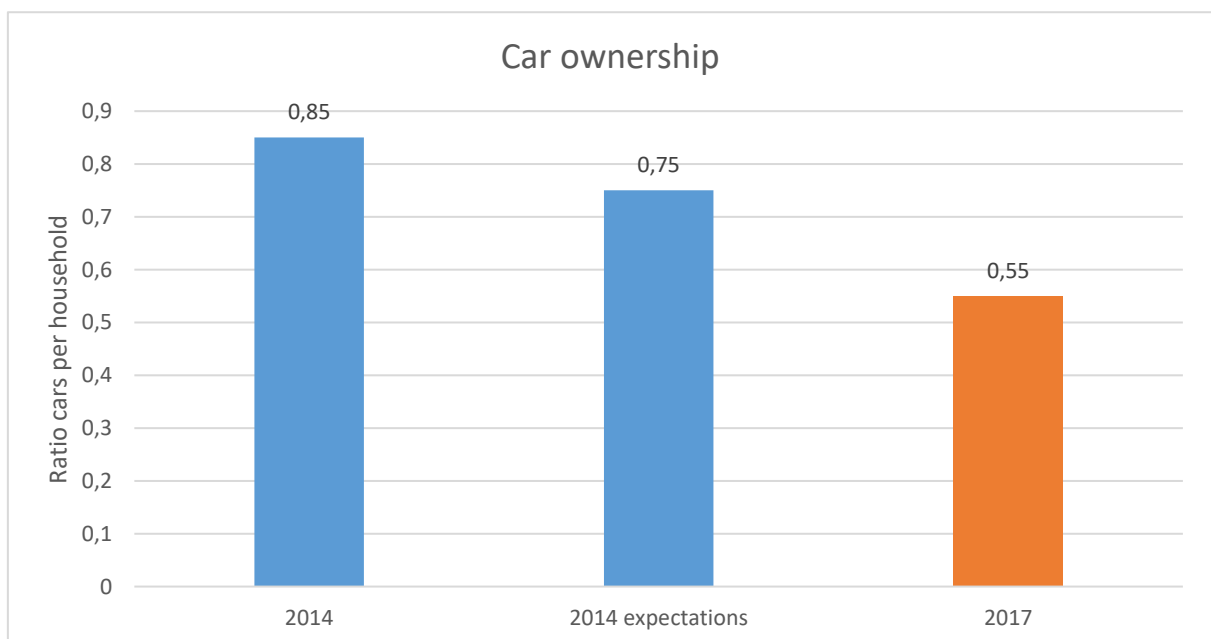
Figure 6.7 Car ownership comparison, Own elaboration, 2014 data source: Ruttloff, T. (2014).

Considering the number of bikes, in 2014 it was expected to increase from 2,46 bikes per household to 2,58. The ratio of bikes per household is 2,56, which is comparable to the expectations. There are 8 e-bikes, with a ratio of 0,08 e-bikes per household, what also matches with the expected results from 2014 of 0,1 e-bikes per household. The same ratio is obtained for motorbikes (0,08 motorbikes per household), being exactly the half of the expected ratio for this vehicle in 2014 (0,16 motorbikes per household).

In total, 50 from the 90 households do not own a car (55%). This result is also higher than the expectations of 2014, when a 36% of the households were expected to own no cars. Regarding the different types of households, 28 of the cars (56%) belong to households from building joint ventures, 19 (38%) belong to households from cooperative building associations and 3 (6%) belong to rental houses. The ratios therefore are 1,04 cars per household for building joint ventures and 0,32 for cooperative building associations. Figure 6.8 shows the relationship between the data from 2014 and 2017.
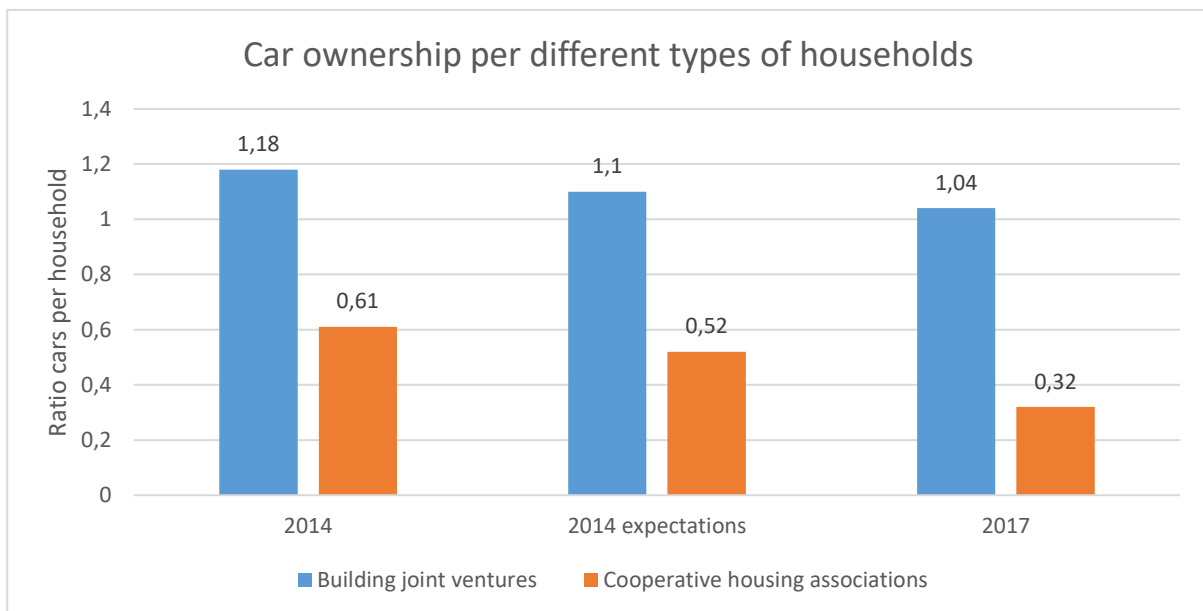
Figure 6.8 Car ownership per different types of households. Own elaboration, 2014 data source: Ruttloff, T. (2014).

Figure 6.8 shows a decrease of car ownership for all the sectors of the population. However, the decrease is higher for cooperative building associations. Reasons can be multiple, like proximity to the mobility station, emotional bond to the project or economic reasons. This result shows two well-differentiated sectors of the population in Domagkpark, which should be considered for the analysis.

For the actual car ownership, 32 households (35,6%) own one car, 7 (7,8%) own two cars and one household (1,1%) owns four cars. 31 cars (62%) belong to households with children,

stating that this is an important factor reason for the inhabitants of Domagkpark regarding car ownership.

The next question asked the households if the number of vehicles had changed since 2014. Figure 6.9 shows the results.
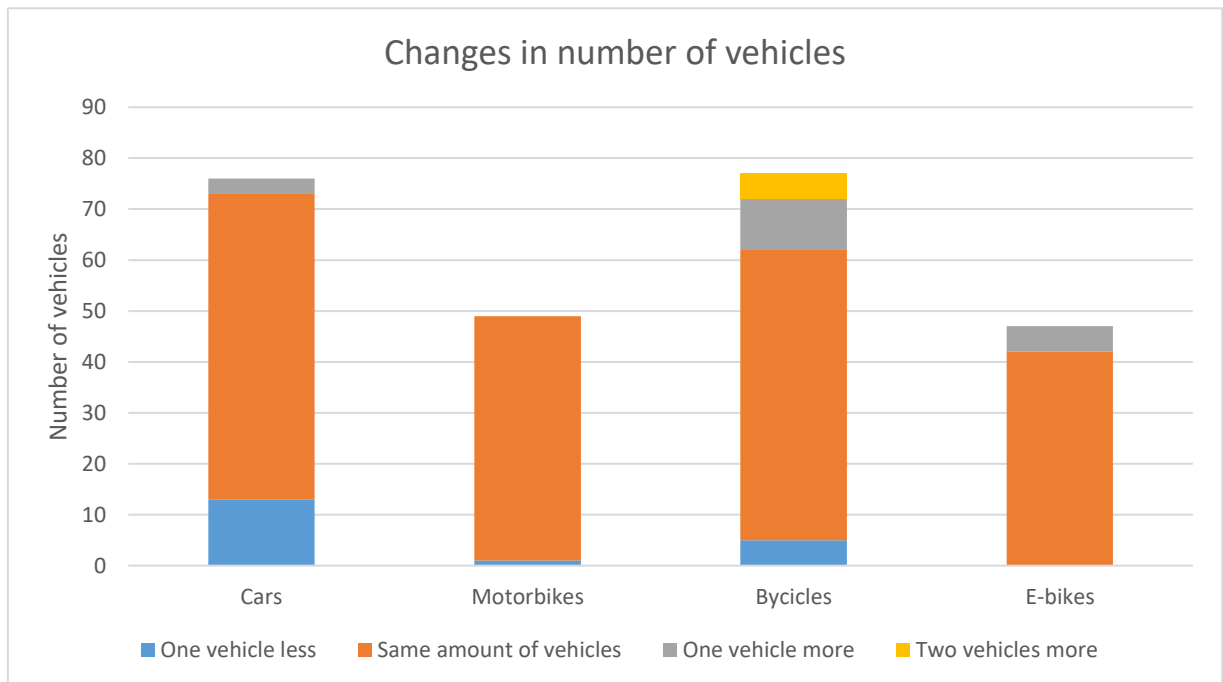
Figure 6.9 Changes in the number of vehicles. Own elaboration.

The data are provided in table 6.1.

	One vehicle less	Same number of vehicles	One vehicle more	Two vehicles more
Cars	13	60	3	0
Motorbikes	1	48	0	0
E-bikes	5	57	10	5
Others	0	42	5	0

Tab. 6.1 Changes in number of vehicles. Own elaboration.

Respondents only had to answer one row in case there had been some change in their vehicle ownership. Therefore, there are not 90 responses in total for every row.

The total decrease in the number of cars was of 10 vehicles. 13 were sold and 3 new cars were bought. According to this data, the original number of cars was 60 for the sample. Therefore, we have a decrease in car ownership of 16,6% over the original number. The expected decrease in 2014 was 11,9%. 4 of the cars sold (30,7%) belong to building joint ventures and 9 (69,3%) belong to cooperative building associations, verifying the data obtained and the differences for both groups. The impact in the reduction of car ownership is more important in the sector of the population that already depends less of private car to meet their mobility needs. The increase in number of bikes represents 7% over an original number of 215. It is also higher than the expected increase from 2014, of 4,9%.

The next question asked the households if the mobility offers in Domagkpark had had any influence in the decision to buy or sell a vehicle. Figure 6-10 shows the results.
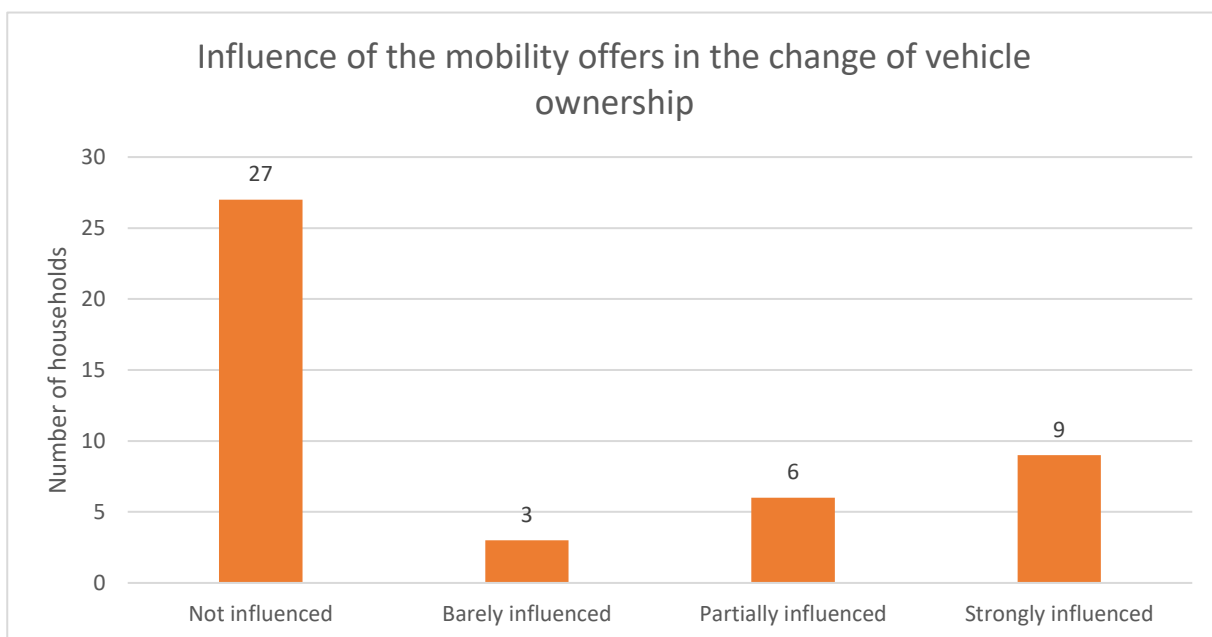
Figure 6.10 Influence of the mobility offers in the change of vehicle ownership. Own elaboration.

Households were not obligated to answer the question, therefore again there are not 90 responses. The responses include the number of other vehicles bought and sold, not only the cars.

Regarding the reduction of car ownership, 8 households (61,5%) admitted having been strongly or partially influenced by the mobility offers in Domagkpark when taking the decision to sell their cars. 6 of them belong to cooperative building associations and 2 belong to building joint ventures. These 8 persons are all users of the Mobility Station. We can state therefore that the Mobility Station had a direct impact on the sale of 8 cars (13,3% in the sample in 10 months. Regarding the types of households, the reduction of car ownership for the cooperative building associations was 21,4%, while for building joint ventures it was only 6,2%. The cars

sold without reporting any influence of the Mobility Station are not regarded to evaluate the impact on car ownership.

The target population is here divided. Building joint ventures register a higher car ownership and lower number of registrations at the Mobility Station. Also, the reduction of car ownership is lower in this sector of the population. In contrast, the households from the cooperative building associations did already have a lower car ownership and still have experienced a higher reduction in number of cars. Also, the number of registered users of the Mobility Station in this sector of the population is higher.

To consider the impact on car ownership for the whole target population (388 households), the approach used by Ruttloff, T. (2014) will be followed. Ruttloff, T. used two different extrapolations to scale his results for the total number of households. The first extrapolation was simply to extrapolate the data for the higher number of households directly, without any further consideration. The second, proved in his study to give lower and therefore safer values, consisted in extrapolating the results taking into consideration the different types of households.

From the 388 households of the target population, 100 belong to building joint ventures (WA 8 and WA 9) and 288 belong to cooperative building associations as has been reported by Knorre, M. (2017). Taking the actual car ownership ratios from the sample we can extrapolate a total number of cars of 104 for building joint ventures and 92 for cooperative building associations. Considering a decrease percentage of 6,2% for building joint ventures, the estimated decrease in number of cars is 6. The same calculation for cooperative building associations with a decrease percentage of 21,4% gives a result of 19 cars. The result is an estimated sale of 25 cars directly influenced by the Mobility Station for the target population.

Taking into consideration that there are 7 cars (6 conventional and 1 electric) at the Mobility Station, the conclusions is that 1 car of the car-sharing system substitutes 3,6 private cars.

Regarding the expectations from 2014, Rutloff, T. estimated that in total there would have been 36 cars less in Domagkpark. Nevertheless, the study of 2014 does not consider the direct influence of the Mobility Station in the sales of the cars. A similar calculation for the present sample population gives an amount of 43 cars less in Domagkpark, so the results for the present study are still higher than the expectations.

6.1.1.4 Use of Sharing Services and PT

The households were asked for the number of their members registered at sharing-services and using the PT. The first of these questions asked for the number of users in sharing services regarding four options; station-based car-sharing, free-floating car-sharing, station based bike-sharing and free-floating bike-sharing. The data obtained were the number of households per number of membered registered for the different options. These are shown in table 6.2.

	1 member	2 members	3 members
Station-based car-sharing	27	14	1
Free-floating car-sharing	25	8	0
Free-floating bike-sharing	11	1	0
Station-based bike-sharing	18	2	0

Tab. 6.2 Number of households per number of members registered. Own elaboration.

To avoid misunderstandings with the offer of the Mobility Station, the question used MVG-Rad as example from station-based bike-sharing and STATTAUTO as example from station-based car-sharing, regarding the bike-sharing offer at the Mobility Station as secondary.

From the results, it can be concluded that the number of members registrations by car-sharing schemes is remarkably higher than for bike-sharing schemes. It is not possible to evaluate from the data the exact number of members by every sharing scheme, since some of them could be the same person registered for more than one service. However, the results expected from this question are the number of households with at least one member registered for a sharing services. The results are shown in figure 6.11.
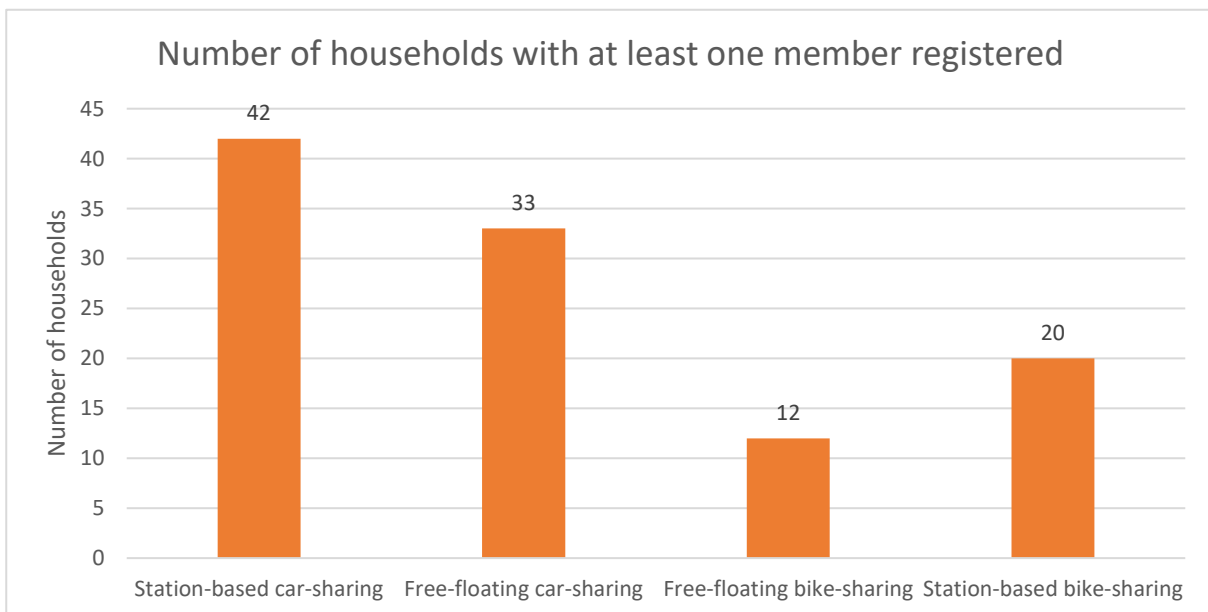
Figure 6.11 Number of households with at least one member registered. Own elaboration.

The highest number of households with at least one registered member is 42 (46,6%) for station-based car-sharing. This could be expected regarding the impact of the Mobility Station. 33 households (36,6%) have at least one member registered at a free-floating car-sharing service. For free-floating and station-based bike-sharing schemes the number of households with at least one registered member is remarkably lower: 12 (13,3%) and 20 (22,2%) respectively. This could also be to expect regarding the ratio of private bikes per household (2,56). This is consistent with the lower number of rentals for e-bikes at the Mobility Station than for cars and with the data provided by the users. The population in Domagkpark usually make use of their own private bikes.

The data from 2014 expected an increase from 24% to 59% of households with at least one person registered by a car-sharing scheme and an increase from 14% to 39% for the bike-sharing schemes. Taking the higher values from the data obtained for the sample, we have at least 46,6% of households with at least one member registered for a car-sharing scheme and 22,2% for bike-sharing schemes. Both are higher than the values obtained in 2014, but lower than the expected value. The results from 2014 do not consider the different types of car- and bike-sharing, therefore the aggregated number should be higher regarding the number of double registrations. For this study, it was considered interesting to obtain the data for the different types of sharing services since all of them are present in the district and promoted by the mobility concept.

Regarding the different type of households, it is important to consider that 49 from the total number of individual registrations for station-based car-sharing schemes belong to cooperative building associations while the same data was of 7 registrations by building joint ventures. The number of registrations for building joint ventures is higher for free-floating car-sharing services (15), but still lower than the same data for the cooperative building associations (25 registrations). The rest of the registrations belong to rental houses.

The second question in this section of the survey asked the households their number of PT monthly tickets. According to the data obtained from the modal split, PT is the main modal share for the sample population together with private bike. Figure 6.12 shows the results.
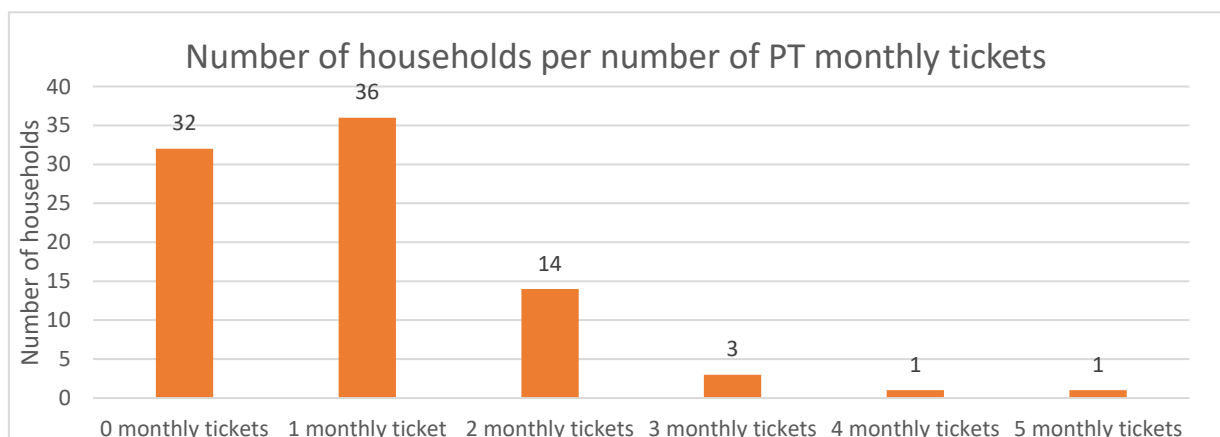
Figure 6.12 Number of households per number of PT monthly tickets. Own elaboration.

The total number of PT monthly tickets is 82. Under the assumption that children under 6 years old do not own a PT monthly ticket, the result shows that 42% of the persons in the sample own a PT monthly ticket. This result shows only a slight increase with respect to the results from 2014, when 36% of the sample population owned a PT monthly ticket. The expectations were this value to increase till 50% of the population.

Regarding the presence in the households, 55 (61,1%) have one or more PT monthly tickets. 55 PT monthly tickets (67%) belong to cooperative building associations and 24 (29%) belong to building joint ventures. The rest belong to rental houses.

The numbers for sharing services and PT monthly tickets regarding the type of household evidence again the differences between both groups.

6.1.1.5 Vehicle Kilometres Travelled

For the calculation of the yearly VKT, the households were asked about the number of kilometres travelled per year with each one of their cars. It was distinguished between total amount of kilometres per year and the number of kilometres per year for vacation trips. Three persons answered the questions without owning a car. The first one owned a camper, and therefore those data were included. The other two ones responded one question each without owning a car. Those data were not included. The total number of cars is still 50, because one household having 4 cars could not give the information for all of them. The number of cars was limited to 3 in both questions. Table 6.3 shows the results.

	Below 5.000 km	5.000 – 10.000 km	10.000 – 15.000 km	15.000 – 20.000 km	Above 20.000 km
Car 1 (Total)	7	15	11	6	2
Car 2 (Total)	3	2	2	0	1
Car 3 (Total)	1	0	0	0	0
	Below 1.000 km	1.000 – 2.000 km	2.000 – 5.000 km	5.000 – 10.000 km	Above 10.000 km
Car 1 (Vac.)	8	10	21	1	1
Car 2 (Vac.)	6	1	0	1	0
Car 3 (Vac.)	1	0	0	0	0

Tab. 6.3 Total and vacation trips number of yearly VKT per car. Own elaboration.

Table 6.4 shows the percentage of the cars over the total number for all the options, regarding 41 first cars, 8 second cars and 1 third car.

	Below 5.000 km	5.000 – 10.000 km	10.000 – 15.000 km	15.000 – 20.000 km	Above 20.000 km
Car 1 (Total)	17%	36,6%	26,9%	14,6%	4,9%
Car 2 (Total)	37,5%	25%	25%	0	12,5%
Car 3 (Total)	100%	0	0	0	0
	Below 1.000 km	1.000 – 2.000 km	2.000 – 5.000 km	5.000 – 10.000 km	Above 10.000 km
Car 1 (Vac.)	16%	20%	42%	2%	2%
Car 2 (Vac.)	6	2%	0	2%	0
Car 3 (Vac.)	2%	0	0	0	0

Tab. 6.4 Percentage of the cars over the total number for all the options.

This percentages are not higher than the percentages In 2014, so there has been no increase in the VKT for the car owners. In section 6.2.3 the results have shown that 8 cars have been sold influenced by the Mobility Station. Regarding the number of actual owned cars from the households that sold one, we can estate if the cars sold were first, second or third cars. From the 8 cars sold, 6 were first cars (the households own no more cars now) and 2 were second cars (the households still own a car). Looking at the distribution of percentages, a safe approach can be found in table 6.5 to distribute the 8 sold cars.

	Below 5.000 km	5.000 – 10.000 km	10.000 – 15.000 km	15.000 – 20.000 km	Above 20.000 km
Car 1 (Total)	1	2	2	1	0
Car 2 (Total)	1	1	0	0	0
	Below 1.000 km	1.000 – 2.000 km	2.000 – 5.000 km	5.000 – 10.000 km	Above 10.000 km
Car 1 (Vac.)	1	2	3	0	0
Car 2 (Vac.)	1	1	0	0	0

Tab. 6.5 Assumption of the distribution of the sold cars. Own elaboration.

The distribution has been done unfavouriting the VKT reduced to have a safe calculation. A safe approach to consider the number of VKT is to take the lower limit of the km intervals. Doing so, the total amount of VKT reduced is 50.000 km per year. To estimate the original number of VKT, the upper limit for the km intervals in table 6.3 can be taken for the calculation and the result can then be added to the reduced VKT. IT results in 560.000 VKT per year for the original number of cars of 60. Dividing both results the percentage of reduced VKT per year is 8,9%.

6.1.2 Personal Data

The second part of the survey focused on obtaining data from the persons from the sample population. It begins with the demographics and the modal split of the population. Then, the respondents are divided in users and non-users to answer questions about the Mobility Station.

The first link of the survey provided 86 valid responses. 4 were uncomplete for the second part and therefore could not be used. The second link provided 12 valid responses. In total, for the second part of the survey 98 responses were available for the analysis.

6.1.2.1 Demographic Data of the Sample

The first questions asked to the respondents obtained data regarding their age, gender, employment, studies and possession of a driving license. In total, 43 women (43,9%) and 52 men (53,1%) participated in the survey. 3 persons did not want to answer their gender (3%).

Figure 6.13 shows the result for the age of the participants.
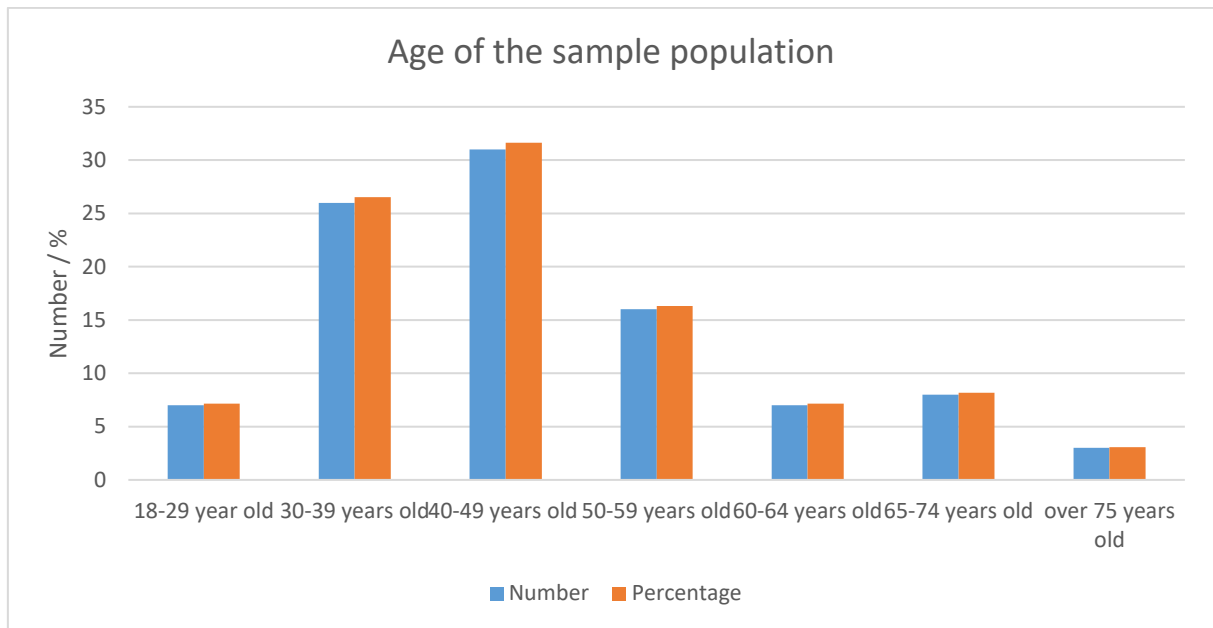
Figure 6.13 Number and percentage of participants per age group. Own elaboration.

The data are provided in table 6.6.

	18-29 years old	30-39 years old	40 – 49 years old	50 – 59 years old	60 - 64 years old	65 – 74 years old	Over 75 years old
Number	7	26	31	16	7	8	3
%	7,1	26,5	31,6	16,3	7,1	8,2	3,1

Tab. 6.6 Number and percentage of participants per age group. Own elaboration.

The principal age groups in our sample are the persons between 40-49 years old and the persons between 30 and 39 years old. Only 3 participants (3,1%) were over 75 years old and only 7 (7,1%) were under 30 years old. Regarding the genders for the two main age groups, 25 % and 38 % of the men belong to the 30-39 and 40-49 years old groups. In total 63 %. For the women, the result was 28 % and 21 % (49% in total).

Figure 6.14 shows the employment status of the participants.
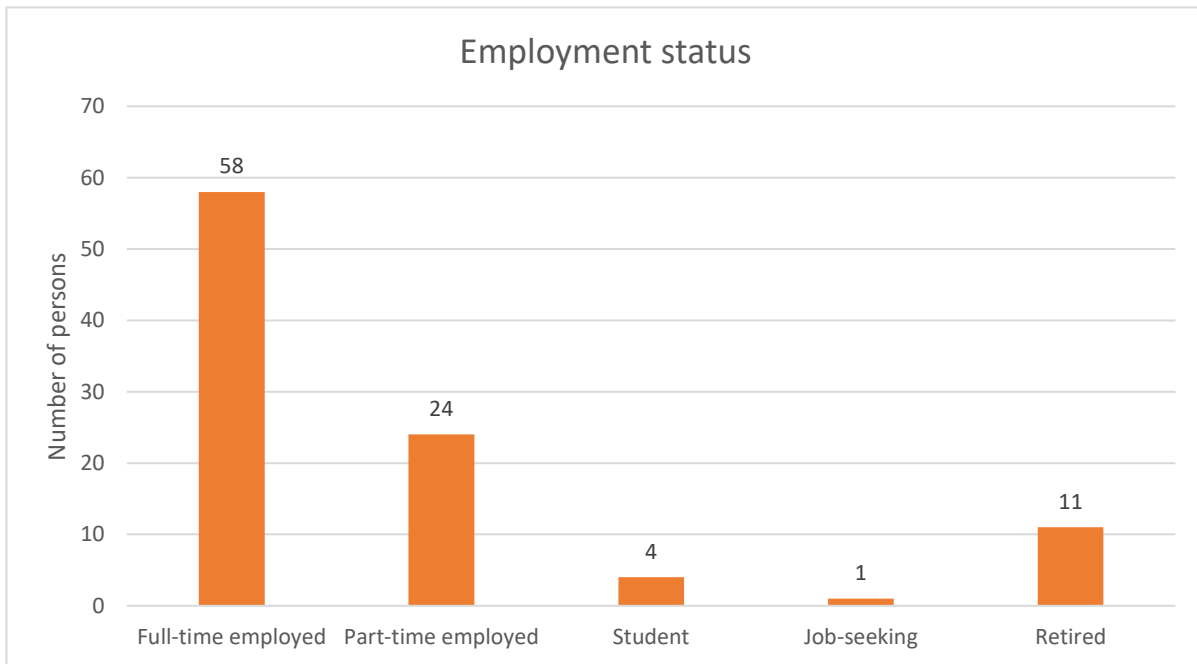
Figure 6.14 Employment status of the participants. Own elaboration.

59 % of the participants are fully employed. In total 83,7 % have a job and only 11% are retired. Regarding the distribution per genders 35 women (81,4%) are fully or partially employed. The same result for the men is 47 (90,3%). Figure 6.15 shows the result for the completed studies by the participants.
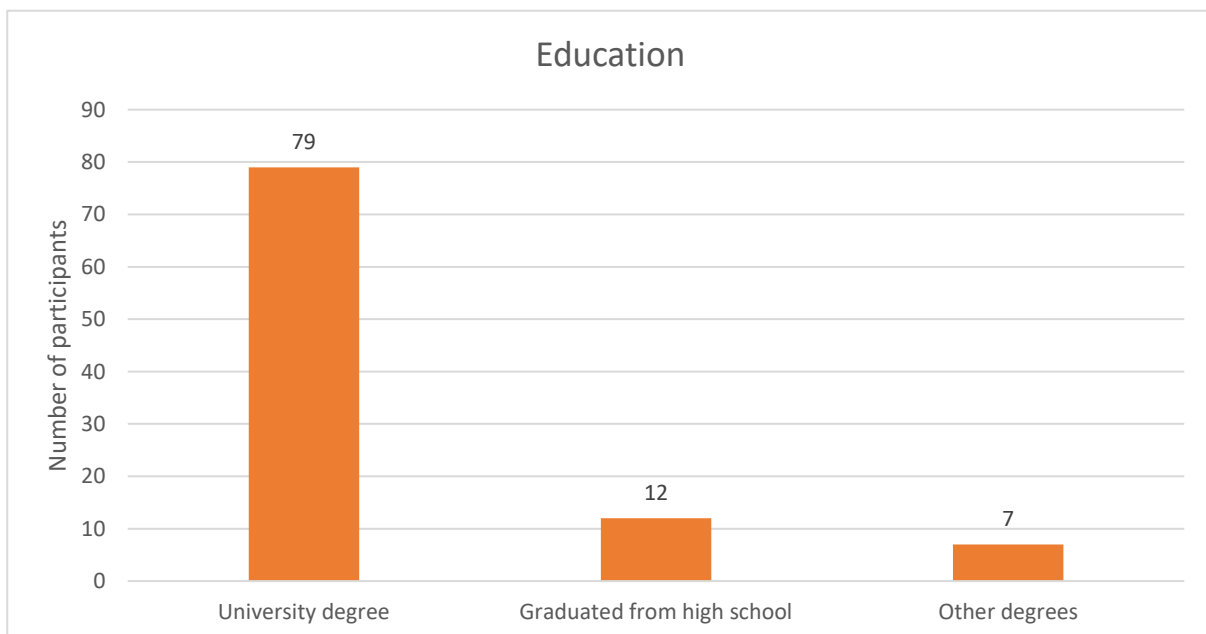
Figure 6.15 Completed studies by the participants

80,6% of the participants have a university degree. 12,2% graduated from high school and the rest had other degrees. No participant stated to not have studies. Regarding the gender distribution, 46 men (88,5%) have a university degree. For the women, it is the 70%.

The sample is homogeneous when regarding the gender although there are some differences in the completed studies and the age. Both genders are well represented. More men than women responded the survey, but the number of both groups was not significantly different. Women responding the survey are slightly younger for the main groups. Most of the respondents (80,6%) have a university degree and 83,7% are employed.

From the 98 participants, 96 (98%) own a driver license.

6.1.2.2 Modal Split

The participants were asked about their travel behaviour to study the impact of the Mobility Station on multimodality and modal split. First, participants were asked about how often they used different transport methods. In this first question, participants were not obligated to answer for every transport mode. Therefore, the number of responses for every transport mode do not match with the number of participants. The most used transport mode is private bike. 70,4% of the respondents use their bike several times per week. Many users also use the PT, at least 54,1% use it almost several times per week. Private car is the third most common chosen transport mode, but its impact is not so big as for the other two. 37 respondents (37,7%) declare that they never use the private car. Figure 6.16 and table 6.7 show these results in percentage over the total respondents.
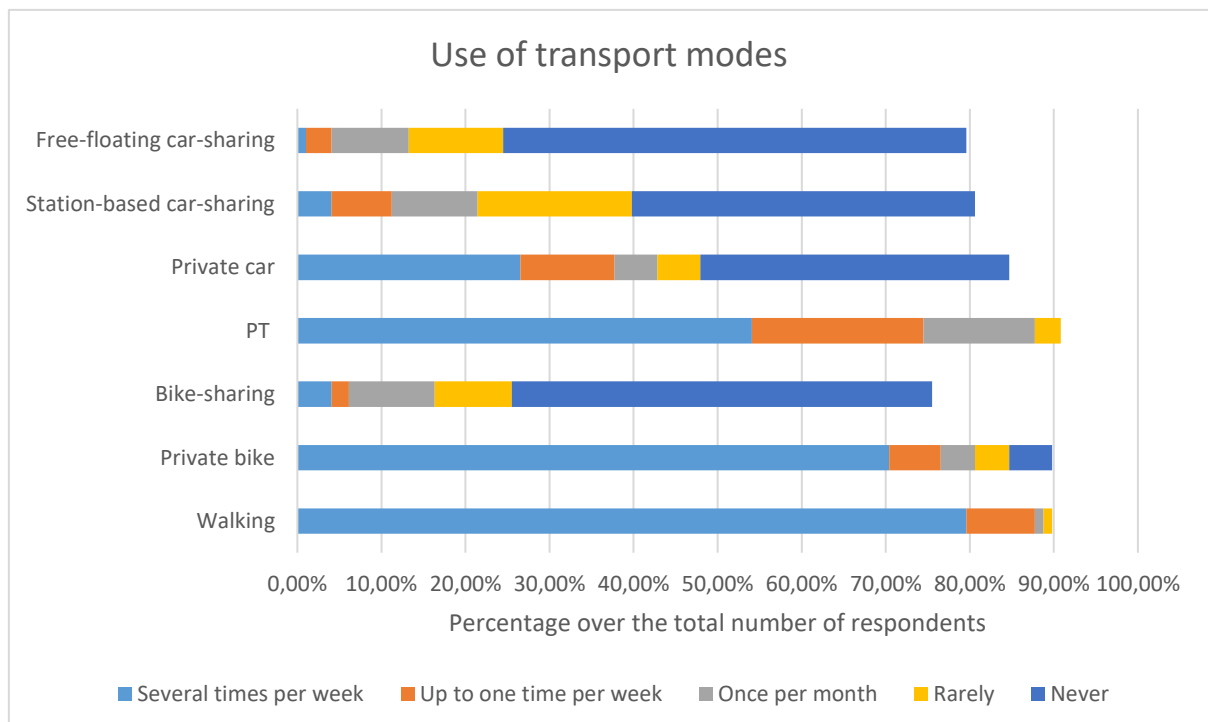
Figure 6.16 Use of transport modes. Own elaboration.

	Several times per week	Up to one time per week	Once per month	Rarely	Never
Walking	79,59%	8,16%	1,02%	1,02%	0,00%
Private bike	70,41%	6,12%	4,08%	4,08%	5,10%
Bike-sharing	4,08%	2,04%	10,20%	9,18%	50,00%
PT	54,08%	20,41%	13,27%	3,06%	0,00%
Private car	26,53%	11,22%	5,10%	5,10%	36,73%
Station-based car-sharing	4,08%	7,14%	10,20%	18,37%	40,82%
Free-floating car-sharing	1,02%	3,06%	9,18%	11,22%	55,10%

Tab. 6.7 Use of transport modes. Own elaboration.

Station based car-sharing is used by more respondents than free-floating car-sharing due to the Mobility Station. Bike-sharing show similar results to station-based car-sharing, but there are more persons using the second one several times per month. Most bike-sharing users are registered users of the mobility station if we attend to the low number of users from other platforms as it is shown in sections 6.4 and 6.5. Under this assumption, the comparison between car-sharing and bike-sharing data is consistent with the number of rentals provided in section 3.4. Most users from the Mobility Station prefer the use of cars. It is also to expect when considering that there are 2,56 bikes per household for the sample and that 70,4% of the respondents make use of their private bikes several times per week. The respondents were also asked in this question about other transport modes such as taxis or peer-to-peer sharing services like flinc. Nevertheless, the low number of responses for those options has no significant impact.

Considering walking as a transport mode, 79,6% of the sample use this mode several times per week. Since this result can be confusing, and it is not showed in the travel patterns for going to work or private activities with such a high use, it is not considered to be the most used transport mode.

Regarding the users of the Mobility Station, 91,6% state to use private bikes several times per week. The percentage for PT use among them is 75%. They show a high multimodal behaviour, at least changing between two modes of transport. This percentages fall to 61% and 44% for non-users, regardless of other factors. Nevertheless, none of both transport

modes are connected at the Mobility Station. We cannot estate from these data that the Mobility Station influences travel behaviour towards multimodality. We can just assure that the population of Domagkpark show a high bimodal and sustainable travel behaviour, especially the users of the Mobility Station and the member from cooperative building associations. However, only 5,7% of the users of the Mobility Station state to use private cars several times per week, while 41,3% of non-users do it. Use of MIT transport is therefore lower for the users of the Mobility Station.

To evaluate the modal split, the respondents were asked about the transport modes they regularly use to do certain activities. The responses were not limited to one transport mode per activity, so multimodality can be analysed. Figure 6.17 shows the results for the modal split in the categories work/ education and private trips/shopping
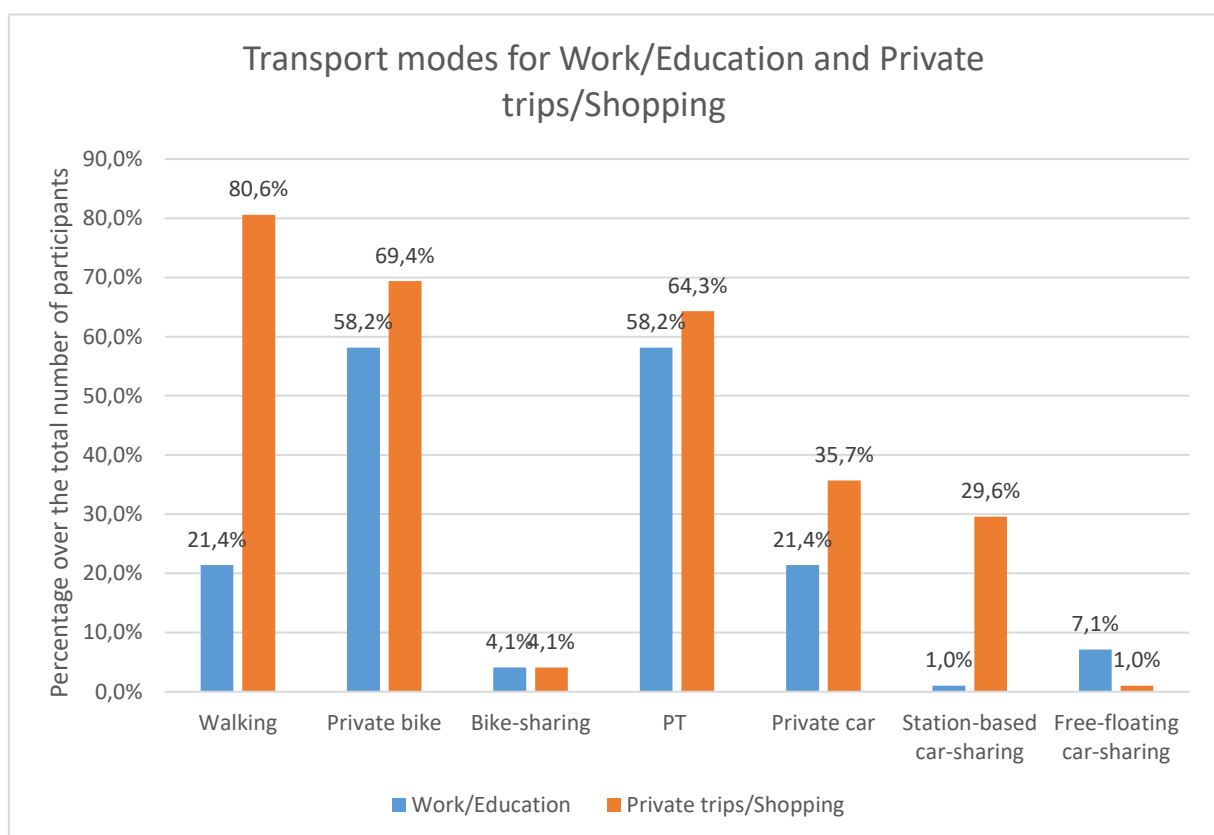
Figure 6.17 Transport modes for different activities. Own elaboration.

Regarding specific activities like going to the working place or shopping, still bike-sharing and PT are the most used transport modes. Only walking as a transport mode is chosen by more persons for private activities or shopping. It is also remarkable that private car and station-based car-sharing use increase for private activities. This is also shown for the users when regarding the questions about last trip in section 6.4. Private car is only used by 21,4% of the respondents for reaching their working/ studying places. We can conclude that the three main

modal shares are private bike, PT and private car. The same results showed the study from Ruttloff, T., 2014. Even the MIT (Motorized Individual Transport) is almost the same. The Mobility Station therefore, does not promote multimodality or impact the modal split directly. The two reasons therefore are:

- It is a private mobility station, with no connection with the main modal shares of the population of Domagkpark and located directly below their residences. Persons do not arrive to it in a transport mode to change to another.
- The travel behaviour of the inhabitants of Domagkpark is already highly multimodal without using the services of the Mobility Station.

6.1.3   User´s Survey

This section provides the results from the user´s survey. From the 98 participants in the survey, 35 (35,7%) are users of the Mobility Station. With the information from the first link, where the comparison can be made, 24 from 32 users (75%) live in a cooperative building association, and 7 from 32 users (21,9%) live in a building joint venture. Regarding the gender, 22 (62,8%) of the users are men and 11 (31,4%) are women. The other 2 users did not want to answer their gender. The use of the different vehicles, the performance and reliability of the Mobility Station and its perception, awareness and acceptance between the users are evaluated in this section.

6.1.3.1 Awareness

The first question for the users was how they became aware of the Mobility Station. Awareness is one of the selected KPIs for this evaluation. It is therefore important to know how many participants are aware from the entire sample population of the Mobility Station and how did they become aware. Figure 6.18 shows the results for this question.
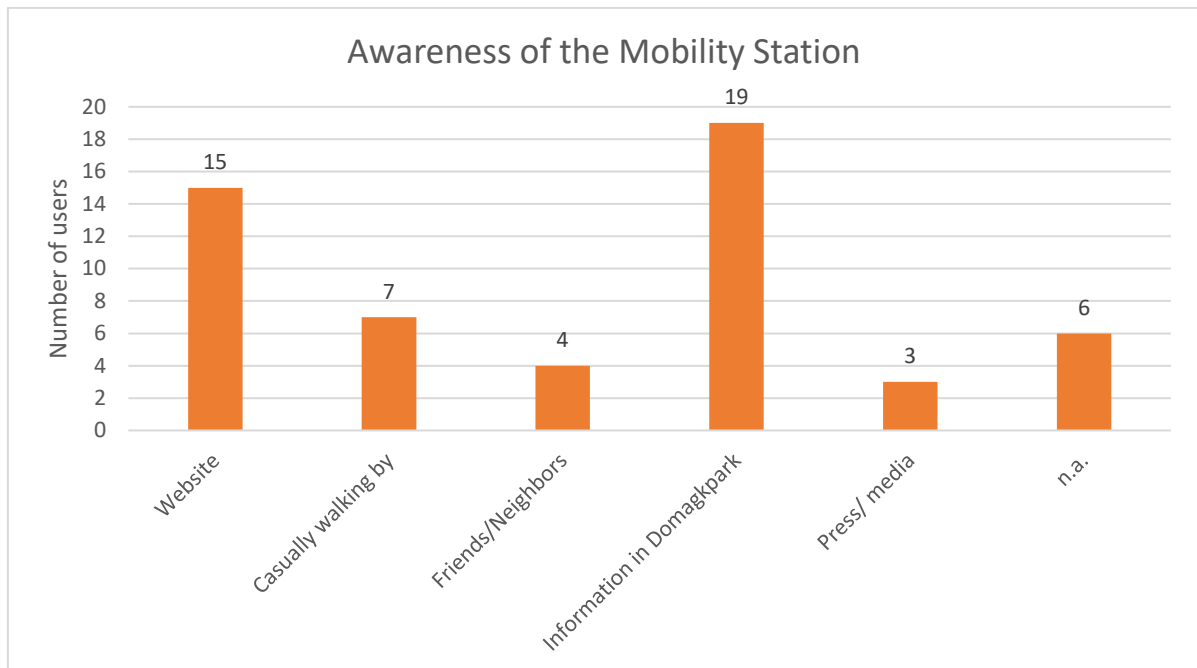
Figure 6.18 Awareness of the Mobility Station amongst the users. Own elaboration.

There was the possibility to choose more than one option. The figure shows that 19 users (54,3%) became aware of the Mobility Station through information in the district. This means events, flyers, informative meetings and all activities promoting the Mobility Station. 15 users (42,8%) became aware of the Mobility Station through the website of the neighborhood association. This means that the most users became aware through promotion actions impulsed by the consortium, STATTAUTO München and the neighborhood association, proving the effectiveness of those.

6.1.3.2 Use of the Vehicles at the Mobility Station and Last Trip

The users were asked about what vehicles of the Mobility Station they regularly use and the frequency of that use. Also, they were asked to remember their last trip with a vehicle of the Mobility Station. Last trip questions intend to know to which purposes the vehicles are booked and which other transport modes they substitute.

Figure 6.19 shows the results of the use of the vehicles at the Mobility Station.
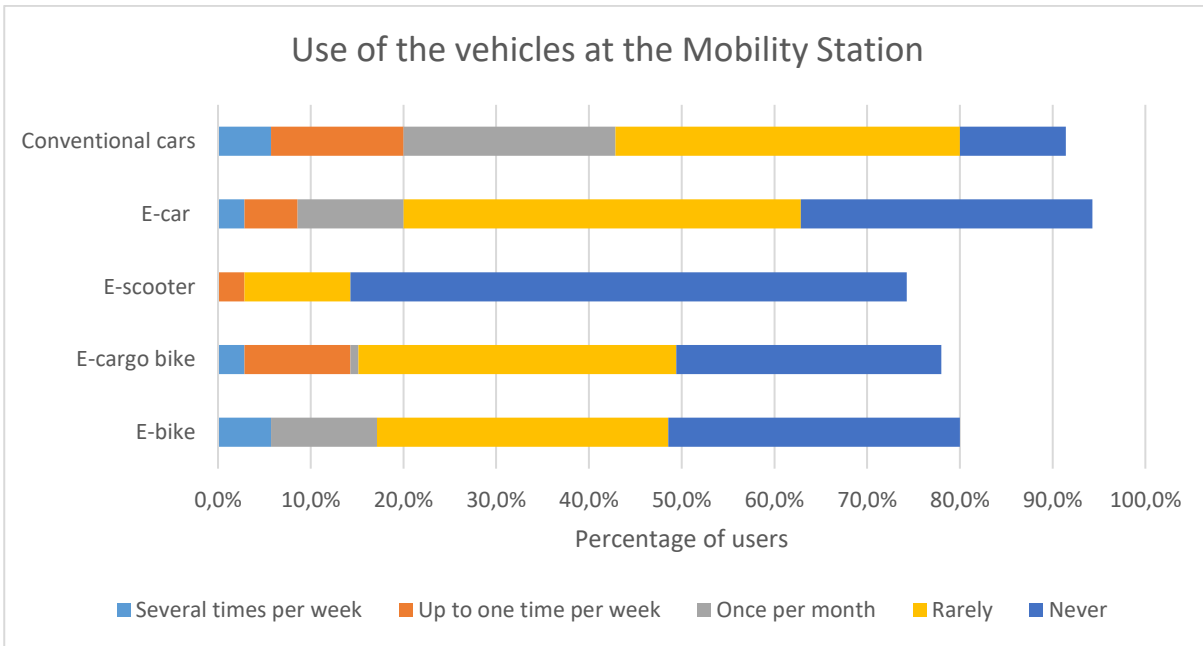
Figure 6.19 Use of the vehicles at the Mobility Station. Own elaboration.

Table 6.8 provides the results.

	Several times per week	Up to one time per week	Once per month	Rarely	Never
E-bike	5,7%	0,0%	11,4%	31,4%	31,4%
E-cargo bike	2,9%	11,4%	0,8%	34,3%	28,6%
E-scooter	0,0%	2,9%	0,0%	11,4%	60,0%
E-car	2,9%	5,7%	11,4%	42,9%	31,4%
Conventional cars	5,7%	14,3%	22,9%	37,1%	11,4%

Tab. 6.8 Use of the vehicles at the Mobility Station. Own elaboration.

The data show that the most used are the conventional cars and the e-cargo bike. E-car and e-bikes show similar results, and this is supported by the back end-data. Nevertheless, e-car have a similar number of rentals as the two e-bikes combined. The reason for the low use percentage of the e-car here is that there is only one vehicle. The back-end data show it is one

of the three most booked cars. E-scooters are used only by 2,9% of the users up to once per week. In contrast, 60% of the users state that they never use the e-scooters.

The next questions focused on the last trip. Users were asked to remember their last trip with a vehicle of the Mobility Station, the purpose of the rental and the transport mode that they would have used instead.

3 users (8,6%) rented for their last trip an e-bike. The e-cargo bike was rented by 9 users (25,7%) and e-car was rented by 6 users (17,1%). The other 17 users (48,6%) rented a conventional car. Figure 6.20 shows the results for the trips purposes. There were several answers possible for the same trip.
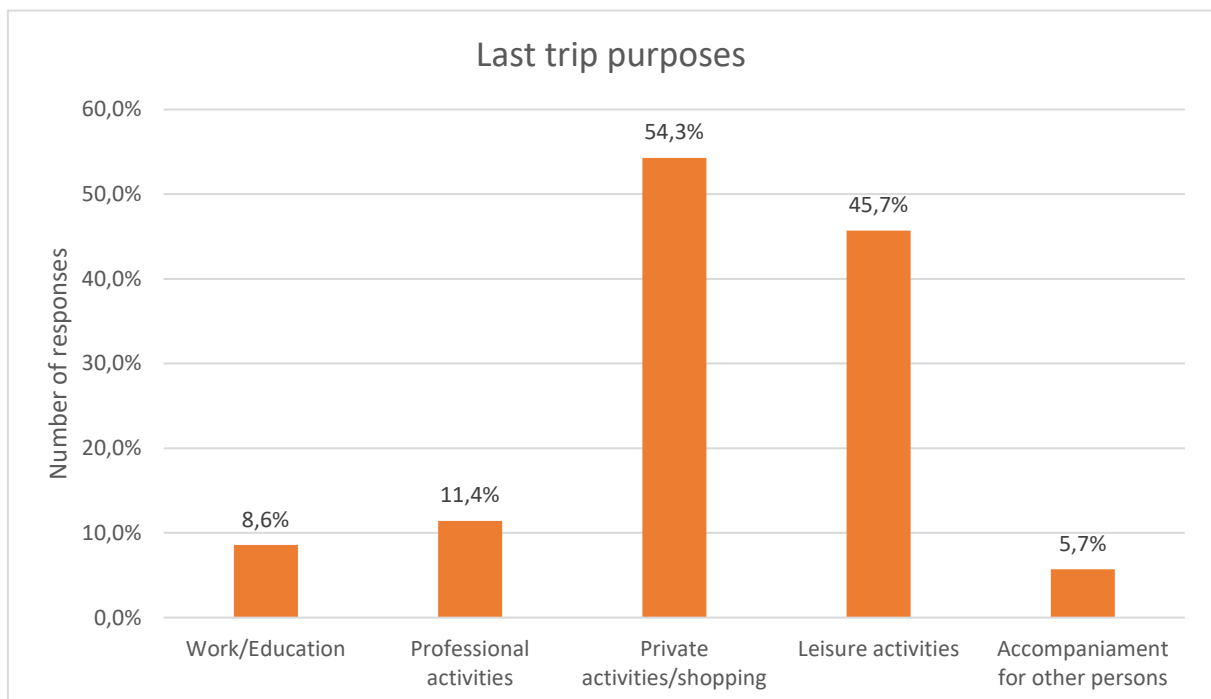
Figure 6.20 Last trip purposes. Own elaboration.

The results show that 54,3% used the vehicle for private activities/shopping while 45,7% did it for leisure activities. This is consistent with the data from the usage and the modal split. Sharing services from the Mobility Station are not integrated for the most users in their daily life, but rather used for certain activities when they have special mobility needs. E-cargo bike and cars supply a transport mode many users would not have access to otherwise. E-bikes do not have an intensive use because most of the users can use their own bikes for free.

When asked what transport mode they would have used if the Mobility Station would not have been available, 10 users (28,6%) answer a private car (own or rented), 12 users (34,3%) answer PT, 2 users (5,7%) answer a car-sharing service, 6 users (17,1%) answer a bike outside from the Mobility Station and 4 answer that they would have not realized the travel.

6.1.3.3 Reliability

Users were asked if they had encountered any difficulties while booking or using the Mobility Station. 13 of them (41,3%) answered affirmatively. Figure 6.21 shows the results for the most typical problems encountered.
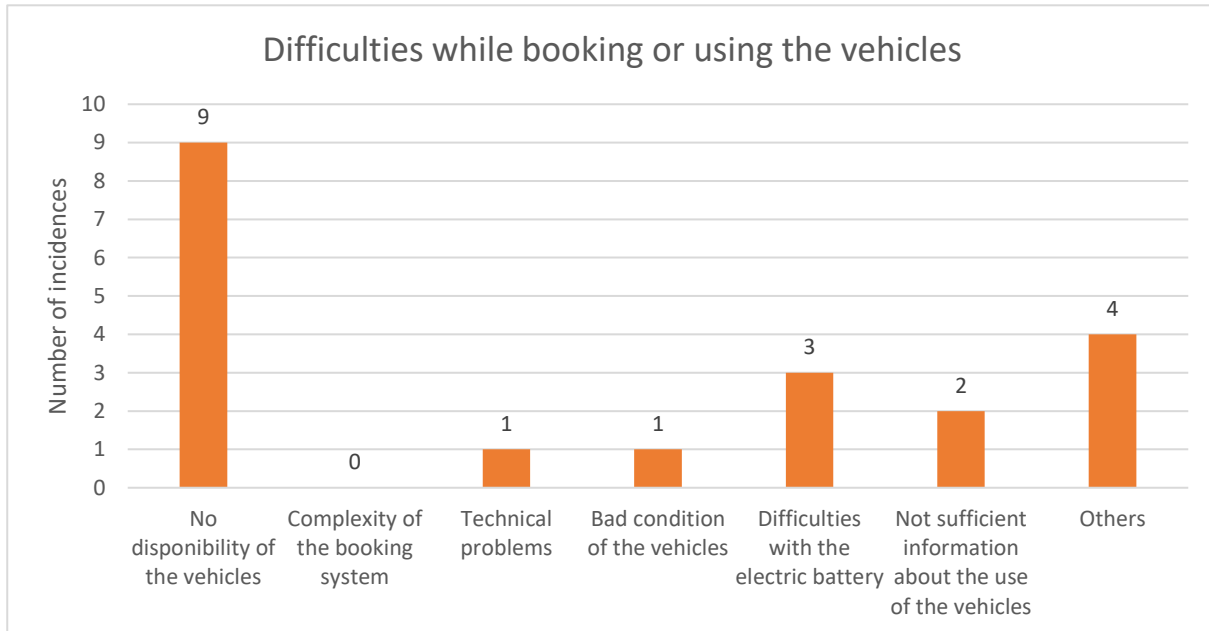
Figure 6.21 Difficulties while booking or using the vehicles

Users were able to choose more than one category and they also had a free space to leave further comments. The main problem encountered was the no availability of the vehicles. 25,7% of the total users answered that they could not find the desired vehicle. Problems encountered listed under the other categories were diverse, including problems accessing the keys for the vehicles, not finding the desired offer on the internet platform and not having sufficient information about how to use the electric vehicles. One respondent answered that the use of the Mobility Station could be increased solving the availability problems. This will be discussed in the next question in this section. Without regarding the availability of the vehicles, 31,4% of the users have found at least once a problem. Since it is not a high number or does involve severe technical problems, it must be taken into consideration for the recommendations.

The users were also specifically asked to evaluate the availability of the vehicles. The results are showed in figure 6.22.
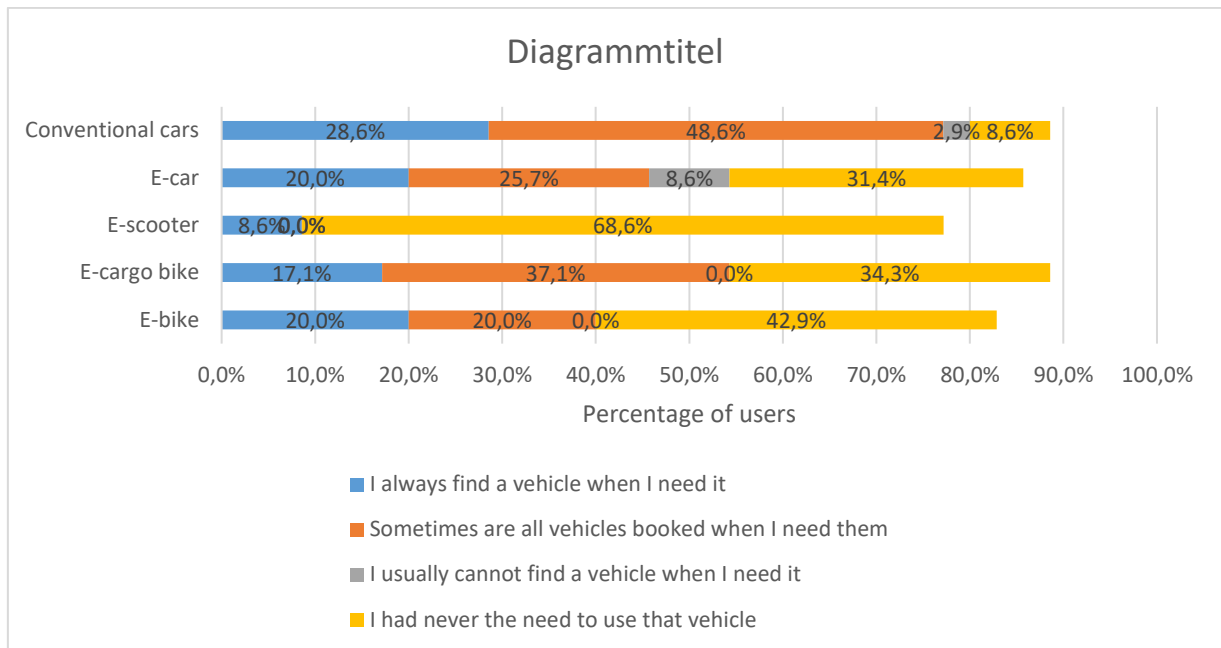
Figure 6.22 Availability of vehicles. Own elaboration.

The data show a good availability. However, sometimes vehicles needed for special purposes like the cars or vehicles with only one unit at the Mobility Station like the e-cargo bike or the e-car have availability problems. 8,6% of the respondents state that they cannot usually book the e-car. 2,9% of the respondents find the same problem for the conventional cars. Conventional cars and the e-cargo bike find occasional availability problems. 37,1 % cannot book the e-cargo bike sometimes and 48,6 % state the same about the conventional cars. The acquisition of new vehicles will be a topic of discussion in chapter 7.

6.1.3.4 Acceptance and Satisfaction

The users were asked to evaluate the prices of the Mobility Station. First, they were asked about the prices for the usage of the different vehicles. Then, they were asked about the prices of the deposit and the registration.

In general, the prices were found reasonable and even inexpensive by the users. This shows a high acceptance of the prices and system. Users consider the service to be worth the payment. Figure 6.23 shows the data combined for both questions.
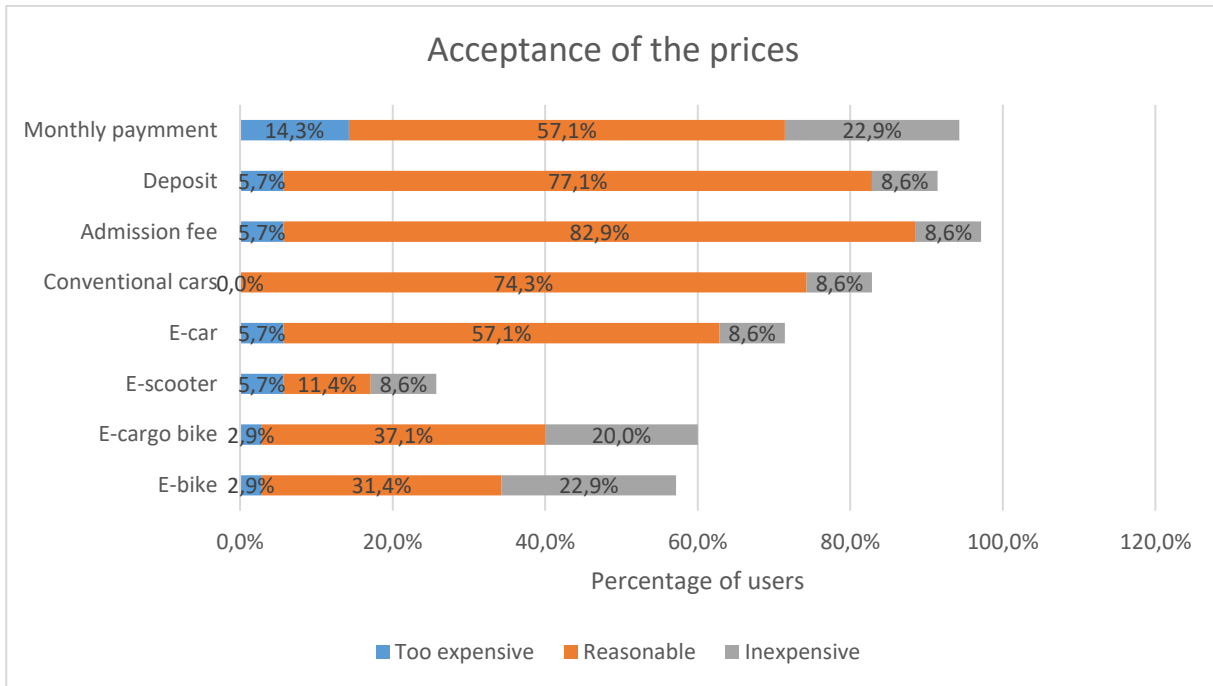
Figure 6.23 Acceptance of the prices. Own elaboration.

Next question asked the users about their general satisfaction with different aspects of the Mobility Station. Figure 6.24 shows the results.
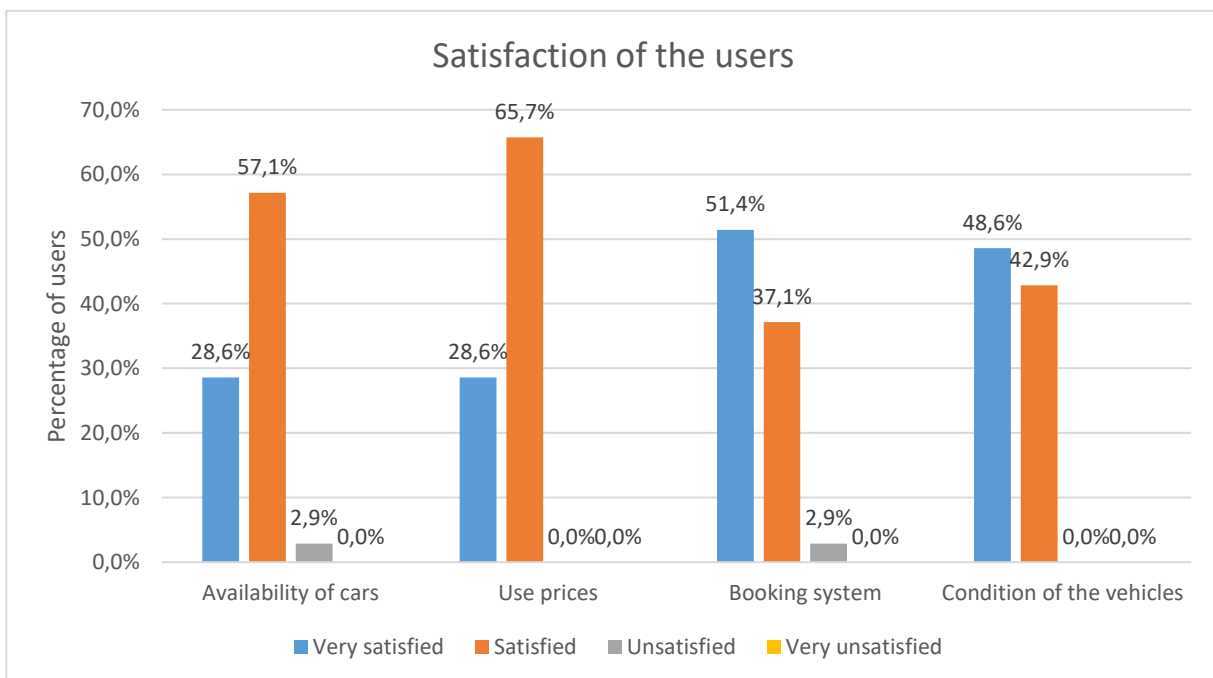
Figure 6.24 Satisfaction of the users. Own elaboration.

Users show a high acceptance and satisfaction of the system. Also, from other data obtained during this evaluation like the commentaries left in the questions, they have shown a high commitment and emotional bound with the project.

In the next question users were asked about possibilities to improve the Mobility Station. Four different options obtained from the experience of WOGENO e.G. and Domagkpark e.G. were given as options. Users could also leave commentaries and had a space in the following question to leave suggestions and petitions. 23 users (65,7%) answered the first question and 10 (28,6%) left commentaries in the next question. It was possible to choose multiple answers.

Figure 6.25 shows the results of the question.
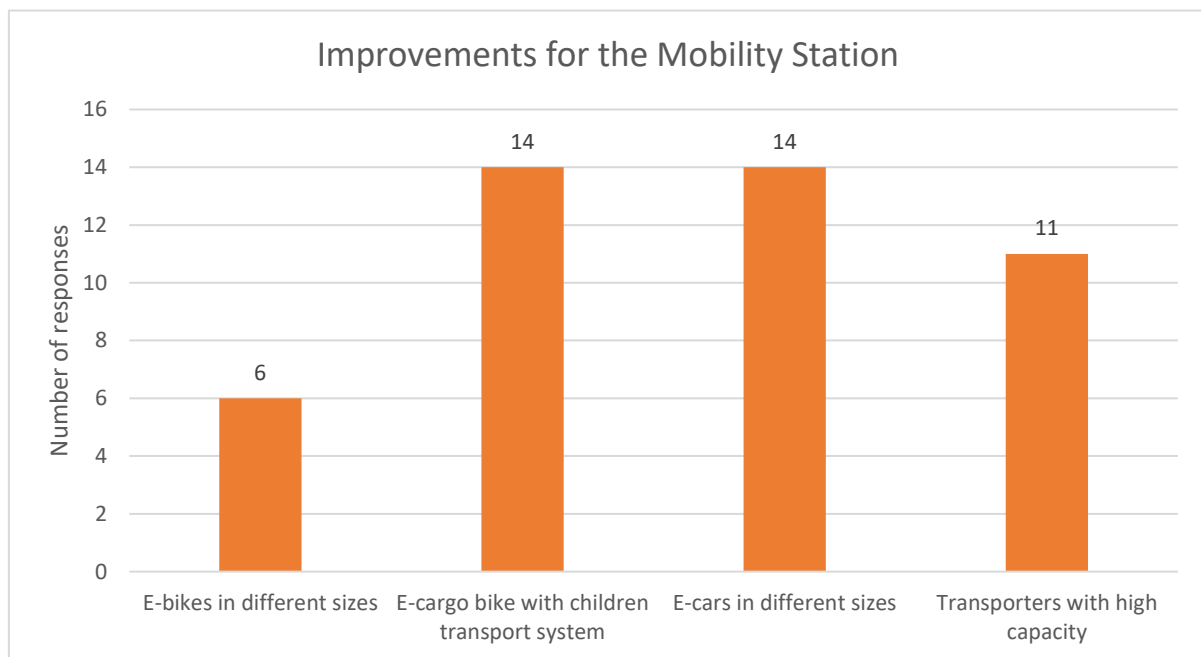
Figure 6.25 Improvements for the Mobility Station. Own elaboration.

Some of the suggestions included more e-cars and e-cargo bikes, showing a high acceptance and support for the e-mobility concept of the Mobility Station.

6.1.3.5 Use of Other Sharing Services

It was intended to know if the users of the Mobility Station were also registered for other sharing services, especially free-floating ones, and in that case to know their opinion and what characteristics from both services they considered better. The users were asked about the services from car2go, DriveNow, Call a Bike and MVG-Rad, all present in the area.

In the second question, they were asked to compare those services and the Mobility Station and had a space for commentaries.

Figure 6.26 shows the results for the first question.
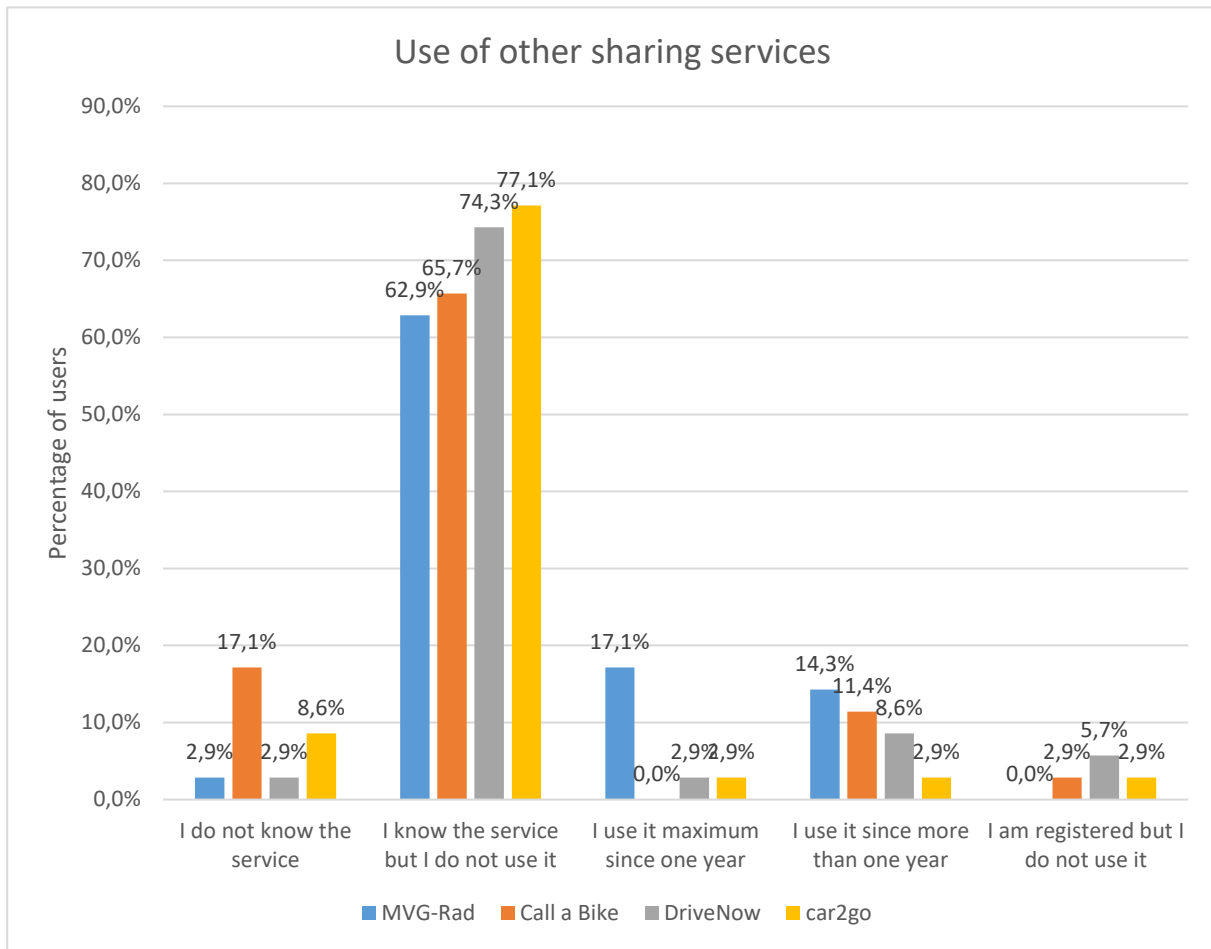
Figure 6.26 Use of other sharing services. Own elaboration.

The respondents were not obligated to answer every row; therefore, the results do not add 100%. The results show that the users of the Mobility Station know well the other sharing services in the district but only a few use them. The service with higher use between the users of the Mobility Station is MVG-Rad with 31,4% of users. Call a bike is the less known sharing service, and it is also the only one that it is not promoted or directly present in the district.

The users left some commentaries with their opinions comparing the Mobility Station and other sharing services. Even though they enumerated the benefits of not having fixed stations for free-floating car-sharing, most of the users stated to prefer the Mobility Station due to proximity, lower risk to not find a car or having a vehicle appropriate for children and better prices among others. Also, some preferred to have fixed stations because they related the concept to be simpler. These results also show the high acceptance of the users from the Mobility Station towards it. Another commentary stated that a reason to use STATTAUTO and the Mobility Station is the emotional bond to the project and to the goals of STATTAUTO of promotion of sustainable mobility.

6.1.4   Non-user´s Survey

Non-users can provide important information about awareness and acceptance of the Mobility Station. Also, it is important to know the reasons why they decline to use its offers. First, it was necessary to divide the non-users between those who were aware of the Mobility Station and those who were not. Non-users were therefore asked if they had heard about the Mobility Station before the survey. Figure 6.27 shows these results.
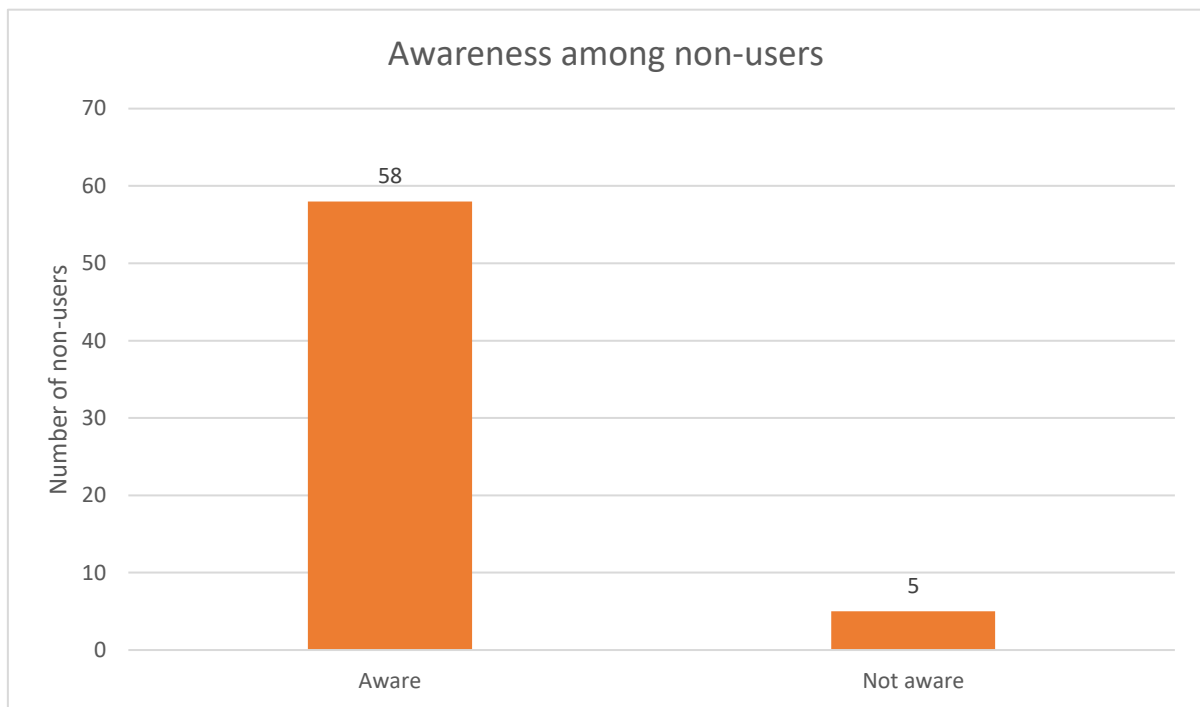
Figure 6.27 Awareness of the Mobility Station among non-users. Own elaboration.

58 of the non-users were aware about the Mobility Station (92%). Only 5 were not aware of its existence. This means that only a 5,1% of the total sample were not aware of the Mobility Station.

6.1.3.1 Aware Non-Users

The questions for aware non-users focus on knowing how they did become aware, knowing why they do not use the Mobility Station and if they could use it in the future and knowing if they use other sharing services in the area and how they do compare them with the Mobility Station.

The first question is, as for the users, how they did become aware. Figure 6.28 shows the results.
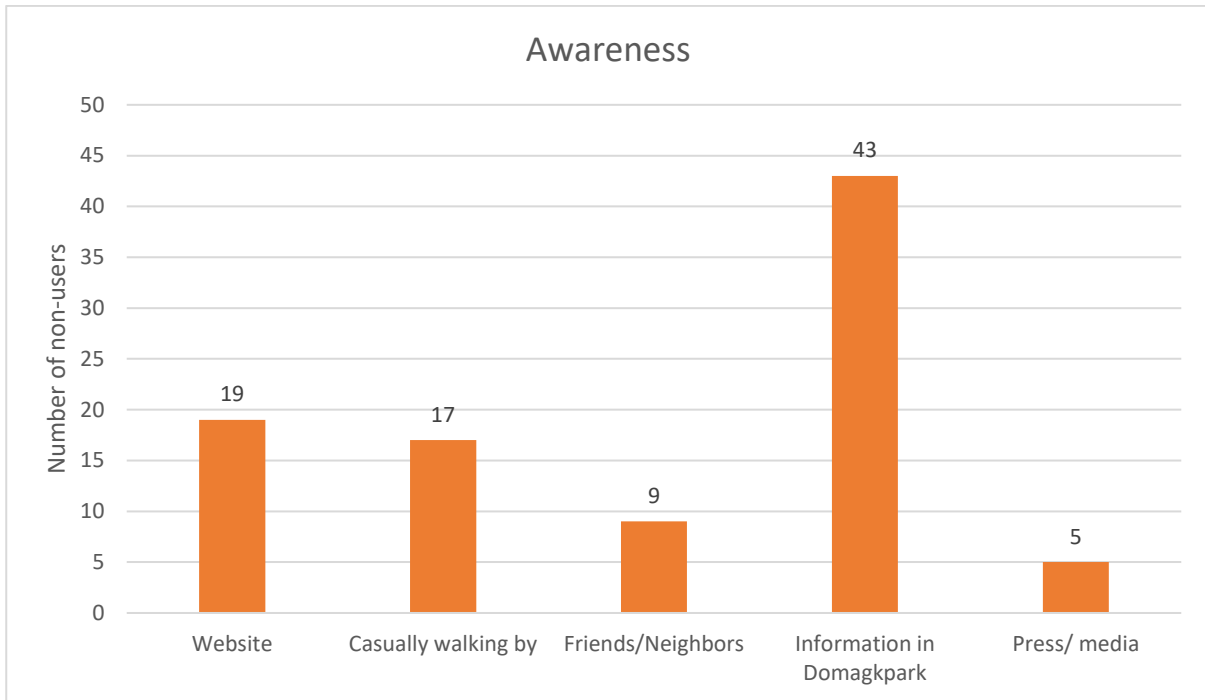
Figure 6.28 Aware non-users. Own elaboration.

There was the possibility to choose more than one option. The results are similar as those for the users. 43 non-users became aware through information in the district (74,1%). The second highest information mean was the website from Domagkpark e.G. 19 non-users (32,7%) became aware that way.

For the next question, it was asked why the non-users did not use the services of the Mobility Stations. Figure 6.29 shows the results.
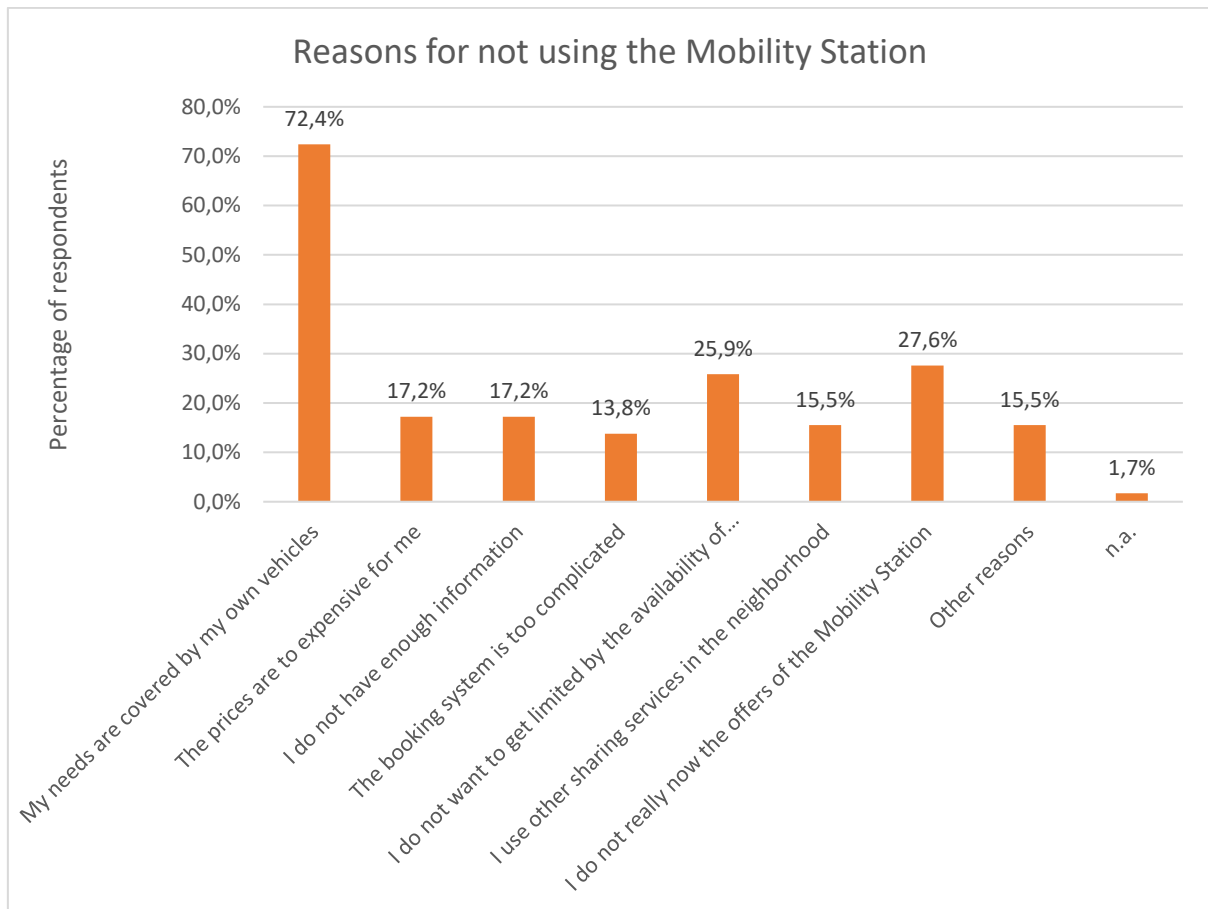
Figure 6.29 Reasons for not using the Mobility Station. Own elaboration.

The main reason for not using the Mobility Station, given by 72,4% of the respondents, was that their needs were covered through their own vehicles. This is a hard group to reach. Even though the Mobility Station has an important impact on car ownership, selling a car and starting to use sharing services is not easy for many respondents. 25,9% of the respondents stated that they did not want to get limited by the availability of vehicles. This could be improved with the addition of the 2 new Mobility Stations and the acquisition of new vehicles. Another important group states that they do not have enough information about the Mobility Station (17,2%), that the booking system is too complex for them (17,2%) and that they do not really know what the offers of the Mobility Station are (27,6%). Some persons added in the commentaries that they were already thinking about registering at the Mobility Station.

There were also a few persons who answered the survey as non-users, but stated that someone else in their households was already registered and that they used the services together.

When asking non-users if they could imagine using the Mobility Station in the future, 35 (69,3%) said yes. 8 persons (13,8%) stated that they would surely use the mobility services in the future and 27 (46,5%) stated that they would probably do.

In the next question, non-users were asked about the sharing services in the district. Figure 6.30 shows the results from the question.
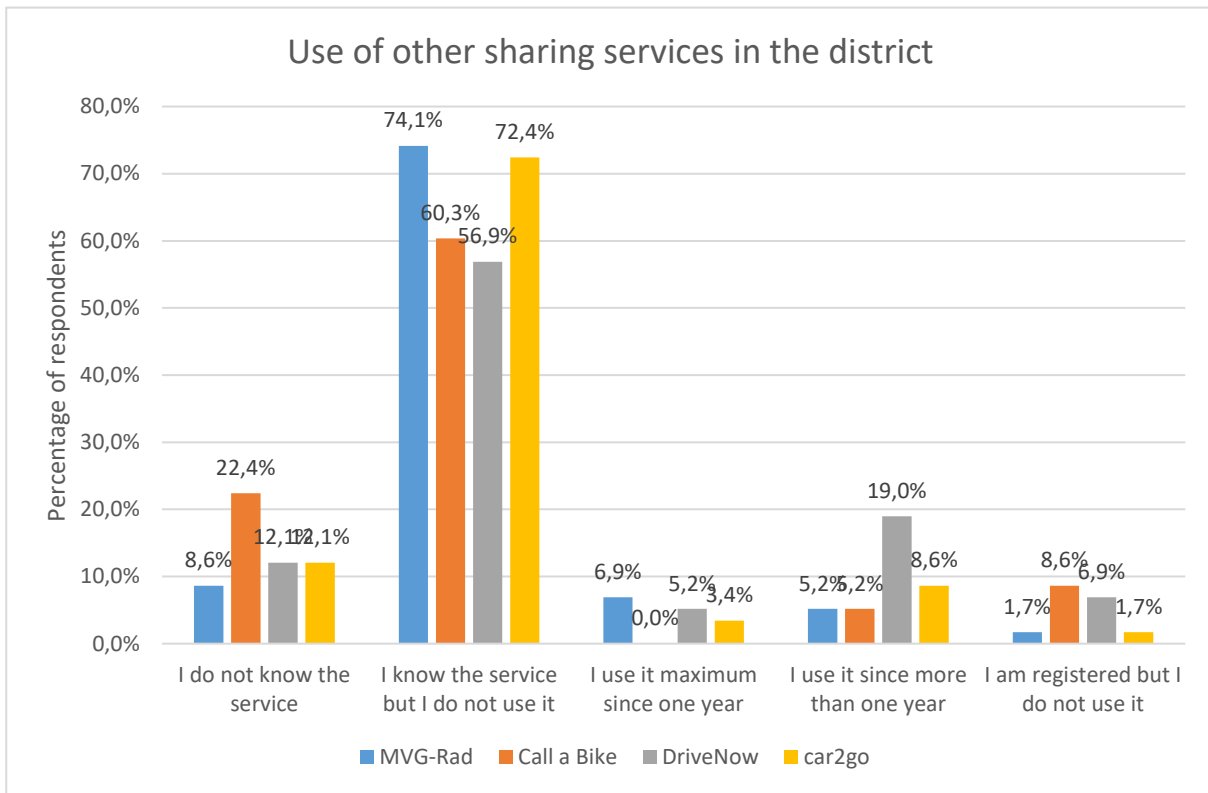
Figure 6.30 Use of other sharing services in the district among non-users. Own elaboration.

The figure shows a similar result as for the users but with an increase in the number of users of DriveNow. Non-users of the Mobility Station tend to use other car-sharing services in contrast with users that use bike-sharing schemes at most.

Non-users were then asked to give their opinion about four statements regarding the comparison between the Mobility Station and free-floating car-sharing services like DriveNow and car2go in case they used them. They also had a space to leave commentaries. Figure 6.31 shows the results.
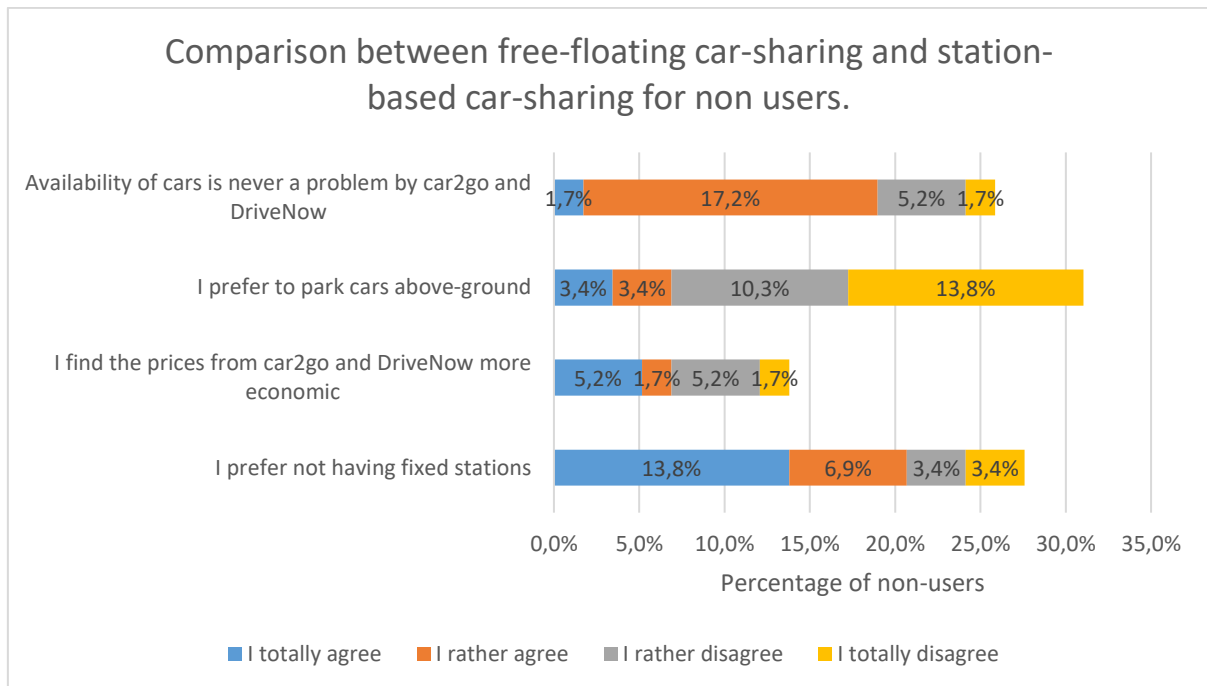
Figure 6.31 Comparison between free-floating car-sharing and station-based car-sharing for non-users. Own elaboration.

The two principal advantages from free-floating car-sharing above station-based car-sharing for non-users are not having fixed stations (20,7%) and the availability of cars (18,9%).

6.1.3.2 Not-Aware Non-Users

Only 5 respondents (5,1%) from the total sample population were not aware about the Mobility Station. These respondents were given a text with a few basic informations about the Mobility Station and a link to the website of Domagkpark e.G. They were asked to read the information and to answer if they could imagine using some of the offers of the Mobility Station in the future. Figure 6.32 shows the results.
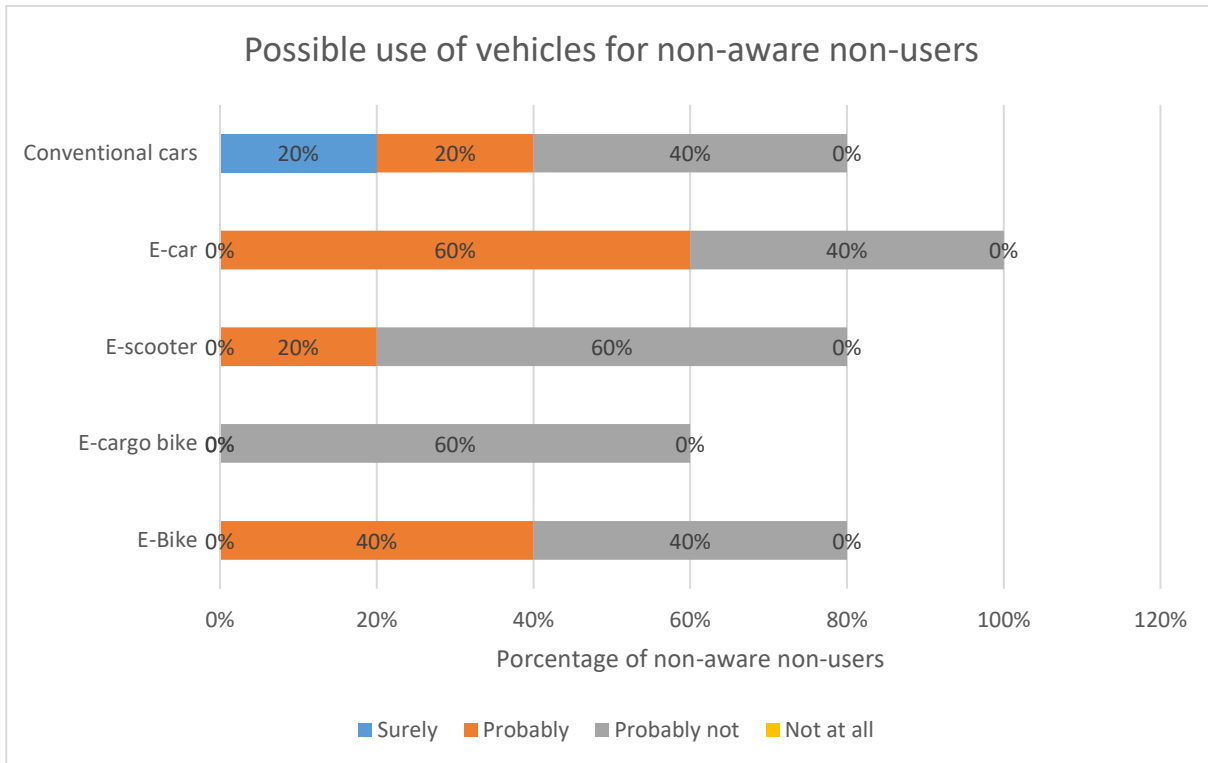
Figure 6.32 Possible use of vehicles for non-aware non-users. Own elaboration.

Cars and e-bikes are the vehicles stated to be more probably used by non-aware users. 2 persons stated that they would surely use conventional cars from the Mobility Station.

6.1.5   New Mobility Stations and Personal Beliefs

Regarding the new mobility stations that will be implemented in Domagkpark, all participants of the survey were asked if they would like to have more mobility stations. In that case they were also asked what components would they like to have in a mobility station.

39 respondents (39,7%) answered that they would like to have more mobility stations in Domagkpark. 23 (23,5%) answered that they would not like to have more mobility stations in the district and 36 (36,8%) did not gave an opinion. One user stated that he did not want to have more mobility stations but that he saw necessary to increment the number of vehicles at the existing one.

Figure 6.33 shows the results from the second question.
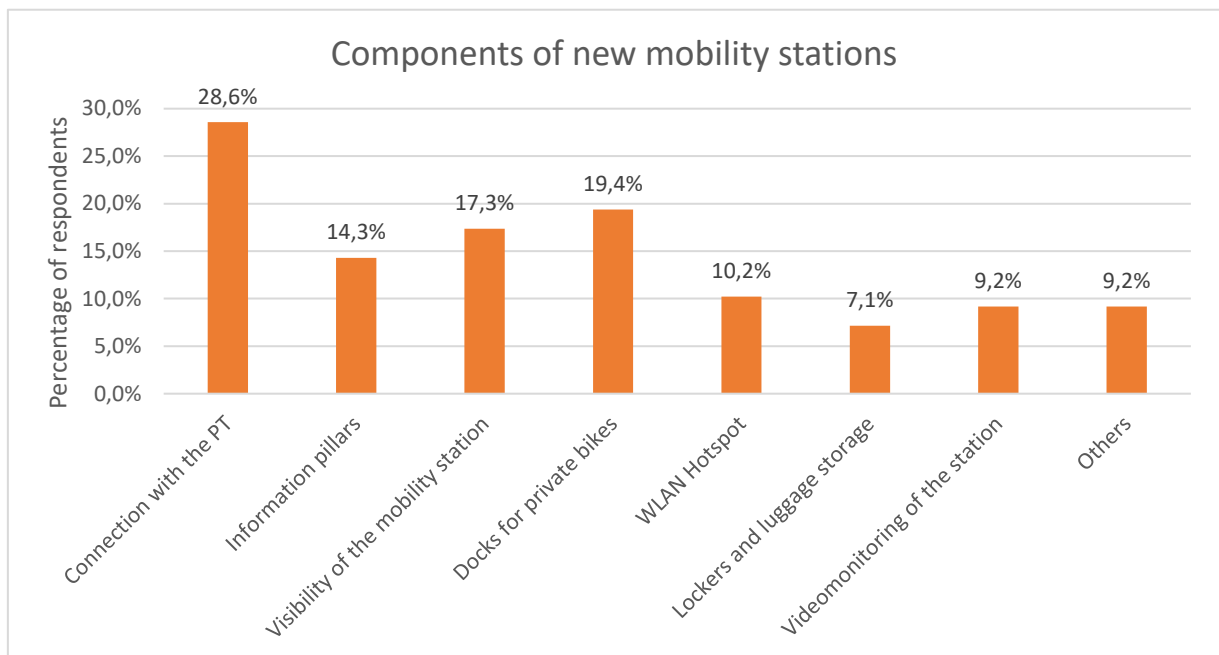
Figure 6.33 Components of new mobility stations. Own elaboration.

For 28,6% of the respondents, connection with the PT is an important aspect for a new mobility station. 19,4% would like to have docks for private bikes and 17,3 % think it is important for the mobility station to be visible.

To end the survey, the respondents were asked to give their opinion about different statements regarding their personal beliefs. Results are shown in figure 6.34.
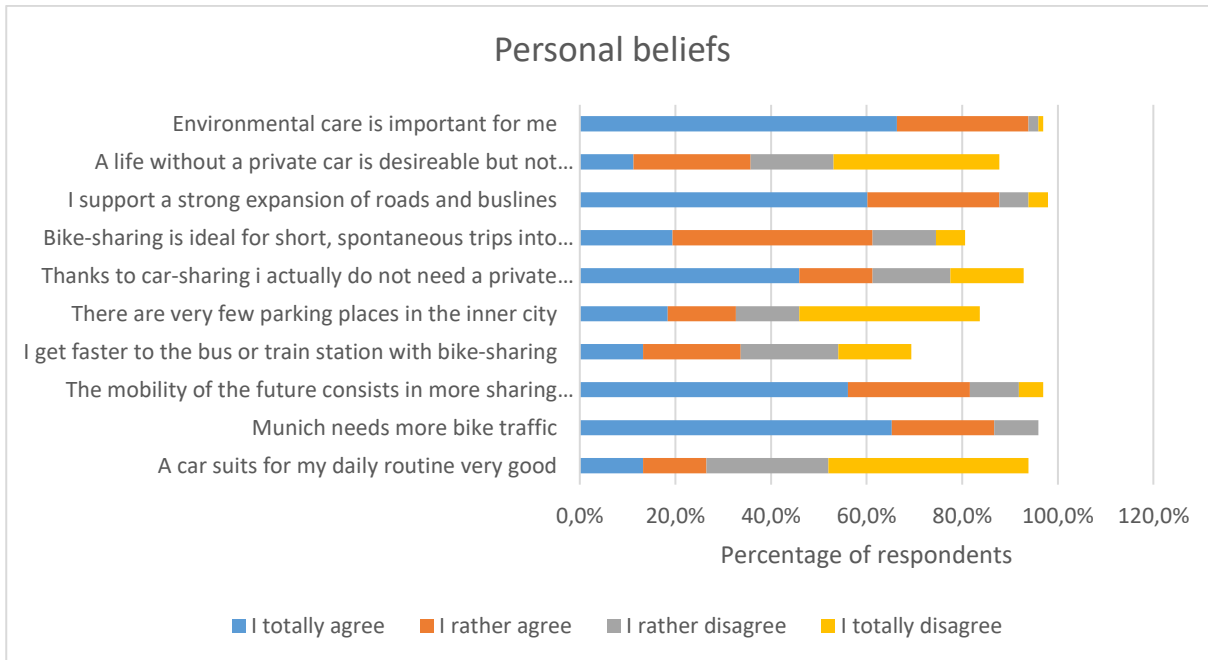
Figure 6.34 Personal beliefs. Own elaboration.

The results show a population of Domagkpark that is compromised with the environment and open to new mobility solutions and services. More than 80% of the respondents agreed that new mobility will consist in sharing services and 60% agree that thanks to car-sharing they actually do not need a car.

This can be taken into consideration when regarding the acceptance of the Mobility Station but also can be relevant for future mobility plans in the district.

6.2 Results from the Process Evaluation

This section presents the results from the process evaluation. Process evaluation consisted on 5 interviews where it was intended to search barriers and drivers for the three main different phases of the project. At the end, stakeholders took part in a learning history workshop, where the different barriers and drivers where discussed in group.

6.2.1   Interviews with the Stakeholders

The section starts with the results from the interviews. As explained in chapter 5, the interviews followed a list of prepared questions to help conducting the talk. Nevertheless, to have minimum influence on the answers of the stakeholders, most of the questions were spontaneous depending on the topics from the conversation. There were four areas in every interview; role and motivation, goals and expectations, barriers and drivers and future perspectives. The protocols for the interviews can be found in Appendix 1.

<u>Annette Eggart. Dynamo Fahrradservice Biss e.V.</u>

Dynamo Fahrradservice e.V. is responsible for the maintenance and care of the bicycles. They also take part in the informative events to promote the Mobility Station. They are therefore a technical contact partner for the users. Miss Eggart stated that they did not have any previous experience in similar projects. The motivation to take part in this one was to work with WOGENO e.G., to create 5 new jobs for unemployed persons in a new store and to increase their sales and demand. Also, they wanted to introduce themselves into e-mobility in bikes.

Some of the barriers encountered were:

- The bad condition of the e-bikes due to bad user behaviour which should be addressed through more informative events.
- The low use of the e-scooters which should be addressed through more informative events and test trips for the users.
- The fact that they had no previous experience, making the process slower.
- The vandalism and security problems.

Some of the drivers encountered were:

- The communication in the working group. All stakeholders could take decisions within their organizations and everything was fluent and fast.
- The social aspects from the population. People of Domagkpark were likely to be involved in the project.

Annette Eggart stated to be positive positioned towards new mobility stations and would like to continue cooperating in these projects. Dynamo Fahrradservice Biss e.V. was involved in the implementation and operation phase mainly and less in the planning phase.

<u>Olaf Rau. STATTAUTO München.</u>

STATTAUTO München is the main provider and operator from the Mobility Station. They are responsible for the booking system and the cars. They have an experience together with WOGENO e.G. from over 10 years. The goal of the company is to continue promoting these projects, they have already a fixed number of new projects until 2021, giving them stability and security. Olaf Rau stated that the Mobility Station is working well. The number of rentals is surprisingly high. He also explained that other users from STATTAUTO outside Domagkpark were using the service. Even though the Mobility Station is going well, the benefits do not cover the costs. However, Olaf Rau stated that the offer at the Mobility Station is rational and useful. STATTAUTO München was involved in all the phases of the project.

Some of the barriers encountered were:

- The low use of the e-scooters.

- The vandalism and security problems. This was regarded to be a new problem that could have an impact in the future.

Some of the drivers encountered were:

- The communication within the working group.
- The involvement and support of the city of Munich.
- The social aspects of Domagkpark.

He also stated that the number of rentals for the e-bikes is better than in other stations and that the offer will be increased in the future. He is positive towards new mobility stations.

Torsten Belter. KVR.

The city of Munich is supporting the Mobility Station as well as other mobility projects. Torsten Belter belongs to the traffic department of the Department of Public Order (KVR). He is the coordinator for the project and the evaluation. The motivation of the city is to promote sharing services for the citizens. They intent thereby to improve the air quality, to reduce the parking places, to reduce the car ownership and to influence the mobility behaviour of the inhabitants of Munich. The city has already experience from other projects with WOGENO e.G. and from the Mobility Station.

Torsten Belter stated that there were no political barriers but that the involvement of the city with e-mobility measures made easier to find financing. He also stated for further projects the importance to have a contact partner at the mobility station and a clear definition of the roles for bigger stations (regarding more than one provider). He also found important that there is only one booking system through STATTAUTO München. The KVR was involved during all phases of the project.

Some of the barriers encountered were:

- The low use of the e-scooters.
- The delay in the delivery of the cars: although it ended with no consequences. For the future, he recommends considering 50% longer deliver times.
- The cost-efficiency of the project. It can be done more with less money, learning for the future.

Some of the drivers encountered were:

- The involvement from WOGENO e.G. and Christian Stupka as promoters of the project.
- The support and co-financing of the city.
- The communication with the working group.
- The information about the mobility station in the neighbourhood. Mouth to mouth propaganda.

- The social aspects of the population of Domagkpark. They are more likely willing to reduce the car-ownership.

Torsten Belter stated to be positioned positive towards new mobility stations and willing to support new projects.

Maria Knorre. Domagkpark e.G.

Maria Knorre represents the neighbourhood association of Domagkpark in the working group. They are responsible for the internal communication, operation of the website, organization of events and coordination. Their goal is to promote the community life in Domagkpark and to improve the mobility services.

During this interview, almost no barriers were encountered for any phase of the project, except that the problem of the e-scooters was treated as well. Only the budget for informative events and publicity in the district seemed to be a barrier but was solved when the European Community co-financed the ECCENTRIC project. However, the learnings about the budget and resources location for this kind of events are already being applied in new districts.

Maria Knorre also stated that the project was a success and that other districts and cities around the world were learning from Domagkpark. She also stated the importance of the surveys during the planning phase for the evaluation of the population, included those carried by the cooperative building associations like WOGENO e.G. among their members. Another important assumption was, that maybe the system for a small Mobility Station like this is not necessary going to work for bigger projects. Some of the drivers encountered were:

- The involvement of WOGENO e.G.
- The social aspects of the population of Domagkpark.
- The economic aspects, even though they can be included in last point. Many inhabitants cannot afford to buy a car and therefore the Mobility Station supply their needs.
- The communication and coordination in the working group.
- The information in the district.

Domagkpark e.G. has been involved during the implementation and operation phases. Maria stated to be positioned very positive towards the Mobility Station.

Christian Stupka. WOGENO e.G.

Christian Stupka represented the cooperative building association WOGENO e.G. Until 2015 he was responsible for the mobility projects in WOGENO e.G. and was the main promoter of the new mobility concept for Domagkpark. The motivation of WOGENO e.G. for this project is to promote sustainable, ecologic mobility and to reduce construction and rental costs. WOGENO e.G. is involved in all phases of the project. Christian Stupka was involved in the planning and implementation phases.

In the interview, he stated regulatory problems with the local construction commission and construction committee to obtain permission for a reduced parking place per residence ratio. He also stated that the financing was not clear at the beginning. This work registered these problems but they will not be considered in the analysis and recommendations. The scope of this study is to evaluate the performance of the Mobility Station and to study the drivers and barriers that affected the process and that can be managed or used to give recommendations for similar projects.

Some of the barriers encountered were:

- The regulation and discussion with political agents to implement the mobility concept.
- The coordination and lack of implication of the MVG to promote PT in the district.
- The language barriers of the inhabitants of the north of the district as a possible future barrier.

Some of the drivers encountered were:

- The communication and good co-working with the other stakeholders.
- The cultural aspects of the inhabitants of Domagkpark and car-sharing members.
- The support of the city.
- The information and publicity about the Mobility Station in the district.

Table 6.9 summarizes some barriers encountered during the interviews.

Barrier	Stakeholder-Person	Phase	Category	Solution/ Learning/ Commentaries
Low use of the scooters	Dynamo-Annette/ STATTAUTO-Olaf/ KVR-Torsten/ Domagkpark e.G.-Maria/ WOGENO e.G.-Christian	Operation	Operational	People afraid of scooters. Information events with test trips.
Bad condition of the vehicles after use.	Dynamo-Annette	Operation phase.	Operational.	Bad habits of users. High reparation costs. Informative events and talks.
Cost-efficiency of the implementation	KVR-Torsten	Planning and implementation phase.	Financial/ organizational	Standardisation of the processes and learnings for the future.

Tab. 6.9 Barriers encountered during the interviews.

Table 6.10 summarizes the main drivers of the project encountered by most of the stakeholders.

Driver		Phase	Category	Commentaries
Communication with the working group	Dynamo-Annette/ STATTAUTO-Olaf/ KVR-Torsten/ Domagkpark e.G.-Maria/WOGENO e.G.-Christian	Planning/ Implementation / Operation	Communication	Quick and easy. All stakeholders could take decisions in their organizations.
Social aspects of the population of Domagkpark	Dynamo-Annette/ STATTAUTO-Olaf/ KVR-Torsten/ Domagkpark e.G.-Maria/WOGENO e.G.-Christian	Planning/ Operation	Cultural	Many users from the Mobility Station were already users from STATTAUTO.
Involvement of the city	STATTAUTO-Olaf/ KVR-Torsten/WOGENO e.G.-Christian	All phases	Political/Institutional	E-mobility, co-financing.
Particular involvement from WOGENO e.G. and Christian Stupka	KVR-Torsten/ Domagkpark e.G.-Maria/WOGENO e.G.-Christian	All phases.	Organizational	Strong driver
Informative events and activities in the district.	KVR-Torsten/ Domagkpark e.G.-Maria/WOGENO e.G.-Christian	Planning and implementation phase	Organizational	Possibility to register at the events. Mouth to mouth propaganda. Brochure.

Tab. 6.10 Main drivers of the project as stated by the stakeholders.

It was difficult during the interviews to encounter barriers. All the stakeholders showed to be very positive about the Mobility Station and could not find barriers, or stated some problems that could be solved but none of them was regarded as a barrier by them.

However, the personal interviews allow for some learning for the future and recommendations. It is important to remark that the Mobility Station has a small size and it is operated by a small group of persons in well coordination and cooperation. Also, there is only one provider and all the actors involved are committed to the project, not regarding the cost-efficiency. For larger mobility stations, the communication and role description of the participants is critical. It must be clear since the beginning who will provide what service, who will be the contact partner for the users and what the different roles for every part will be.

The stakeholders identified several drivers. All gave a big importance to the communication inside the working group. It is especially interesting that Annette Eggart (Dynamo Fahrradservice Biss e.V.) said, that the fact that all stakeholders were able to take decisions within their organization allowed a fast and good solving of problems and decision taking. In contrast, Christian Stupka stated the difficulties to get commitment of a larger organization like MVG. Communication is a key success factor for a mobility project, regardless of its size.

The support of the city and the involvement of WOGENO e.G. as the main promoter of the new mobility concept of Domagkpark were also stated as important drivers.

Two drivers supported by the results from the survey are information about the Mobility Station in the district and the social aspects of the population of Domagkpark. It was encountered in the survey, that almost 95% of the respondents were aware of the Mobility Station, and most of them became aware through information in the district. Also, the population of Domagkpark shows a different travel behaviour depending on the household group to which they belong, but for its whole, they form a very environmentally committed community willing to support sustainable mobility.

6.2.2 Learning History Workshop

The learning history workshop took place on July 10th, 2017, at the Chair of Urban Structure and Transport Planning. Five stakeholders from the project assisted; Johanna Schäfer (WOGENO e.G.), Maria Knorre (Domagkpark e.G.), Torsten Belter (KVR), Olaf Rau (STATTAUTO München) and Annette Eggart (Dynamo Fahrradservice Biss e.V.).

First, the barriers of the project were discussed. Even though they were not regarded as barriers by the stakeholders, they had the opportunity to share their point of view about different problematics. One major problem both for the users as for the stakeholders was the variety of tariffs and contracts available. Depending on the location of their house or on the type of services they want to use, users can choose among many different contracts with STATTAUTO München, which was reported to be overwhelming for them. It was suggested by Maria Knorre to have a lower number of contracts options, but the difficulties came from

combining the bike- and the car-sharing schemes as well as the different offers for the different cooperative building associations. Olaf Rau and Johanna Schäfer stated that the bike-sharing scheme was not profitable, and Olaf Rau also explained that car-sharing companies would not buy their own bikes to provide the service. However, it was stated that there is a need to simplify the contracts for the users.

Other problems during the planning and implementation were the integration of the booking system for e-bikes and other services into the car-sharing booking system from STATTAUTO München. Also, the selection of the proper vehicles for the Mobility Station without enough test trips or the develop of particular solutions for the Mobility Station like the charging systems for the e-vehicles were considered important problems. Another example was the system that STATTAUTO München had to implement for people under 18 years old. These users have access to the common box where the keys for all vehicles are. Therefore, they can pick up the keys from a car and a system had to be implemented to avoid that they could use it.

All these technical innovations were challenges during the initial phases of the project and will help to improve the planning of new mobility stations.

Regarding the low use of the-scooters, the stakeholders were asked what solutions they could find to improve their performance. Johanna Schäfer stated that some measures had already been taken, like a price reduction. Olaf Rau stated that the Mobility Station could put aside the e-scooters if the use continues to be low after a few years of service.

The population in the north of the district was also a topic of discussion regarding the barriers. Stakeholders stated that the low number of registrations among that sector of the population, is not necessary due to language barrier, but more likely due to the longer distance to the Mobility Station and the lower incomes of the persons living there in social apartments. Olaf Rau stated that the interest had increased for that sector of the population in the last informative events that were carried there, but he also stated that there was still a "deposit barrier". Most people cannot afford the deposit for the use of the Mobility Station and therefore do not register.

Considering the long distance to the Mobility Station, Olaf Rau concluded that it was probably better to have more smaller mobility points in an area rather that one big mobility station to promote the use. This is also a conclusion of the survey and was suggested by some users in the commentaries.

The discussion about the drivers of the project showed two other drivers that did not come out in the interviews; the visibility of the above-ground part of the Mobility Station and its wide offer of vehicles. For this part of the workshop, the stakeholders went to the board and explained their own notes in front of everyone. The stakeholders voted then the 3 most influencing drivers in their own opinion, resulting that the communication and co-working of the parts had been the most decisive success factor for the Mobility Station.

Finally, the stakeholders were asked about their position towards the workshop and what would they improve for future workshops. Johanna Schäfer stated that the fact that they came to the workshop without preparation or bringing anything had been very productive. This can be important for future workshops. When stakeholders are asked to assist without any preparation, they are more likely ready to participate and come up with spontaneous ideas than if they already have in mind what they want to discuss.

All stakeholders had a positive position towards the workshop. The common opinion was, that putting things together and in a discussion allowed a better sight of the topics and also allowed that new topics came out which they had not thought about.

As recommendations, Johanna proposed a secondary vote to divided the drivers between elemental or must-have drivers for a project and the other, superfluous ones. Another proposition came from Annette. She proposed to stick the points assigned to the drivers when voting instead of filling a table. So, it can be possible to see the number of votes for every driver directly.

All participants found better the second part of the workshop, when they had to stand up and present their drivers in front of the rest. They also valuated positively that they had to write their own sticky notes with the drivers and barriers.

7 Recommendations

This chapter summarizes some of the recommendations derived from the analysis of the results in chapter 6. It is divided into recommendations for the performance of the Mobility Station, recommendations for the new mobility stations that will be implemented in Domagkpark and recommendations for the impact and process evaluation.

7.1 Recommendations for the Mobility Station

The Mobility Station shows a good performance overall, however basing on the results from STATTAUTO München, the survey and the process evaluation, some recommendations to improve the performance can be made.

The low use of the e-scooter has been an important issue during the evaluation. Data show that most of the users and non-users do not even consider using it. During the process evaluation, it has been reported that some measures like price reductions have already been applied. Nevertheless, it is recommended to stop offering at least one of the two e-scooters if the trend continues as till now. One vehicle is enough to meet the needs of the users and preserve the wide offer at the Mobility Station, regarded as one of the drivers of the project.

It is recommended to add one new e-car and one new e-cargo bike to the offer, regarding the number of rentals and the number of users that stated that those vehicles have low availability. The new e-cargo bike could have a children transport system as there are many users requesting it. Regarding the number of cars, the question of adding a new car to the offer regarding the availability data is open. In that case, basing on the number of rentals, a minicompact is the final recommendation to increment the offer. Smaller cars have a higher number of rentals and the same occupancy as the bigger models. Therefore, they are used for short trips and their incrementation can also increase the number of users. The addition of one transporter is also a common request from the users.

It is recommended to find a way to decrease the number of tariff options for the users to make the Mobility Station more accessible. Regarding reaching new potential users, many non-users stated that they do not use the Mobility Station due to not having enough information. Since the information events and actions in the district have demonstrated to have a high impact on the population, it is also recommended to perform informative events regularly, especially in the sectors of the population with lower number of registrations. This could also improve the experience from users stating that they did not have had enough information when using the vehicles. Test trip and regular informative events can increase the performance of the Mobility Station.

There are some technical issues that need to be addressed. Some users stated to have found difficulties while booking the vehicles and even non-users state that the booking system seems complicated. A complete list of the difficulties encountered will be provided to all the stakeholders with the description given by the users.

7.2 Recommendations for the new Mobility Stations

The data prove, that use of the Mobility Station and car ownership reduction depend greatly on socio-economical aspects of the population, but also on the distance to the Mobility Station. Therefore, for new mobility stations, it is important to consider the previous data about the population when defining the offer. This work can serve as a baseline for the development of the new mobility stations. The number of vehicles must be defined according to the use perspectives and increased if necessary later.

It was also a result from the process evaluation, that small mobility points would be more productive than more than one big mobility stations. The goal is to reach as many people as possible. The new mobility stations therefore should be located far away from the Mobility Station, and the offer should not be as large as for the main one, especially if this one is incremented.

During the process evaluation, it was also encountered that the main factor for the success of a mobility measure is the communication between the stakeholders, but also a clear definition of the roles. This must be especially considered when working with larger organizations that have a slower response capacity. There must be a contact partner on site to improve the performance.

Learnings about the Mobility Station regarding individual technological solutions can be adapted to improve the process of developing the new ones.

From the survey data, it was obtained that the most three important aspects of a mobility station for the inhabitants of Domagkpark were the connection to the public transport, the presence of docks for bicycles and the visibility of the mobility station.

7.3 Recommendations for the Impact Evaluation

It has been reported, that the inhabitants of Domagkpark might be overwhelmed through the many events, information meetings and e-mails they receive. The response rate for future surveys could not be as high as expected. Therefore, big time intervals between surveys are recommended. It is also recommended to make surveys as short as possible.

When analysing the reduction of car ownership without a "business-as-usual" scenario, it can be important to ask the respondents if they had not only sold a car but also decided to not buy one influenced by the measure. In this survey, this was not taken into consideration. The

reason was the design of the questions to match with the survey of 2014 and the need to shorten the questionnaire. Including this kind of question can give more optimistic results, even if the actual car ownership reduction its stated and valid without them. Even if it is a subjective question, it is highly recommended to consider this approach in future surveys.

Also, the estimation of the VKT reduction can be improved asking the households directly, but the results would be more subjective and more questions would be necessary.

Taking the present work as an example, delivering two different surveys for households and persons was concluded to be unnecessary due to the low number of responses obtained from the second one. It involves much more work and delivers no better results. In opposition, doing one survey only with filters for the different groups of the sample population is highly recommended. It reduces the amount of work and simplifies the process for the respondents, avoiding misunderstandings.

Back-end data are key to understand the performance of the Mobility Station and should be obtained as secondary data when it is possible.

7.4 Recommendations for the Process Evaluation

Developing a process evaluation has demonstrated to be highly rewarding for the evaluation of the Mobility Station. It must be considered to integrate a process evaluation for every mobility measure. Many of the necessary informations to understand the process and the Mobility Station came directly through the stakeholders. It is recommended that the process evaluation takes part during the whole three phases of the project and that it is followed regularly to improve its outcomes.

It is especially recommended to introduce learning history workshops in the evaluation of the mobility measures. All the stakeholders were positive towards it and stated that it allowed to share their points of view and find useful conclusions. They also stated that not preparing the workshop from part of the stakeholders made it more productive. However, in the framework of ECCENTRIC, where different measure leaders for different mobility measures meet, it is not possible to not ask the stakeholders to prepare information for the workshop.

It was also stated by the stakeholders that it was helpful to be able to write down their own found barriers and drivers instead of giving them the themes prepared in advance.

Regarding the personal interviews, it is extremely important to set the scope of the evaluation and try to maintain the guide into that scope. Even if it is helpful to know all aspects of a process, sometimes the interviews provide information that cannot be used for the concrete goals of the evaluation.

8 Conclusions and Summary of the Results

The present chapter summarizes the conclusions of the impact and process evaluation. First, the impacts of the Mobility Station in the selected KPIs are analysed. The next section focuses on the findings of the process evaluation. Finally, the last section provides a future outlook into the concept of mobility stations and the ECCENTRIC project.

8.1 Impact Evaluation

The impact evaluation of the Mobility Station has been performed through the survey and the analysis of the back-end data. For this purpose, 6 KPIs for the measure were selected as stated in chapter 5. The impact of the Mobility Stations in these KPIs is analysed in this section.

Car ownership.reduction

The impact of the Mobility Station on car ownership reduction has been estimated to be 3,6 cars substituted for every single car of the Mobility Station. The reduction directly influenced by the Mobility Station was 13,3%, higher than the expected reduction in 2014, even though this expectation did not consider the particular impact of the measure. It is a high impact that has valuable consequences in VKT reduction and improvement of the air quality. The total car ownership ratio has been reduced from 0,85 to 0,55, 0,1 points more than the expected.

It must also be considered that the Mobility Station had been operating only for 10 months when the survey took part, and that some users stated that they would have bought a car if the Mobility Station had not existed. It is important to evaluate the car ownership reduction in the future again. Even if many inhabitants do not want to sell their cars, the number of cars bought will likely decrease so that there is not expected an increment in the car ownership.

The personal beliefs of the inhabitants of Domagkpark gathered in the survey show that more than 80% of the inhabitants agree that the mobility of the future will consist on sharing more than on possessing.

Basing on the actual car ownership reduction and on the future perspectives, the Mobility Station has had a significant impact on car ownership reduction and shows a high potential to continue influencing this indicator.

As a natural consequence of the car ownership reduction, the VKT have been reduced as well. The estimation was of 8,9% of the VKT reduced.

<u>Modal split and travel behaviour</u>

It has be found that the modal split of the inhabitants of Domagkpark has not experienced big changes since 2014. Private bike, PT and private car are still the three main modal shares. Private car is used several times per week by 26,5% of the inhabitants and 21,4% state to use it regularly to reach their working places. However, there has been an increase in the use of sharing services. While in 2014 the expected modal share of car-sharing was 0,4%, today 4,08% of the inhabitants use car-sharing several times per week.

The number of car-sharing registered member has increased from 24% to a minimum of 46%, and the number of bike-sharing registered members has increased from 14% to a minimum of 22%. Also, the number of PT monthly ticket among the inhabitants has slightly increased from 36% to 42%.

Another interesting result is obtained from the use of the vehicles of the Mobility Station. Only 5,7% of the users state that they use the conventional cars at the Mobility Station several times per week. Also, the main reasons to use the conventional cars are private and leisure activities, showing that the cars at the Mobility Station are used to supply special mobility needs, promoting a more efficient travel behaviour.

These data show, that even if the Mobility Station does not influence the modal split in the daily lives of the inhabitants of Domagkpark, it does actually influence their travel behaviour and efficiency in a positive way.

The reason why the Mobility Station does not influence the modal split, is that the most of the inhabitants of Domagkpark rely on their own private bikes and on the PT to supply their mobility needs. The other sector of the population relying on private cars are mostly non-users from the Mobility Station.

It cannot also be said that the Mobility Station influences travel behaviour towards multimodality, since the inhabitants of Domagkpark already show a high multimodal travel behaviour without considering the offers at it. Regarding intermodality, it is not expected that a private mobility station improves it. Users of the Mobility Station do not use it as a node to change from one transport mode to another.

The conclusion is that the Mobility Station has a positive impact on travel behaviour, but that it does not have a significative influence on the modal split. For the users, because they do not need the services of the Mobility Station daily, and for the non-users because they rely in their own cars. The potential to influence the modal split comes precisely from the non-users, new mobility stations and the grow of the actual Mobility Station could lead to a reduction of the MIT modal share in Domagkpark in the future.

Reliability

The reliability of the Mobility Station has been evaluated through the percentage of users that reported having had difficulties while using or booking the vehicles, and through the estimated availability problems by the users. Most of those difficulties experienced during the use or booking of the vehicles were also availability problems, so this is the main factor to be addressed. In the recommendations from chapter 8 there has already been discussed the need to increment the offer at the Mobility Station. Regarding other problems, only 31,4% of the users had found any difficulty, mostly related with the booking system. The percentage is significant and these difficulties should be addressed. However, almost no difficulties related with technical problems have been reported. Therefore, although there is space to improve, the service at the Mobility Station has shown to be reliable.

Awareness

Awareness is an important factor to evaluate the impact of a measure. It derives from actions like informative events, information in the website and others. In Domagkpark, the survey showed that 95% of the respondents were aware of the Mobility Station, and most of them stated that they did become aware through the information in the district. This means the actions taken to promote the Mobility Station have had a significant impact and were efficient.

Also, during while conducting the survey, two informative events took place, and the Mobility Station had 13 new registered members between April and July 2017 (from 108 to 121). Some non-users stated that they were actually considering registering at the Mobility Station. The informative actions have a great impact to promote the Mobility Station.

Acceptance and satisfaction

The last two selected KPIs were acceptance and satisfaction. Only 2,9% of the users stated to be unsatisfied from the booking system and the availability of the vehicles, which are the two main difficulties encountered when using or booking the vehicles. This shows the high satisfaction of the users with the system.

Users were also asked to evaluate the prices of the Mobility Station for different offers and differentiating between monthly costs, deposit and admission fee. Only 14,3% stated to find the monthly prices expensive. For the rest of the categories, this proportion fell under 6%.

Another estimator for the acceptance were the personal beliefs of the inhabitants of Domagkpark. More than 80% agreed that sharing services are the mobility of the future, and more than 60% agreed that car-sharing avoided the need to have an own car.

8.2 Process Evaluation

This section summarizes the main findings from the process evaluation, regarding the barriers and drivers encountered during the interviews and the learning history workshop.

Barriers of the project

There were not many barriers encountered during the evaluation, and there were also not big impediments for the project. Nevertheless, some problems were reported during the planning, implementation and operation phases.

Barriers were found specially when developing individual solutions for the Mobility Station, some of them technical like the implementation of the booking system combining all the offers. Other barrier was the many tariff options available for the users of the Mobility Station, regarded as inefficient and overwhelming.

All the difficulties could be solved and the learnings will be applied in the future mobility stations. Difficulties that persist nowadays can be addressed for the future measures.

Drivers of the project

There were many drivers encountered by the stakeholders that impulsed the project and allowed a successful consecution. The most important ones where the communication and co-working of the working group (especially the fact that all stakeholders belonged to small organizations and/or were able to take decisions quickly within them), the involvement of WOGENO e.G. as main promoter, the support of the city of Munich, the social aspects of the population of Domagkpark and the informative events and actions to promote the Mobility Station.

Communication within the working group was found to be the most decisive factor for the development of the project. However, for mobility projects involving more actors, or larger companies, it might not be possible to have a good communication. It is therefore important to assure that this good communication and co-working is achieved.

For new mobility stations, it is also very important as stated by the stakeholders to define the roles of all providers since the design phase. For the Mobility Station in Domagkpark there is only one provider and the scope and size of the Mobility Station are small and can be well-managed. For larger projects, it is important to assure the drivers that functioned for this project.

8.3 Future Outlook

This work shows that private mobility stations have relevant impacts on car ownership reduction and travel behavior. They can be positively implemented within communities to supply their mobility needs and promote sustainable mobility.

However, the impact depends greatly on the social aspects of the population. These need to be studied before the implementation.

In the future, two new mobility stations will be implemented in Domagkpark in the frame of the ECCENTRIC project. According to these results, the expected impact of the new mobility stations can be positive. The Mobility Station in Domagkpark still shows potential to attract new users and influence the mobility of the district.

In the next years, the car ownership reduction and number of registered members at the Mobility Station should be evaluated again. The results shown in this evaluation have been taken after only 10 months of operation, and the real impact of the measure will be visible in the future.

This work can serve as a baseline for future evaluation projects of the Mobility Station or for similar measures.

List of References

ASSOCIATION FOR PROJECT MANAGEMENT [2017]: *Stakeholder Management* [Online]. Available: https://www.apm.org.uk/body-of-knowledge/delivery/integrative-management/stakeholder-management/ [Retrieved July 25, 2017]

BBSR [2017]: *New forms of mobility, mobility stations and urban design.* Federal Institute for Research on Building, Urban Affairs and Spatial Development [Online]. Available: http://www.bbsr.bund.de/BBSR/EN/RP/ExWoSt/Studies/forms-of-mobility-mobility-stations/01-start.html?nn=1207450&notFirst=true&docId=1207446 [Retrieved July 12, 2017]

BBSR [2015]: *New forms of mobility, mobility stations and urban design.* Bonn: Bundesinstitut für Bau- Stadt- und Raumforschung.

BEUERMANN, C., BÖHLER, S., KOSKA, T., REUTTER, O. [2010]: *Evaluationskonzept für die Modellvorhabe Innovative öffentliche Fahrradverleihsysteme.* Wuppertal: Wuppertal Institut.

BELTER, T. [2016]: Eccentric. Site & Partner presentation Munich (Presentation).

BUNDESVERBAND CARSHARING [2017a]: *Geschichte* [Online] Available: https://carsharing.de/alles-ueber-carsharing/ist-carsharing/geschichte [Retrieved July 16, 2017]

BUNDESVERBAND CARSHARING [2017b]: *Begriffsbestimmung* [Online] Available: https://carsharing.de/alles-ueber-carsharing/ist-carsharing/begriffsbestimmung [Retrieved July 16, 2017]

BUNDESVERBAND CARSHARING [2017c]: *Aktuelle Zahlen und Daten zum CarSharing in Deutschland* [Online] Available: https://carsharing.de/alles-ueber-carsharing/carsharing-zahlen [Retrieved July 16, 2017]

CHAIR OF URBAN STRUCTURE AND TRANSPORT PLANNING, TUM [2016]: ECC Initial Measure Description (Presentation).

CIVITAS [2017a]: *About CIVITAS* [Online]. Available: http://civitas.eu/about [Retrieved July 12, 2017]

CIVITAS [2017b]: *CIVITAS 2016-2020. What is CIVITAS?* Presentation.

CIVITAS [2017d]: *ECCENTRIC* [Online]. Available: http://civitas.eu/eccentric [Retrieved July 27, 2017]

DZIEKAN, K., RIEDEL, V., MÜLLER, S., ABRAHAM, M., KETTNER, S. & DAUBITZ, S. [2013]: *Evaluation matters. A practitioner's guide to sound evaluation for urban mobility measures.* Münster: Waxmann Verlag GmbH.

DOMAGKPARK E.G. [2017a]: *Mobilität. Informationen* [Online]. Available: https://www.domagkpark.de/mobilitaet-informationen.html [Retrieved July 26, 2017]

DOMAGKPARK   E.G.   [2017b]:   *Akteure*   [Online].   Available: https://www.domagkpark.de/akteure.html [Retrieved July 26, 2017]

DOMAGKPARK   E.G.   [2017c]:   *Entstehungsgeschichte*   [Online].   Available: https://www.domagkpark.de/entstehungsgeschichte.html [Retrieved July 26, 2017]

DOMAGKPARK E.G. [2017d]: *Vielfältig Mobil im Neuen Quartier.* Munich: Konsortium Domagkpark.

DYNAMO FAHRRADSERVICE BISS E.V. [2017]: *Startseite* [Online]. Available: http://www.dynamo-muenchen.de/ [Retrieved July 23, 2017]

DEMAIO, P. [2009]: Bike-sharing: History, Impacts, Models of Provision, and Future. *Journal of Public Transportation, 12(4),* 41-56.

FINKE, T. [2009]: *Handlungsleitfaden für die Evaluation von Mobilitätsmanagement-Programmen.* Dissertation, RWTH Aachen.

GEWOFAG [2017]: *Profil* [Online]. Available: https://www.gewofag.de/web.nsf/id/profil-gewofag [Retrieved July 26, 2017]

HELLER, E. [2016]: *Evaluation of Mobility Stations in Offenburg. Assessment of Perception and Acceptance of an Integrated Multimodal Mobility Service and Potential Changes on Mobility Behavior.* M.Sc. Environmental Engineering Master´s Thesis, Technische Universität München.

HOVÁRTH & PARTNERS [2015]: *New Mobility* [Online]. Available: https://www.horvath-partners.com/en/competence/mobility/new-mobility/ [Retrieved July 15, 2017]

HÜETLIN, T. [August 28, 2013]: Car-Sharing Gears Up in German Cities. *Der Spiegel* [Online]. Available: http://www.spiegel.de/international/zeitgeist/car-sharing-increasingly-popular-in-german-cities-a-913891.html [Retrieved July 16, 2017]

INTERNATIONAL ORGANIZATION FOR MIGRATION [2015]: *World Migration Report 2015. Migrants and Cities: New Partnerships to Manage Mobility*. Geneva: International Organization for Migration.

JANSEN, H., GARDE, J., BLÄSER, D., & FRENSEMEIER, E. [2015]. Städtische Mobilstationen. In *Entscheidungen beim Übergang in die Elektromobilität* (pp. 515-532). Springer Fachmedien Wiesbaden.

KRISMANSKI, H. [2015]: *Mobilitätsstationen – Räumliche Verknüpfung von Mobilitätsangeboten.* Technische Universität Berlin, Institut für Stadt- und Regionalplanung, Neuruppin.

KNORRE, M. & ALARCOS, A. [2017]. Personal interview for the process evaluation.

LANDESHAUPTSTADT MÜNCHEN [2012]: *Ehemalige Funkkaserne, das neue Stadtquartier im Norden Schwabings.* Brochure. Munich: Landeshauptstadt München. Referat für Stadtplanung und Bauordnung.

LANDESHAUPTSTADT MÜNCHEN [2013]: *Von der Kaserne zum Stadtquartier.* Referat für Stadtplanung und Bauordnung. Munich: Weber Offset GmbH.

LANDESHAUPTSTADT MÜNCHEN [2017]: *Allgemeine Fragen zur Radlhauptstadt München* [Online]. Available: https://radlhauptstadt.muenchen.de/ueber-uns/faqs/ [Retrieved July 17, 2017]

LÓPEZ, H. [2016]: KPIs for the ECCENTRIC Project [Presentation]. Technische Universität München.

LENZ, B., FRAEDRICH, E. [2016]: *New Mobility Concepts and Autonomous Driving: The Potential for Change.* In Maurer, M., Gerdes, J.C., Lenz, B., Winner, H. (Ed.), *Autonomous Driving. Technical, Legal and Social Aspects* (pp. 173-191) [Online].

LIPPELT, J. [2013]. Worldwide Bike Sharing Programmes. *DICE Report*, *11*(4), 50.

LUGINGER, L. [2016]: *Success Factors of Integrated Multimodal Mobility Services.* M.Sc. Environmental Engineering Master´s Thesis. Technische Universität München.

MIDGLEY, P. [2009]. The role of smart bike-sharing systems in urban mobility. *Journeys*, *2*(1), 23-31.

MIRAMONTES, M., PFERTNER, M., SHARANYA RAYAPROLU, H., SCHREINER, M. & WULFHORST, G. [2016]: *Impacts of a Multimodal Mobility Service on Travel Behavior and Preferences: User Insights from Munich´s First Mobility Station.* Technische Universität München, Chair of Urban Structure and Transport Planning.

MOSS, M., O´NEILL, H. [2012]: *Urban Mobility in the 21st Century* [Online]. Available: https://wagner.nyu.edu/files/rudincenter/NYU-BMWi-Project_Urban_Mobility_Report_November_2012.pdf [Accessed July 12, 2017]

MÜNCHNER VERKEHRSGESELLSCHAFT MBH [2015]: *Mobility Station Münchner Freiheit – Facts and Figures* [Online]. Available: https://www.mvg.de/dam/mvg/services/mobile-services/mobilitaetsstation/flyer-mobilitaetsstation-muenchner-freiheit.pdf [Retrieved July 12, 2017] Brochure. Munich: Münchner Verkehrsgesellschaft mbH.

MÜNCHNER VERKEHRSGESELLSCHAFT MBH [2017a]: *Das Mietradsystem MVG-Rad* [Online]. Available: https://www.mvg.de/services/mobile-services/mvg-rad.html [Retrieved July 17, 2017]

MÜNCHNER VERKEHRSGESELLSCHAFT MBH [2017b]: *Minifahrplan U6* [Online]. Available: https://www.mvg.de/dam/mvg/minifahrplaene/2017/u-bahn/mvg-miniplan-u6.pdf [Retrieved July 20, 2017]

NOBIS, C. [2017]: *Multimodale Vielfalt. Quantitative Analyse multimodalen Verkehrshandelns.* Doctoral Thesis, Humboldt Universität zu Berlin. Berlin.

PFERTNER, M. [2017]: *Evaluation of Mobility Stations in Würzburg – perceptions, awareness and effects on travel behavior, car ownership and CO_2 emissions.* M.Sc. Transportation Systems Master´s Thesis, Technische Universität München.

RUTTLOFF, T. [2014]: *Modellquartier für Nachhaltige Mobilität – welche Mobilitätsbedürfnisse haben die zukünftigen Bewohner des Domagkparks und welche Empfehlungen ergeben sich für ein Quartiersbezogenes Mobilitätskonzept?* M.Sc. Environmental Engineering Master´s Thesis, Technische Universität München.

MARTIN, E. W., & SHAHEEN, S. A. [2011]: Greenhouse gas emission impacts of car-sharing in North America. *IEEE Transactions on Intelligent Transportation Systems*, *12*(4), 1074-1086.

MARTIN, E., SHAHEEN, S., & LIDICKER, J. [2010]: Impact of car-sharing on household vehicle holdings: Results from North American shared-use vehicle survey. *Transportation Research Record: Journal of the Transportation Research Board*, (2143), 150-158.

RAU, O. & ALARCOS, A. [2017]: Personal interview for the process evaluation.

SPICKERMANN, A., GRIENITZ, V. & VON DER GRACHT, H.A. [2013]: Heading towards a multimodal city of the future? *Technological Forecasting and Social Change*, 14, 201-221.

STATTAUTO MÜNCHEN [2017a]: *Station Domagkpark* [Online]. Available: https://www.stattauto-muenchen.de/station/?station=3504 [Retrieved July 22, 2017]

STATTAUTO MÜNCHEN [2017b]: *Über uns* [Online]. Available: https://www.stattauto-muenchen.de/ueber-uns/ [Retrieved July 22, 2017]

UITP [2017]: *CIVITAS SATELLITE* [Online]. Available: http://www.uitp.org/civitas-satellite [Retrieved July 28, 2017]

UNITED NATIONS. [2016]: *Mobilizing Sustainable Transport for Development* [Online]. Available: https://sustainabledevelopment.un.org/content/documents/2375Mobilizing%20Sustainable%20Transport.pdf [Accessed July 17, 2017]

UNITED NATIONS. UNITED NATIONS HUMAN SETTLEMENT PROGRAM (UN-HABITAT) [2013]: *Planning and Design for Sustainable Urban Mobility. Global Report on Human Settlements 2013.* Simultaneously published in the USA and Canada: Routledge.

VAN ROOIJEN, T., NESTEROVA, N. & GUIKINK, D. [2013]: *CIVITAS WIKI – Coordination, evaluation and dissemination of CIVITAS PLUS II.* CIVITAS Initiative.

VOLKERS, N. [2014]: *Mobilitätskonzept Siedlung Domagkpark (Funkkaserne). Eckpunkte und Begründungen für reduzierten Stellplatzschlüssel* [Online]. Available: https://www.domagkpark.de/presse.html [Accessed July 20, 2017]

WOGENO E.G. [2017]: *Die WOGENO-Idee* [Online]. Available: https://www.wogeno.de/ueber-uns/die-wogeno-idee.html [Retrieved July 26, 2017]

WAGNIS E.G. [2017]: *Über Wagnis* [Online]. Available: http://www.wagnis.org/wagnis/ueber-wagnis.html [Retrieved July 26, 2017]

WEHMEIER, T., BAMBERG, S., BECKMANN, K.J., DZIEKAN, K., GERTZ, C., JUST, U., KLEINWÄCHTER, E., MOTZKUS, A., MÜHLENBRUCH, I., WIELAND, B., WILKE, G., WÜRDEMAN, G. & WULFHORST, G. [2012]: *Hinweise zur Evaluation von verkehrsbezogenen Maßnahmen.* Köln: Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV).

WULFHORST, G., PRIESTER, R. & MIRAMONTES, M. [2013]: *What Cities Want -   How cities plan future mobility.* Technische Universität München, Chair of Urban Structure and Transport Planning. Munich: MAN SE Corporate Communications, Public Affairs.

List of Figures

List of Tables

Appendix 1: Interviews with the Stakeholders

The protocols for the 5 interviews are provided in this Appendix in english.

1. Annette Eggart (Dynamo Fahrradservice Biss e.V.)
2. Olaf Rau (STATTAUTO München)
3. Torsten Belter (KVR, LHM)
4. Maria Knorre (Domagkpark e.G.)
5. Christian Stupka (WOGENO e.G.)

Interview with Anette Eggart (Dynamo Fahrradservice Biss e.V.)

Date: 16/5/2017

Start: 09:15

End: 10:20

1 Role and Motivation

-   Dynamo is a small organization dedicated to sell, repair and recycle bikes. Focus: help long term job-seeking workers and migrants. Social entrepreneurship. Training programs.
-   Maintenance of the bicycles in Domagkpark. Technical contact person for users.
-   Information events for the users.
-   Motivation to work with WOGENO e.G.: social engagement, exciting project.
-   Other motivation: development thrust to e-mobility without cars.
-   No previous experience.

2 Goals and Expectations

-   Create 5 new jobs for unemployed persons in a new store.
-   Increase in sales and demand.

3 Barriers and Drivers

-   Problem with scooters (barrier, operation phase): users might not know how to drive it. They could be scared about it. Solution: new information events and trial trips for the scooters.
-   New project with new models and no previous experience (barrier, planning phase). Time losses. Experience gained for new projects.
-   Technical aspects (barrier, planning phase): connection of the e-bikes at the docks, protection from stealing. Experience gained for new projects.
-   Not many direct communication with WOGENO e.G. Main contact partner: Olaf Rau (STATTAUTO München) (driver, planning phase). Fast decision making. Good communication.
-   Pragmatic working during the operation phase. Communication through STATTAUTO München. Notification of problems.
-   User behavior (barrier, operation phase). Bad condition of the vehicles after use. High reparation costs. However, not involved economically.
-   Booking system could be simplified (barrier, operating phase).
-   Social aspects from the population of Domagkpark (driver, operating phase).

- Information events (driver, operating phase). Can be designed more practical with test trips.
- Communication during the process (driver, planning phase). Persons in charge must be able to take decisions quickly to make it work (small organizations).
- 3 times per year: basic cleaning. Maintenance without waiting for problems.

4 Future Perspectives

- Positive towards new stations.
- Technical optimization, connection of bikes to the docks.
- Development has not ended: new models (senior bikes, three-wheel-vehicles).
-

Interview with Olaf Rau (STATTAUTO München)

Date: 18/5/2017

Start: 09:10

End: 10:15

1 Role and Motivation

- Service provider. Main operator.
- Over 10 years together with WOGENO e.G. More mobility stations. In total 15 projects before.
- Reduction of parking places.
- No more social entrepreneur (too big market presence today)

2 Goals and Expectations

- Station-based car-sharing with a fixed network. New mobility stations planned till 2021: security, stability.
- Good use of the vehicles. Surprisingly high utilization. Also, other users from STATTAUTO use the Mobility Station.
- Future: new mobility nodes: Parkstadt-Schwabing.

3 Barriers and drivers

- Low use of the e-scooters (barrier, operating phase): more information events.
- Good working group (driver, planning and operating phase): uncomplicated.
- Good preparation, several meetings in the planning phase.
- Early start (driver, planning phase).
- Support from the city (driver, all phases).
- Complicated implementation of the e-bike booking system in the general system from STATTAUTO München (barrier, implementation phase). Learnings for the future.
- No problems with the offer of PT monthly tickets, but some disappear (barrier, operation): additional fee for delays.
- Good condition of the vehicles.
- Mobility Station well designed technologically (security of the cars). Goal for all mobility stations.
- Communication (driver, all phases).
- Bikes are more booked than in other stations, maybe because of information events (driver, implementation and operation phase).

4 Future expectations

- Positive towards new mobility stations.
- High use of the vehicles.
- New vehicles to add to the offer.

Interview with Torsten Belter (KVR)

Date: 18/5/2017

Start: Approx. 16:00

End: Approx. 17:05

1 Role and Motivation

- Representing the city of Munich. Department of Public Order, Traffic Department. Coordinator for the project and the evaluation. Co-financing from the city.
- City: big motivation to promote sharing services for the citizens.
- Change the mobility behavior.
- Experience in similar projects: other projects with WOGENO e.G., mobility station in Münchner Freiheit (more or less comparable).
- Promotion of e-mobility.

2 Goals and expectations

- Effects on environmental factors like air quality (e-mobility here important)
- Lower car ownership.
- Reduction of parking places.

3 Barriers and Drivers

- E-mobility (driver, planning and implementation phase): city of Munich interested in promoting e-mobility, therefor good financing.
- No political barriers, but difficult without e-mobility.
- WOGENO e.G. and Christian Stupka (driver, planning and implementation): strong driver. Involvement from WOGENO e.G. and Christian Stupka as major promoters of the mobility concept for Domagkpark.
- Communication with the working group.
- Important to define roles for bigger projects, such as providers and booking and billing system. Here only STATTAUTO, important aspect.
- Informative events and brochures, direct communication between neighbors (driver, operation phase).
- Experience by co-financing (driver, planning phase).
- During the implementation one meeting per month with the working group.
- Social aspects (driver: operation phase); high possibilities for reduction of car ownership

- Delay in the delivering from the vehicles (barrier, implementation process): was not a problem at the end, learnings for the future.
- Low use of e-scooter (barrier, operation phase): people might not know how to use them.
- Prices of the Mobility Station maybe high (barrier, operation).
- High costs, could be made more with less money, learnings for the future.

4 Future perspectives

- Very positive and supportive for further mobility projects
- Important: roles and cost-efficiency

Interview with Maria Knorre (Domagkpark e.G.)

Date: 23/5/2017

Start: 10:18

End: 11:23

1 Role and Motivation

- Neighborhood association, communication and running the website.
- Coordination and information. Organization of events.

2 Goals and Expectations

- Improvement of the mobility services.
- Reduction of car ownership.
- Success: other districts are learning from Domagkpark.

3 Barriers and Drivers

- Other surveys (driver, planning phase). Study of the population of Domagkpark. Cooperative building associations do their own surveys for their members.
- Working group of the consortium for the mobility concept.
- Interest of the city (driver, implementation phase).
- Information in the district (driver, implementation and operation phase).
- Social aspects o Domagkpark (driver, implementation phase).
- Economy of the inhabitants of Domagkpark (driver, operation phase): many users cannot buy a car and therefore the Mobility Station can supply their needs.
- Small station, the operation of this station could not work for larger projects.
- Informative events (driver, implementation and operation phase): users could register directly at the events.
- WOGENO e.G. (driver, all phases). Involvement and resources.
- Communication and cooperation of the working group.
- Financing: not clear budget for information and communication inside the district, now European Community but it is important to make it clear in new projects.
- E-scooters: not worth, personally thought. Informative events to make people get to try the e-scooters.

4 Future Perspectives

- Positive towards the Mobility Station

Interview with Christian Stupka (WOGENO e.G.)

Date: 31/5/2017

Start: 10:10

End: 11:05

1 Role and Motivation

- Responsible for mobility projects in WOGENO e.G. until 2015.
- Motivation: sustainable, ecologic mobility. Reduction of construction costs and thereby rental costs.
- Experience with STATTAUTO München since year 2000.

2 Goals and Expectations

- Reduction of car ownership.
- Changes in the modal split.
- Environment quality improvement.

3 Barriers and Drivers

- Good co-working (driver, all phases).
- Support of the city (driver, all phases).
- But: problems with the above-ground parking places and the Baureferat (English: construction committee) for the use of the streets in Domagkpark.
- Financing of the project was not clear at all at the beginning.
- WOGENO e.G. (driver, all phases): involvement,
- Experience with STATTAUTO München historically very good.
- Coordination with MVG more difficult, bigger organization. More involvement to promote PT would have been desirable.
- Regulation problems with the Lokalbaukomission (English: local construction commission) for the reduction of the obligatory parking places per residence. Success at the end.
- Cultural aspects of car-sharing owners (driver, operation phase).
- Language barrier for the inhabitants in the north zone (possible barrier in the future, operation phase).
- Information and publicity in the district (driver, implementation and operation phase).
- E-scooters: e-bikes are more user-friendly and they have almost no difference in speed and range. Considering retiring them after two years if the use does not grow.
- Support from the city (driver, all phases).
- Introducing new inhabitants to the mobility service is a key aspect.

4 Future perspectives

- Reduction of emissions
- Car ownership is obviously decreasing
- Good perspectives for ECCENTRIC and the Mobility Station

Appendix 2: Survey (German)

Umfrage Mobilitätsstation Domagkpark 2017

Begrüßung

Guten Tag!

Herzlichen Dank, dass Sie an unserer Befragung teilnehmen! Sie leisten damit einen wertvollen Beitrag, die Mobilitätsangebote in ihrem Wohngebiet weiter zu verbessern.

Der Fragebogen wurde von der Technischen Universität München in Zusammenarbeit mit der Landeshauptstadt München, Domagkpark e.G. und STATTAUTO München entwickelt. Alle Ihre Antworten werden anonym erhoben und ausschließlich im Rahmen dieser Befragung verwendet.

Für Rückfragen stehe ich gerne zur Verfügung:

Álvaro Alarcos
Studienfach "M. Sc. Bauingenieurwesen"
Fachgebiet für Siedlungsstruktur und Verkehrsplanung
TU München

E-Mail: a.alarcos.andreu@gmail.com
Telefon: 01573-3663439

Bitte klicken Sie auf weiter, um die Befragung zu starten.
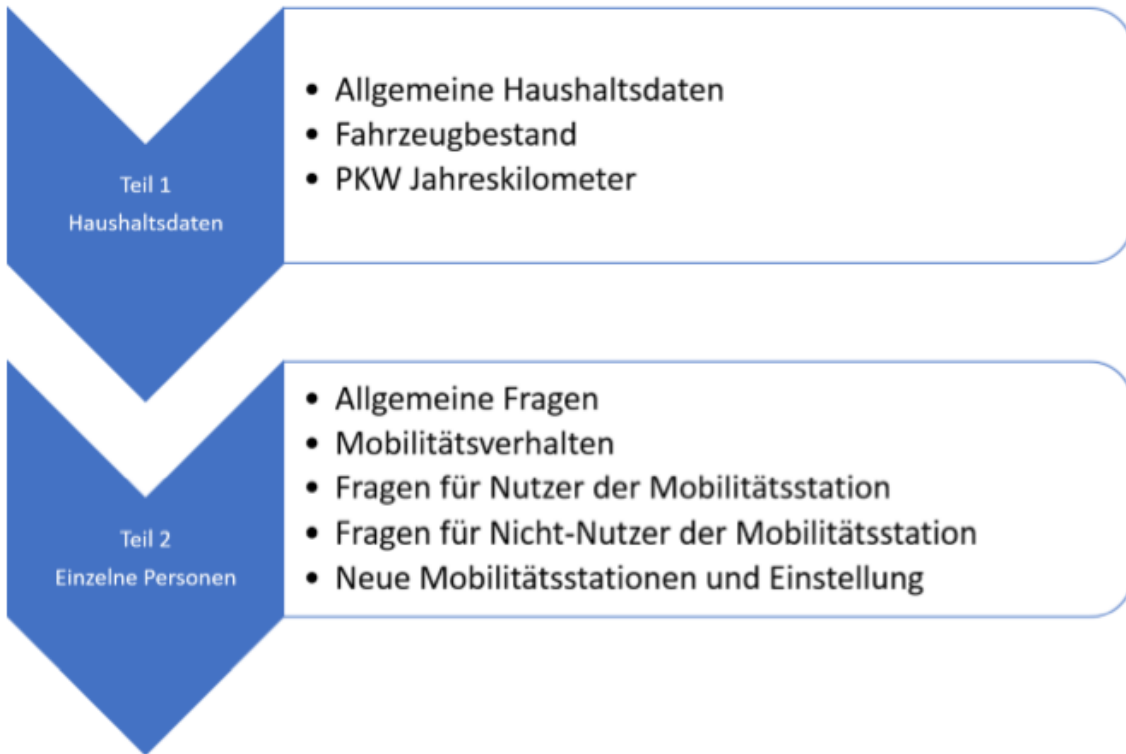
ТШ

Umfrage Mobilitätsstation Domagkpark 2017

Demographie und Mobilitätsverhalten - Haushaltsdaten

* 1. 2014 wurden zukünftige Domagkparkbewohner/innen zu ihrem Mobilitätsverhalten befragt. Haben Sie oder jemand in Ihrem Haushalt bei der damaligen Umfrage teilgenommen?

○ Ja

○ Nein

* 2. Wie wohnen Sie am Domagkpark?

○ Bei einer Wohnungsgenossenschaft

○ In einer Eigentumswohnung (Baugemeinschaft)

○ In einer Mietwohnung

* 3. Wie viele Personen leben in Ihrem Haushalt?

	0	1	2	3	4	5 oder mehr
18 Jahre und älter	○	○	○	○	○	○
6-17 Jahre alt	○	○	○	○	○	○
unter 6 Jahre alt	○	○	○	○	○	○

* 4. Wie viele Personen aus Ihrem Haushalt verfügen über einen PKW-Führerschein?

	0	1	2	3	4	5
Anzahl von Personen	○	○	○	○	○	○

TIM

Umfrage Mobilitätsstation Domagkpark 2017

Demographie und Mobilitätsverhalten - Haushaltsdaten - Fahrzeugbestand

*5. Welche Fahrzeuge stehen Ihrem Haushalt zur Verfügung?

	0	1	2	3	4	5
PKW	○	○	○	○	○	○
Motorrad	○	○	○	○	○	○
Fahrbereites Fahrrad	○	○	○	○	○	○
E-Fahrrad/Pedelec	○	○	○	○	○	○
Andere	○	○	○	○	○	○

Falls Sie "Andere" angekreuzt haben, nennen Sie bitte welche:

*6. Wie hat sich zwischen 2014 und heute der Fahrzeugsbestand in Ihrem Haushalt geändert?

	Es gibt zwei Fahrzeuge weniger	Es gibt ein Fahrzeug weniger	Es gibt die gleiche Anzahl von Fahrzeugen	Es gibt ein Fahrzeug mehr	Es gibt zwei Fahrzeuge mehr
PKW	○	○	○	○	○
Motorrad	○	○	○	○	○
Fahrbereites Fahrrad	○	○	○	○	○
E-Fahrrad/Pedelec	○	○	○	○	○
Andere	○	○	○	○	○

Falls Sie "Andere" angekreuzt haben, nennen Sie bitte welche:

7. Falls sich der Fahrzeugbestand geändert hat, wie stark wurde diese Änderung von den Mobilitätsangeboten (Sharingstation) im Domagkpark beeinflusst?

○ Stark beeinflusst

○ Teilweise beeinflusst

○ Kaum beeinflusst

○ Gar nicht beeinflusst

Falls Sie weitere Kommentare haben, bitte hier schreiben:

* 8. Wie viele Personen sind in Ihrem Haushalt bei einem Sharing-Anbieter registriert?

	0	1	2	3	4	5
Stationsbasiertes Carsharing (z.B. STATTAUTO)	○	○	○	○	○	○
Flexibles Carsharing (z.B. DriveNow, car2go)	○	○	○	○	○	○
Flexibles Bikesharing (z.B. Call a Bike)	○	○	○	○	○	○
Stationsbasiertes Bikesharing (z.B. MVG-Rad)	○	○	○	○	○	○

* 9. Wie viele Personen in Ihrem Haushalt besitzen eine MVV-Zeitkarte?

	0	1	2	3	4	5
Anzahl von Personen	○	○	○	○	○	○

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Demographie und Mobilitätsverhalten - Haushaltsdaten - PKW Jahreskilometer

10. Wenn Sie mindestens einen PKW haben, wie viele Kilometer legen Sie im Jahr mit Ihrem/Ihren PKW/PKWs zurück?

	Unter 5.000	5.000 - 10.000	10.000 - 15.000	15.000 - 20.000	Über 20.000
PKW 1	○	○	○	○	○
PKW 2	○	○	○	○	○
PKW 3	○	○	○	○	○

11. Wie viele Kilometer legen Sie davon für Urlaubsfahrten zurück?

	Unter 1.000	1.000 - 2.000	2.000 - 5.000	5.000 - 10.000	Über 10.000
PKW 1	○	○	○	○	○
PKW 2	○	○	○	○	○
PKW 3	○	○	○	○	○

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Demographie und Mobilitätsverhalten - Person

Wir bitten um ein paar persönliche Informationen, die für die Statistik wichtig sind. Bitte beantworten Sie folgende Fragen:

* 12. Sind Sie männlich oder weiblich?

○ Männlich

○ Weiblich

○ k.A.

* 13. Wie alt sind Sie?

○ 18 - 29 Jahre alt

○ 30 - 39 Jahre alt

○ 40 - 49 Jahre alt

○ 50 - 59 Jahre alt

○ 60 - 64 Jahre alt

○ 65 - 74 Jahre alt

○ über 75 Jahre alt

* 14. Wie würden Sie Ihren Beschäftigungsstatus beschreiben?

	Vollzeit beschäftigt	Teilzeit beschäftigt	Ausbildung/Studium	Arbeitssuchend	Im Ruhestand
Beschäftigungsstatus	○	○	○	○	○

* 15. Was ist ihr höchster Bildungsabschluss?

○ Hauptschulabschluss

○ Realschulabschluss (Mittlere Reife)

○ Fachhochschulreife (Abschluss einer Fachoberschule)

○ Abitur, allgemeine oder fachgebundene Hochschulreife (allg. oder berufl. Gymnasium)

○ Hochschulabschluss (Universität, Fachhochschule)

○ Anderer Schulabschluss

○ Schule beendet ohne Abschluss

8

TШ

Umfrage Mobilitätsstation Domagkpark 2017

Demographie und Mobilitätsverhalten - Person - Modal Split

* 16. Besitzen Sie einen PKW-Führerschein?

○ Ja

○ Nein

* 17. Steht Ihnen persönlich ein PKW zur Verfügung?

○ Ja, immer

○ Ja, manchmal

○ Nein

*18. Wie oft nutzen Sie die folgenden Verkehrsmittel?

	Mehrmals pro Woche	Bis einmal pro Woche	Einmal im Monat	Seltener	Nie	k.A.
Zu Fuß	○	○	○	○	○	○
Privates Fahrrad	○	○	○	○	○	○
Bikesharing (z.B. MVG-Rad, Call a Bike)	○	○	○	○	○	○
Öffentlicher Nahverkehr (z.B. U-Bahn, Tram, Bus...)	○	○	○	○	○	○
Privater PKW	○	○	○	○	○	○
Stationsbasiertes Carsharing (z.B. STATTAUTO)	○	○	○	○	○	○
Flexibles Carsharing (z.B. DriveNow, car2go)	○	○	○	○	○	○
Privates Carsharing (Nachbarschaftsauto)	○	○	○	○	○	○
Mitfahrgelegenheiten (z.B. flinc)	○	○	○	○	○	○
Taxi (auch Uber)	○	○	○	○	○	○
Sonstiges	○	○	○	○	○	○

Falls Sie "Sonstiges" angekreuzt haben, geben Sie bitte die Fahrzeuge an:

* 19. Für welche Aktivitäten benutzen Sie in der Regel welche
Verkehrsmittel? (Es sind mehrere Antworten pro Zeile möglich)

	Weg zur Arbeit/Ausbildung	Berufliche Erledigungen	Private Erledigungen (z.B. Einkaufen)	Freizeitaktivitäten	Begleitung von anderen Personen	k.A.
Zu Fuß	☐	☐	☐	☐	☐	☐
Privates Fahrrad	☐	☐	☐	☐	☐	☐
Bikesharing (z.B. MVG-Rad, Call a Bike)	☐	☐	☐	☐	☐	☐
Öffentlicher Nahverkehr (z.B. U-Bahn, Tram, Bus...)	☐	☐	☐	☐	☐	☐
Privater PKW	☐	☐	☐	☐	☐	☐
Stationsbasiertes Carsharing (z.B. STATTAUTO)	☐	☐	☐	☐	☐	☐
Flexibles Carsharing (z.B. DriveNow, car2go)	☐	☐	☐	☐	☐	☐
Privates Carsharing (Nachbarschaftsauto)	☐	☐	☐	☐	☐	☐
Mitfahrgelegenheiten (z.B. flinc)	☐	☐	☐	☐	☐	☐
Taxi (auch Uber)	☐	☐	☐	☐	☐	☐
Sonstiges	☐	☐	☐	☐	☐	☐

Falls Sie "Sonstiges" angekreuzt haben, geben Sie bitte die Fahrzeuge an:

[   ]

* 20. Sind Sie für die Mobilitätsstation im Domagkpark registriert und
fahrberechtigt?

○ Ja

○ Nein

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Nutzer der Mobilitätsstation - Nutzung und letzte Fahrt

* 21. Wie sind Sie auf die Station aufmerksam geworden? (Es sind mehrere Antworten möglich)

☐ Durch die Webseite von Domagkpark (www.domagkpark.de)

☐ Zufällig im Vorbeilaufen-/fahren entdeckt

☐ Durch Freunde/Bekannte

☐ Durch Information im Wohngebiet

☐ Durch Presse/Medien

☐ k.A.

* 22. Wie oft nutzen Sie die Angebote der Mobilitätsstation?

	Mehrmals pro Woche	Bis einmal pro Woche	Einmal pro Monat	Seltener	Nie	k.A.
E-Fahrräder	○	○	○	○	○	○
E-Lastenrad	○	○	○	○	○	○
E-Roller	○	○	○	○	○	○
E-PKW	○	○	○	○	○	○
Konventionelle PKWs	○	○	○	○	○	○

* 23. Denken Sie an Ihre letzte Fahrt mit einem Fahrzeug der Mobilitätsstation. Welches Fahrzeug haben Sie gemietet?

○ E-Fahrräder

○ E-Lastenrad

○ E-Roller

○ E-PKW

○ Konventionelle PKWs

* 24. Für welchen Zweck/Zwecke haben Sie das Fahrzeug während der Miete genutzt? (Es sind mehrere Antworten möglich)

☐ Weg zur Arbeit/Ausbildung

☐ Berufliche Erledigungen

☐ Private Erledigungen (z.B. Einkaufen)

☐ Freizeitaktivitäten

☐ Begleitung von anderen Personen

☐ k.A.

* 25. Falls es das Angebot der Mobilitätsstation nicht gäbe, mit welchem Verkehrsmittel hätten Sie die zurückgelegte Fahrt wahrscheinlich durchgeführt?

○ Als Fahrer in einem PKW (Privat oder gemietet)

○ Als Mitfahrer in einem PKW (Privat oder gemietet)

○ Mit dem öffentlichen Verkehr

○ Mit einem Carsharing Fahrzeug (z.B. DriveNow)

○ Mit dem Taxi

○ Mit dem Fahrrad (Privat oder außerhalb der Mobilitätsstation, z.B. MVG-Rad)

○ Zu Fuß

○ Ich hätte die Fahrt gar nicht zurückgelet

○ Sonstiges

○ k.A.

Falls Sie "Sonstiges" angekreuzt haben, bitte beschreiben Sie hier welches Verkehrsmittel:

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Nutzer der Mobilitätsstation - Schwierigkeiten und Verfügbarkeit

*26. Kam es bisher zu Schwierigkeiten bei Buchung oder Nutzung der Fahrzeuge?

○ Ja

○ Nein

27. Falls ja, welche Schwierigkeiten sind aufgetreten? (Es sind mehrere Antworten möglich)

☐ Keine Verfügbarkeit von Fahrzeugen

☐ Komplexität des Ausleihsystems

☐ Technische Probleme während der Fahrt

☐ Zustand der Fahrzeuge

☐ Schwierigkeiten mit dem Ladestand (E-Fahrzeuge)

☐ Unzureichende Einweisung in die Nutzung der Fahrzeuge

☐ Andere

Bitte beschreiben Sie hier die Schwierigkeiten. Ihre Antworten und Details sind für uns sehr hilfreich:

*28. Wie bewerten Sie die Verfügbarkeit der Fahrzeuge?

	Ich finde immer das von mir gewünschte Fahrzeug wenn ich es brauche	Manchmal sind alle Fahrzeuge ausgeliehen wenn ich sie brauche	Ich finde selten das von mir gewünschte Fahrzeug wenn ich es brauche	Ich habe dieses Fahrzeug noch nie gebraucht
E-Fahrräder	○	○	○	○
E-Lastenrad	○	○	○	○
E-Roller	○	○	○	○
E-PKW	○	○	○	○
Konventionelle PKWs	○	○	○	○

Umfrage Mobilitätsstation Domagkpark 2017

Nutzer der Mobilitätsstation - Kosten

*29. Wie bewerten Sie die Preise zur Nutzung der Fahrzeuge?

	Zu teuer	Vernünftig	Günstig	k.A.
E-Fahrräder	◯	◯	◯	◯
E-Lastenrad	◯	◯	◯	◯
E-Roller	◯	◯	◯	◯
E-PKW	◯	◯	◯	◯
Konventionelle PKWs	◯	◯	◯	◯

*30. Wie bewerten Sie die Kosten zur Registrierung und Nutzung bei der Mobilitätsstation?

	Zu teuer	Vernünftig	Günstig	k.A.
Aufnahmegebühr	◯	◯	◯	◯
Kaution (Nur für komplettes Angebot von STATTAUTO)	◯	◯	◯	◯
Monatsbeitrag	◯	◯	◯	◯

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Nutzer der Mobilitätsstation - Zufriedenheit und Verbesserungsvorschläge

*31. Wie zufrieden sind Sie mit der Mobilitätsstation im Allgemeinen?

	Sehr zufrieden	Zufrieden	Unzufrieden	Sehr unzufrieden	k.A.
Verfügbarkeit von Fahrzeugen	◯	◯	◯	◯	◯
Buchungspreise	◯	◯	◯	◯	◯
Buchungssystem	◯	◯	◯	◯	◯
Zustand der Fahrzeuge	◯	◯	◯	◯	◯

Weitere Anmerkungen:

32. Welche Verbesserungsvorschläge hätten Sie für die Mobilitätsstation? (Es sind mehrere Antworten möglich)

☐ Fahrräder in verschiedenen Rahmengrößen

☐ Lastenrad mit Möglichkeit für den Kindertransport

☐ E-PKWs in verschiedenen Größen

☐ Transporter PKWs

Andere (bitte angeben):

33. Haben Sie weitere Anregungen oder Verbesserungsvorschläge für
die optimale Nutzung der Mobilitätsstation?

19

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Nutzer der Mobilitätsstation - Angebote außerhalb der Mobilitätsstation

*34. Welche der folgenden Angeboten kennen und nutzen Sie in der Nähe des Domagkparks?

	Kenne ich gar nicht	Kenne ich, nutze ich aber nicht	Nutze ich seit maximal einem Jahr	Nutze ich länger als ein Jahr	Ich bin registriert aber nutze es nicht
MVG-Rad	○	○	○	○	○
Call a Bike	○	○	○	○	○
DriveNow	○	○	○	○	○
car2go	○	○	○	○	○

35. Wenn sie das stationsbasierte Carsharingangebot an der Mobilitätsstation einmal mit sogenannten Free-Floating-Angeboten wie DriveNow und car2go vergleichen: Welches finden Sie besser? Und warum?

ТUП

Umfrage Mobilitätsstation Domagkpark 2017

Bekanntheit der Mobilitätsstation

* 36. Hatten Sie vor dieser Umfrage von der Mobilitätsstation im Domagkpark gehört?

◯ Ja

◯ Nein

TIM

Umfrage Mobilitätsstation Domagkpark 2017

Nicht-Nutzer der Mobilitätsstation - Allgemein

* 37. Wie sind Sie auf die Station aufmerksam geworden? (Es sind mehrere Antworten möglich)

☐ Durch die Webseite von Domagkpark (www.domagkpark.de)

☐ Zufällig im Vorbeilaufen-/fahren entdeckt

☐ Durch Freunde/Bekannte

☐ Durch Information im Wohngebiet

☐ Durch Presse/Medien

☐ k.A.

22

* 38. Woran liegt es, dass Sie die Angebote der Mobilitätsstation in Domagkpark nicht nutzen? (Es sind mehrere Antworten möglich)

☐ Mein Bedarf ist durch eigene Fahrzeuge abgedeckt

☐ Die Preise sind mir zu teuer

☐ Mangelnde Information (Ich weiss nicht genau, wie es funktioniert)

☐ Das Ausleihsystem ist mir zu aufwendig/kompliziert

☐ Ich will mich nicht bei der Verfügbarkeit von Fahrzeugen einschränken

☐ Ich nutze andere Sharingangebote in der Umgebung (MVG Rad, DriveNow...)

☐ Ich kenne das Angebot der Mobilitätsstation nicht genau

☐ Andere Gründe

☐ k.A.

Falls Sie "Andere Gründe" angekreuzt haben, nennen Sie bitte welche:

[   ]

* 39. Könnten Sie sich vorstellen Zukünftlich die Angebote der Mobilitätsstation zu nutzen?

○ Auf jeden Fall

○ Wahrscheinlich

○ Eher nicht

○ Auf keinen Fall

○ k.A.

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Nicht-Nutzer der Mobilitätsstation - Angebote außerhalb der Mobilitätsstation

* 40. Welche der folgenden Angeboten kennen und nutzen Sie in der Nähe des Domagkparks?

	Kenne ich gar nicht	Kenne ich, nutze ich aber nicht	Nutze ich seit maximal einem Jahr	Nutze ich länger als ein Jahr	Ich bin registriert aber nutze es nicht
MVG-Rad	○	○	○	○	○
Call a Bike	○	○	○	○	○
DriveNow	○	○	○	○	○
car2go	○	○	○	○	○

41. Falls Sie das Angebot von DriveNow und car2go statt die Angebote der Mobilitätsstation nutzen, bitte geben Sie der folgenden Aussagen Ihre Einschätzung.

	Ich stimme voll zu	Ich stimme eher zu	Ich stimme eher nicht zu	Ich stimme gar nicht zu	k.A.
Mir ist es lieber keine feste Stationen zu haben	○	○	○	○	○
Die Preise von DriveNow und car2go finde ich günstiger	○	○	○	○	○
Mir ist es lieber Autos oberirdisch zu parken	○	○	○	○	○
Verfügbarkeit ist nie ein Problem bei DriveNow und car2go	○	○	○	○	○

Falls Sie weitere Anmerkungen haben, beschreiben Sie bitte welche:

25

TUM
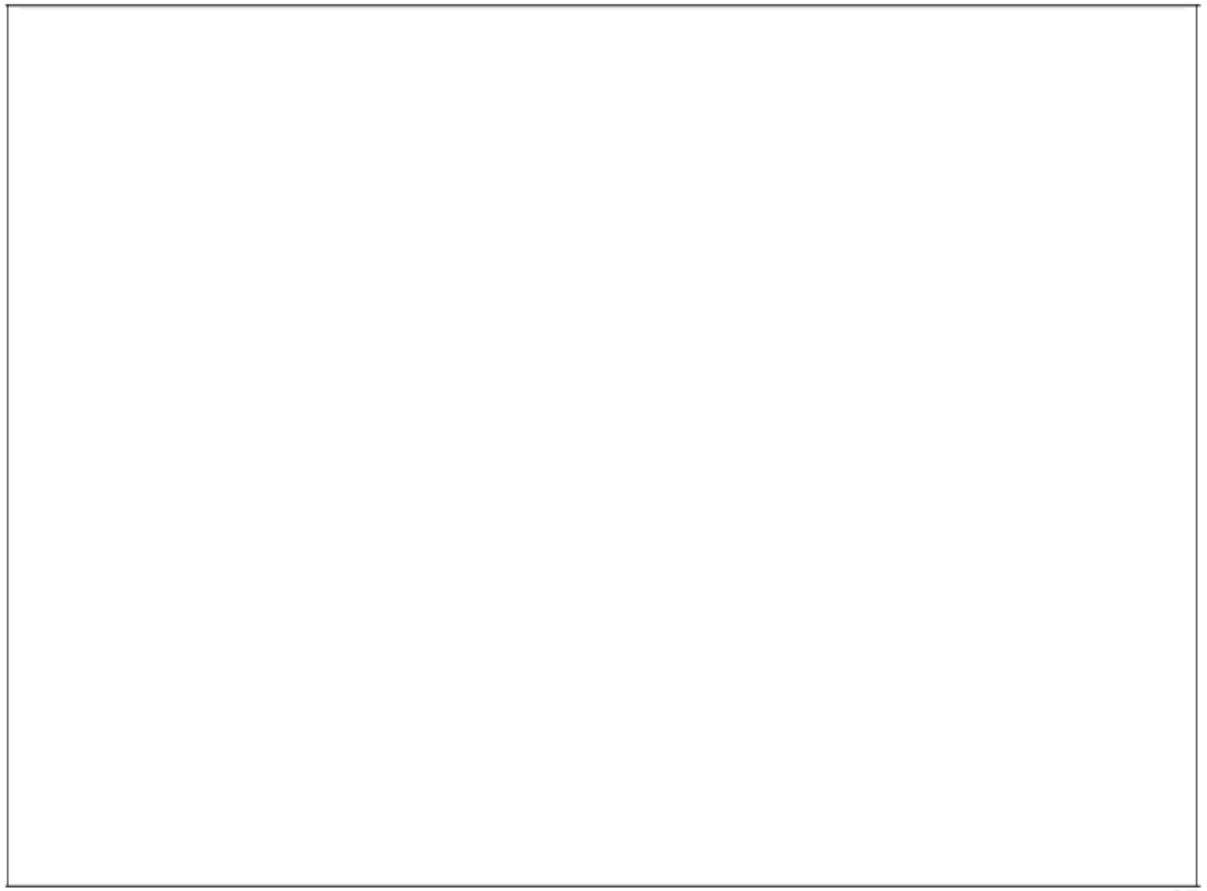
Umfrage Mobilitätsstation Domagkpark 2017

Nicht-Nutzer der Mobilitätsstation

Bitte lesen Sie folgende Informationen:

Allen Bewohnerinnen und Bewohnern des Domagkparks stehen an der ersten Münchner E-Sharing-Station am WOGENO-Haus (Fritz-Winter-Straße 3) verschiedene Fahrzeuge zur Ausleihe zur Verfügung. Dazu zählen im Detail:
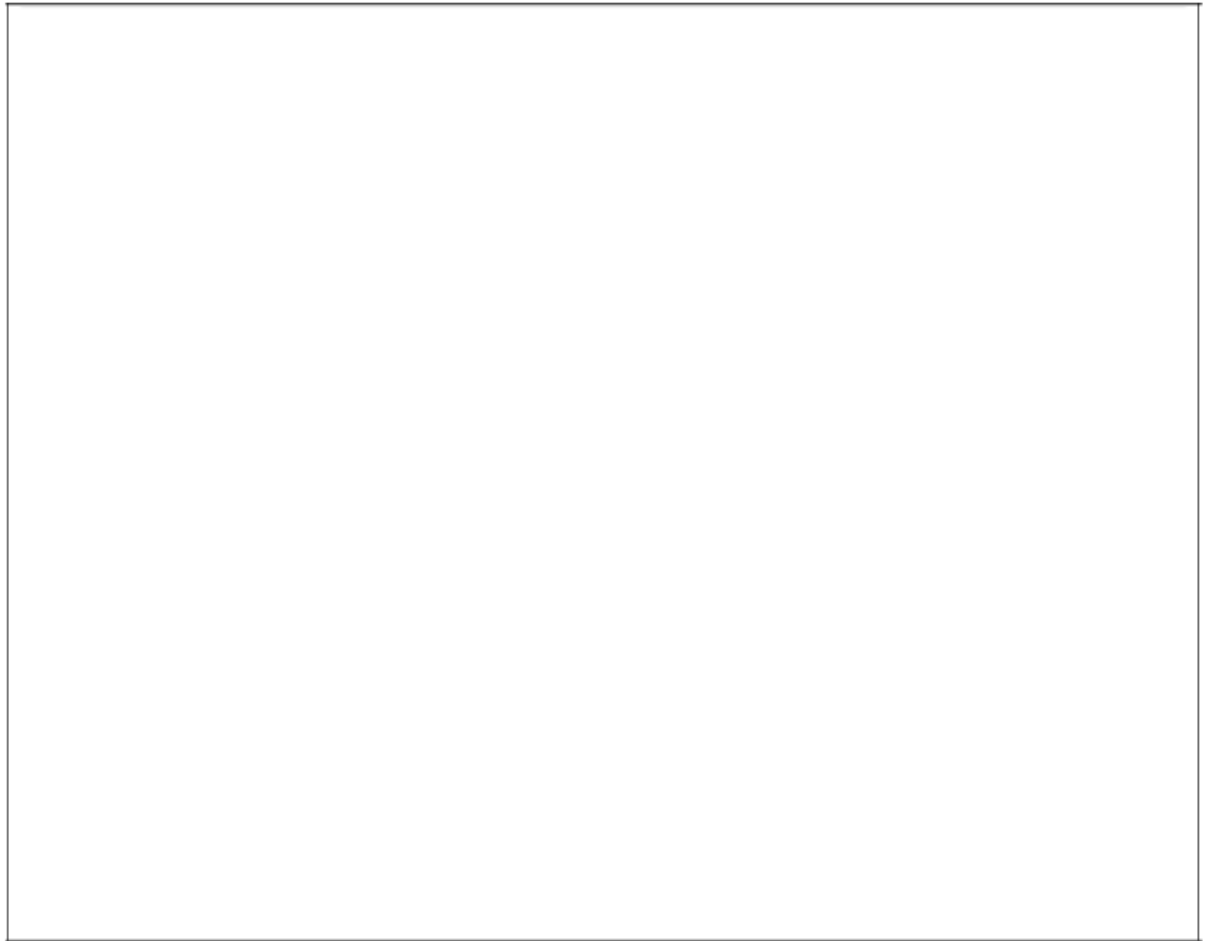
· 2 Elektrofahrräder (Pedelecs mit Tretunterstützung bis max. 25 km/h)
· 1 Elektro-Lastenrad
· 2 Elektro-Roller (max. 45 km/h, mit Führerschein)
· 1 Elektro-PKW
· Weitere konventionelle PKWs in verschiedenen Größen des Carsharing-Anbieters STATTAUTO München

Die PKWs befinden sich in der Tiefgarage des WOGENO-Hauses, die übrigen Fahrzeuge stehen ebenerdig im Hausdurchgang zur Verfügung. Zugang zu den Fahrzeugen erhalten Sie nach der Buchung über den Schlüsseltresor. Die Schlüssel öffnen auch die den Fahrzeugen zugeordneten Spinde, in denen sich der jeweilige Zubehör (z. B. Ersatzakku) befindet.

Weitere Informationen können Sie unter www.domagkpark.de/mobilitaetskonzept finden.

* 42. Welche Angebote der Mobilitätsstation können Sie sich vorstellen in der Zukunft zu nutzen?

	Ganz sicher	Wahrscheinlich	Wahrscheinlich nicht	Keinesfalls	k.A.
E-Fahrräder	○	○	○	○	○
E-Lastenrad	○	○	○	○	○
E-Roller	○	○	○	○	○
E-PKW	○	○	○	○	○
Konventionelle PKWs	○	○	○	○	○

27

TUM

Umfrage Mobilitätsstation Domagkpark 2017

Neue Mobilitätsstationen und Einstellung

In Kürze haben Sie das Ende der Befragung erreicht. Vielen Dank für alle Ihre bisherigen Antworten. Im folgenden Abschnitt möchten wir Sie noch kurz zu weiteren Mobilitätsstationen im Domagkpark befragen.

*43. Würden Sie gerne weitere Mobilitätsstationen im Domagkpark haben?

○ Ja

○ Nein

○ k.A.

44. Falls ja, welche Aspekte wären Ihnen an einer weiteren Mobilitätsstation wichtig?

☐ Verknüpfung mit öffentlichem Verkehr (z.B. Tram, Bus...)

☐ Informationsstellen

☐ Sichtbarkeit der Station im öffentlichem Raum

☐ Abstellplätze für private Fahrräder

☐ WLAN Hotspot

☐ Schließfächer/ Gepäckaufbewahrung

☐ Videomonitoring der Station

☐ Andere

Falls Sie "Andere" angekreuzt haben, nennen Sie bitte welche:

* 45. Zum Abschluss, bitte geben Sie zu folgenden Aussagen Ihre Einschätzung.

	Ich stimme voll zu	Ich stimme eher zu	Ich stimme eher nicht zu	Ich stimme gar nicht zu	k.A.
Zu meinen täglichen Routinen passt ein Auto sehr gut	○	○	○	○	○
München braucht mehr Radverkehr	○	○	○	○	○
Die Mobilität der Zukunft besteht weniger aus Besitzen und mehr aus Nutzen	○	○	○	○	○
Durch Bikesharing komme ich schneller zu Bus- und Bahnstation	○	○	○	○	○
In der Innenstadt gibt es zu wenig Parkplätze	○	○	○	○	○
Dank Carsharing brauche ich (eigentlich) kein eigenes Auto	○	○	○	○	○
Für kurze, spontane Wege in der Stadt ist Bikesharing ideal	○	○	○	○	○
Ich bin für einen starken Ausbau von Straßenbahn und Buslinien	○	○	○	○	○
Ein Leben ohne eigenes Auto ist wünschenswert, aber in absehbarer Zeit nicht realistisch	○	○	○	○	○
Umweltschutz ist mir wichtig	○	○	○	○	○

29

Umfrage Mobilitätsstation Domagkpark 2017

Danksagung

Sie haben die Befragung abgeschlossen. Vielen Dank!

Ihre Meinung ist uns wichtig und wird uns helfen, die Mobilitätsangebote für Sie in Ihrem Wohngebiet zu verbessern.

Falls eine weitere Person in Ihrem Haushalt die Umfrage beantworten will, benutzen Sie bitte den zweiten Link in dem E-Mail. Wenn Sie an der Preisverlosung teilnehmen wollen, bitte schicken Sie uns eine E-Mail mit Ihrem Namen, Ihre Adresse und Ihrem Status als Nutzer oder Nicht-Nutzer an umfragemobi@gmail.com.

30

Declaration Concerning the Master's Thesis

I hereby confirm that the presented thesis work has been done independently and using only the sources and resources as are listed. This thesis has not previously been submitted elsewhere for purposes of assessment.

Munich, July 31, 2017

_____

Ginés Álvaro Alarcos Andreu