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MASTER'S THESIS

M.Sc. in Transportation Systems

Evaluation of Mobility Stations in Würzburg - perceptions, awareness, and effects on travel behavior, car ownership, and CO_2 emissions

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Abstract

Mobility stations are a relatively new concept to integrate public transport with shared mobility services like carsharing and bikesharing. To fight car dependency and its negative consequences like congestion, occupancy of public space, and emissions, the City of Würzburg built nine mobility stations in 2015. The aim of this work is to evaluate this concept and its effects on travel behavior, car ownership, and CO_2 emissions and to generate recommendations for the future of integrated mobility services in Würzburg. The two main methods applied are an online survey and an analysis of backend data of carsharing and bikesharing. The evaluation is further based on literature research, an interview with the planner of the stations and site visits. Backend data for more than one year was provided by the companies nextbike and scouter and the joint survey for users and non-users in cooperation with the University of Würzburg reached in total around 850 respondents, of which approximately 100 were identified as users of shared mobility services in Würzburg. Würzburg's mobility stations are known by 75% of users and 58% of non-users and are effective in increasing the attractiveness of shared mobility services in Würzburg. Users show a tendency to shed private cars while increasing the use of carsharing and public transport use since the stations were opened. Uptake of bikesharing, which is mainly used by visitors, among residents turned out to be significantly slower than in carsharing. While the usual form of getting to and from mobility stations is walking, intermodal trip chains at the stations were found mainly among carsharing users, which reach the stations in up to 20% of all cases by public transport – a behavior that was not observed at regular scouter stations. The saved CO_2 emissions are estimated at 650 t per year, mainly through a reduction of both car ownership and vehicle-kilometers. It is to conclude that the stations are an effective tool to promote shared mobility services as an alternative to private car ownership and monomodal travel behavior in Würzburg. They contribute to reducing the CO_2 emissions caused by private cars and lower parking pressure in their surroundings. Key future recommendations are a stronger branding as well as improvements in the bikesharing system.

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Table of Contents

Abstract I

Acknowledgements II

List of Abbreviations VI

1 Introduction 1

1.1 Goals of this work 1

1.2 Structure of the thesis 2

2 Theoretical Background 3

2.1 Shared mobility services and Mobility as a Service 3

2.1.1 Multimodal and intermodal travel behavior 3

2.1.2 Carsharing 6

2.1.3 Bikesharing 8

2.2 Mobility Stations 9

2.2.1 Modularity and network structure 10

2.2.2 Different levels of integration 13

2.2.3 Goals and expected effects 13

2.2.4 Examples 15

3 Area of investigation 18

3.1 Würzburg: Key facts 18

3.2 Transport system 19

3.2.1 Long-distance transportation 20

3.2.2 Public Transport in Würzburg and in the Region 21

3.2.3 Shared mobility services 23

3.3 Integrated mobility in Würzburg 24

3.3.1 Development and implementation of mobility stations 25

3.3.2 Ideas, goals and expected effects of mobility stations 26

3.3.3 Description of the current system by level of integration 27

4 Methodology 37

4.1 Literature research, expert interview and site visits 37

4.1 Backend data analysis 37

4.1.1 Nextbike 37

4.1.2 Scouter 38

4.1.3 Introduction to boxplots 38

4.2 Survey for users and non-users 39

4.2.1 Incentive 39
4.2.2 Distribution 40
4.2.3 Questions 40
4.2.4 Responses 42
4.2.5 Analysis 42
4.3 Calculation of reduced CO_2 emissions 42
4.4 SWOT Analysis 45
5 Results 46
5.1 User characteristics 46
5.1.1 Personal attributes 46
5.1.2 Transportation options and travel behavior 50
5.2 Usage of the mobility services 60
5.2.1 How is nextbike used in Würzburg? 60
5.2.2 How is scouter used in Würzburg? 72
5.3 Usage details 84
5.3.1 Last trip: Carsharing 84
5.3.2 Last trip: Bikesharing 89
5.3.3 Spatial analysis of origins and destinations 92
5.3.4 Problems reported by the users 95
5.4 Awareness, perceptions, and opinions 96
5.5 Changes in mobility behavior and car ownership 103
5.6 Effects on CO_2 Emissions 107
6 Discussion 109
6.1 Strengths and limitations of the methodological approach 109
6.1.1 Expert interview and site visits 109
6.1.2 Backend data 109
6.1.3 Survey 109
6.1.4 CO_2 calculation 111
6.2 Strengths and weaknesses of the mobility stations 111
6.2.1 SWOT analysis 111
6.2.2 Promotion of multimodality 114
7 Recommendations 115
7.1 Bikesharing 115
7.2 Carsharing 115
7.3 Mobility stations 116

7.3.1 Physical integration 116
7.3.2 Information and virtual integration 116
7.3.3 Marketing 117
7.3.4 Tariff 117
7.3.5 Billing and access 117
8 Conclusions 118
8.1 Summary of results 118
8.1.1 Characteristics and demographics of users 118
8.1.2 Use of mobility stations 119
8.1.3 Acceptance and assessment of the stations 120
8.1.4 Effects on mobility behavior, car ownership and CO_2 emissions 121
8.2 Final remarks 122
8.3 Future outlook 123
List of Figures 125
List of Tables 129
List of References 131
Appendix 1: Photos of the stations 137
Appendix 2: Interview with Adrien Cochet-Weinandt (German) 141
Appendix 3: Questionnaire (German) 145
DECLARATION CONCERNING THE MASTER'S THESIS 159

List of Abbreviations

ICT	Information and Communications Technology
JMU	Justus-Maximilians-Universität Würzburg
MaaS	Mobility as a Service
PT	Public Transport
SVG	Würzburger Stadtverkehrs-GmbH
TUM	Technische Universität München
VVM	Verkehrsunternehmens Verbund Mainfranken
WSB	Würzburger Straßenbahn GmbH
WVV	Würzburger Versorgungs- und Verkehrs-GmbH

1 Introduction

Along with growth and increasing prosperity, traffic problems increase in Würzburg (Wappelhorst et al., 2016). The steady rise in car mode share leads to congestion that costs an average driver 34 hours per year and leads to annual costs of 171 million Euro in the city, according to a recent study of a traffic analysis firm (INRIX, 2017).

Aside from negative effects on livability, health and aesthetics, traffic is also a main contributor to the city's emissions, both greenhouse gasses (e.g. CO_2) and local pollutants (NO_x, $PM_{10,}$ among others) (Stadt Würzburg, 2016a). In the City's 2012 climate action plan, the administration aims at a reduction of CO_2 emissions by 20% compared to the 1990 baseline. While most sectors (industry, private households) reduced their carbon dioxide emissions significantly, transport-related emissions increased between 1990 and 2006 (BAUM Consult GmbH, 2012).

Because of exceeded PM_{10} and NO_2 thresholds, the City created an action plan for air quality in 2004 and updated it in 2010 (Regierung von Unterfranken, 2010). Currently, the second update of the air quality action plan is being developed, and multiple measures are under review: Speed limits, environmental zones, promotion of bicycling, public transport and electric vehicles, among others (Kleiner, 2015).

While these measures are established and their effects well-studied, the City of Würzburg started in 2015 to experiment with a new element to improve its transportation system: Mobility Stations.

Mobility stations, called *Mobilstationen* in Würzburg, provide integrated mobility by connecting public transport, bikesharing, and carsharing in various locations throughout the city. In 2015, nine of these stations were built. The concept is relatively new, and only a few studies describe mobility stations or analyze their effects (cf. Beutel et al., 2016, Garde et al., 2014, Jansen et al., 2015, Wappelhorst et al., 2016, Luginger, 2016, Miramontes et al., 2017 (forthcoming), Heller, 2016). In the near future, more mobility stations are to be built in the Hubland area, an important new urban development in Würzburg.

1.1 Goals of this work

The aim of this Master's Thesis is to evaluate the concept of mobility stations in Würzburg. As more stations are planned to be built in the Hubland area, it is important to assess the present concept to optimize future stations.

Thus, the overarching aim is the evaluation of nine mobility stations in Würzburg as well as the derivation of recommendations for the future development of this approach.

The goals are defined as following:

1. To analyze the strengths and weaknesses of the concept
2. To estimate possible effects of the mobility stations on the user's mobility behavior as well as on the car-ownership around the stations based on previous studies
3. To survey the actual effects on the user's short- and mid-term mobility decisions
4. To derive recommendations for the development of the existing and future mobility stations

In addition, the background of the development and the implementation process is relevant for the evaluation of the project and important for future developments.

1.2 Structure of the thesis

The thesis is organized as outlined below:

Chapter 2 will present the concept of multimodality and will then provide basic information about carsharing, bikesharing, and mobility stations by summarizing the concepts and the history of these services in Germany. Further, a framework of different levels of integration will be presented.

In Chapter 3, the study area is described, including basic facts and a more detailed look at the city's transport system. The second part of Chapter 3 will focus on integrated mobility in Würzburg with an emphasis on the mobility stations.

Chapter 4 presents the methodology of this study. Relevant approaches, instruments, data sets, and formulas are explained.

The results and the respective analysis are shown in chapter 5, grouped by the sub-chapters

- user characteristics,
- usage of the mobility services,
- awareness, perceptions, and opinions,
- usage details,
- changes in mobility behavior,
- effects on CO_2 emissions,
- and a SWOT analysis.

Chapter 6 discusses the results and the methodology of the study and chapter 7 will derive recommendations for the future development of mobility stations in general and Würzburg in particular. Finally, Chapter 8 will conclude the work.

2 Theoretical Background

The following chapter will introduce basic information about shared mobility and integrated mobility services in the German context.

2.1 Shared mobility services and Mobility as a Service

Shared mobility services are an emerging trend in the pursuit of sustainable mobility solutions. Reinforced by the introduction of information and communication technologies (ICT) and the spread of mobile internet and smartphones, many private and public actors started looking for possibilities to create new mobility solutions to solve traffic problems and environmental impacts using these technologies (Murphy, 2016). A comprehensive definition is given by Murphy (2016):

> *"Shared-use mobility is a term used to describe transportation services that are shared among users, including public transit; taxis and limos; bikesharing; carsharing (round-trip, one-way, and personal vehicle sharing); ridesharing (car-pooling, van-pooling); ridesourcing/ride-splitting; scooter sharing; shuttle services; neighborhood jitneys; and commercial delivery vehicles providing flexible goods movement."*

An extensive overview of all services including definitions is available from the Shared Use Mobility Center (2015) for further reference and an analysis of strengths and weaknesses of each service can be found from Cohen and Kietzmann (2014).

Another important term that is related to shared mobility services is "*Mobility as a Service (MaaS)".* This concept aims at putting "*users (…) at the core of transportation services, offering them tailor-made mobility solutions based on their individual needs*" (MaaS Alliance, 2017).

This report will focus on the shared modes that are available in the study area: carsharing and bikesharing, and their connection with public transport.

2.1.1 Multimodal and intermodal travel behavior

Travel behavior is considered *multimodal* if more than one mode of transport is used in a certain time frame (e.g. one week) (Block-Schachter, 2009). While a *monomodal* person would e.g. drive to work every day, a *multimodal* person might bike if the weather is nice, take public transport on regular days and use carsharing on other occasions. Figure 1 visualizes these characteristics.

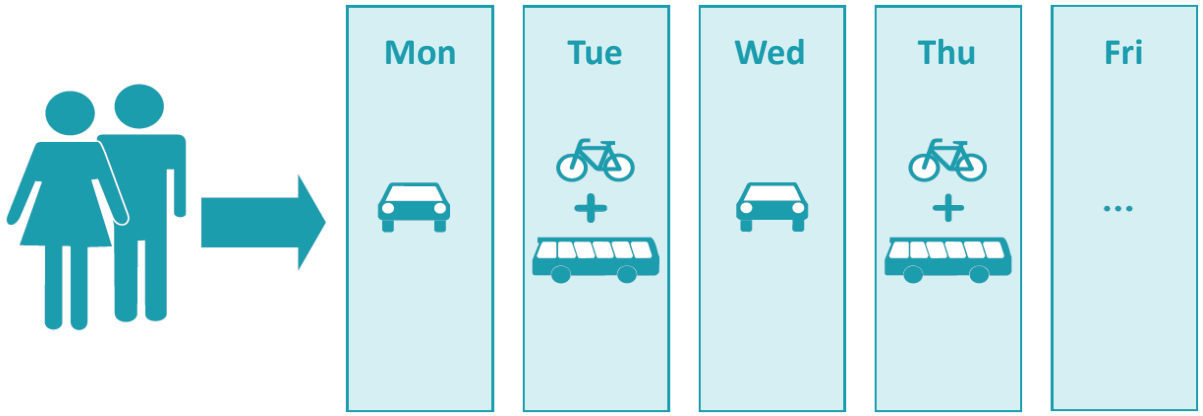

Figure 1: Multimodal travel behavior (translated from: Zukunftsnetz Mobilität NRW 2015)

While *multimodality* refers to travel behavior in general, *intermodality* describes the use of different modes within a trip. A traditional example would be *Park and Ride (P+R)*, where people drive their car to a P+R facility and continue their journey by public transport. Also, many public transport trips can be considered as intermodal if there is a first- and last-mile section of the trip included (Klinger et al., 2016). Figure 2 shows an exemplary trip from home to work where bicycle and public transport are combined.

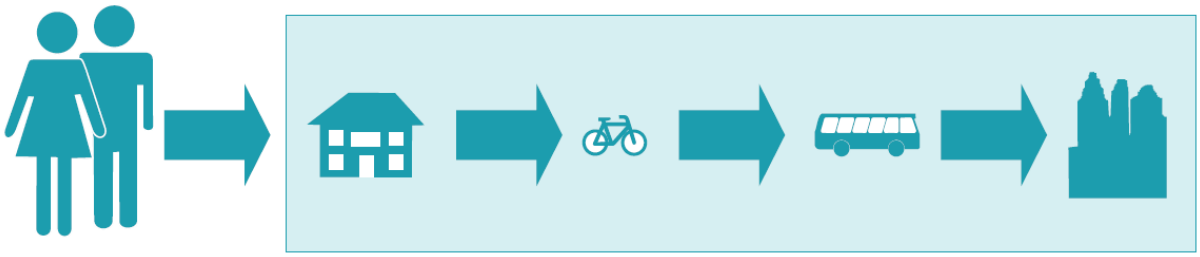

Figure 2: Intermodal travel behavior (Zukunftsnetz Mobilität NRW 2015)

According to Spickermann et al. (2014), multimodal mobility "seems appropriate for solving some of today's mobility problems", and Buehler and Hamre (2014) recognize it as an "important mechanism for reducing automobile dependence and increasing the sustainability of transportation systems by shifting some trips from automobiles to other modes". Hence, promoting multimodality is an emerging goal of urban policies all over Germany.

Nationwide household travel surveys reveal that after a continuous growth until the 1990s, car use and car ownership are decreasing in Germany since the 2000s, especially among young adults (Zukunftsnetz Mobilität NRW 2015, Kuhnimhof et al., 2012). At the same time, the mode share of public transport and bicycling is increasing (Kuhnimhof et al., 2012). While in the past, unimodal travel behavior was prevalent in society, these current changes hint at a travel behavior that is becoming more flexible and less car-focused (Spickermann et al., 2014, Chlond, 2012). Kuhnimhof et al. (2012) analyzed the most important household travel surveys in Germany and concluded that "multimodality has increased among young adults".

Advantages of multimodal mobility

Chlond (2012) describes the private car as a "universal mode" that is comfortable, always available and can be used for all kinds of trips, ranging from short trips to vacation journeys over multiple days. In contrast to this, other modes are described as "very specialized": Bicycles can be faster than cars, but only in congested urban settings. Commuter trains serve typical connections to the city center very well but may be weak in tangential connections. Long distance trains are suitable for city-to-city transportation but lack quality on further connections towards smaller towns and villages. Thus, none of these alternative modes alone can provide the speed and comfort of a car for all kinds of trips.

If this kit of specialized modes is combined, however, each mode can contribute its strengths while others cover its weaknesses and eventually, a system that offers a similar or even better transport quality than a private car is generated (cf. Chlond, 2012).

Kopp (2015) found evidence that carsharing users in Germany are more multimodal than non-users. She also linked the use of carsharing to increased use of the bicycle for transportation while non-users of carsharing use private cars more often.

How to promote multimodality

The key determinants of multimodality are summarized by Buehler and Hamre (2014). Based on selected recent studies, mostly from Germany, they used statistical analysis to quantify the effects of various factors on multimodal travel behavior. A summary is given in Table 1.

Table 1: Key determinants of multimodal car use (adapted from Buehler and Hamre, 2014)

Factor	Findings
Age	Consensus that younger individuals are more likely to show multimodal behavior
Car availability	Car availability is negatively associated with multimodal travel behavior
Education	Higher education is linked to multimodal travel behavior
Gender	Only small differences between men and women regarding multimodal behavior
Driver's license	Holders of a driver's license are less likely to show multimodal travel behavior
Life cycle stage	Smaller households are more likely to show multimodal behavior
Public transport access	Better access to PT leads to more multimodality

Some of these determinants are not to be changed by external factors: this includes *age, gender,* and the *life cycle stage. Education* is not in the scope of behavior change interventions in transport.

Hence, to promote multimodal behavior, the key determinants to influence are *car availability* and *public transport access*.

Reducing the number of driver's licenses could be discussed as a push-measure to reduce private car use; however, this would also affect the ability to use carsharing, and other regulatory measures (e.g. taxes) seem to be more appropriate to reduce car use and car ownership.

In order to promote multimodality, the car-free transportation system has to be strengthened as a whole. Improving the conditions for utilitarian bicycling and providing better public transport are common means to achieve this goal. However, also the importance of the shared modes carsharing and bikesharing gains more and more attention.

Measures and interventions that make people try new modes and experience multimodality have only a negligible effect on traffic flows and emissions, but according to Chlond (2012), *"these occasional changes of modes and behavior should not be underestimated (…). People 'learn' to use other modes and can assess their characteristics and utility. They are becoming 'multimodals' (…)"*. These learning processes will add up, spread among people until multimodal mobility is known to many people as a viable and comfortable alternative to the private car (Chlond, 2012).

Mobility as a Service *(Maas)* is an important pillar in the process of making multimodality attractive and easy to apply. Barriers that hamper the use of new modes and services are very low. Users do not have to buy a vehicle or pay high annual fees but instead just pay for the service they use, without fixed costs. Trip planners and mobile apps may make users aware of new services they have never used before and ideally, accounts can be used with multiple services and in different places (MaaS Alliance, 2017).

2.1.2 Carsharing

The very first experiences with carsharing date back to 1948, where a cooperative in Zurich, Switzerland, ("Sefage – Selbstfahrergemeinschaft") started sharing cars among users who could not afford to buy a car on their own (Shaheen and Cohen, 2007). The first notable carsharing service in Germany started in 1988: *StattAuto Berlin* was a station-based organization that came up during the environmental movement in the 1980s (Nobis, 2006). The idea was adapted rapidly and spread out to many cities all over the country. Figure 3 shows the development of carsharing in Germany from 1997 to 2016.

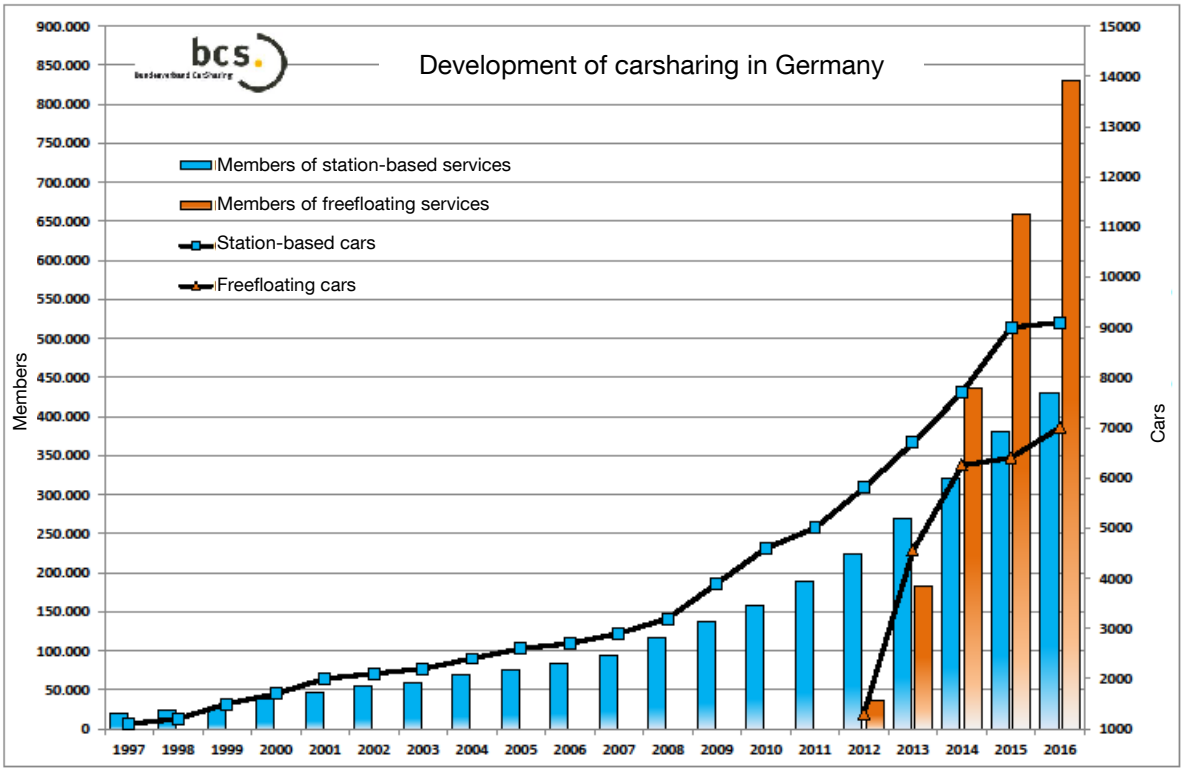

Figure 3: Development of Carsharing in Germany (translated from Bundesverband CarSharing, 2016a)

There are four main types of carsharing systems:

- Station-based carsharing provides vehicles at designated stations with reserved parking: Cars can be booked and reserved in advance. In German systems, cars will usually be returned to the same station. The cost of the rental is calculated through a combination of duration and kilometers traveled (Riegler et al., 2016). One-way station-based carsharing, where the car can be returned to any station, does exist for example in the form of Zipcar in the US and Canada (Jorge et al., 2015).
- Free-floating carsharing allows rentals and returns everywhere in public space within a certain business area. Vehicles can be reserved only for a short time (e.g. 15 min) to access the car. The fare is usually calculated per minute driven (Riegler et al., 2016).
- Combined systems offer freefloating- and station-based carsharing as one service. The company provides classical stations with assigned cars and tariffs for planned rentals but also freefloating-vehicles with tariffs that are made for shorter trips. Examples: book-n-drive (Frankfurt), stadtmobil/JoeCar (Mannheim, Heidelberg), stadtmobil (Hannover) and Stadtteilauto (Osnabrück) (Bundesverband CarSharing, 2015).
- Private carsharing services do not own cars but offer an online platform or app that allows users to rent private cars from other users. This usually happens in the form of round-trips (Riegler et al., 2016).

Figure 3 also shows the introduction of free-floating carsharing in 2012. While the traditional station-based approaches experienced a steady growth until 2012, the introduction of free-floating carsharing with its exponential growth seems to have also boosted the station-based systems by generating a lot of attention and media coverage for the concept.

Table 2 summarizes some key facts about carsharing in Germany in 2016.

Table 2: Statistics about Carsharing in Germany 2016 (Bundesverband CarSharing, 2016b)

	Carsharing total **(change compared to '15)**	Station-based **(change compared to '15)**	Free-Floating **(change compared to '15)**
Authorized drivers	1,260,000 (+21%)	430,000 (+13%)	830,000 (+26%)
Number of vehicles	16,100 (+5%)	9,100 (+1%)	7,000 (+9%)
Number of stations	-	4,600 (±0%)	-
Authorized drivers per vehicle	-	45.2	125.6
Municipalities with CS services	-	537 (+47)	12 + 4[1] (±0)
Population in service area	-	37.0 million	9.9 million

[1]There are 12 cities with classical free-floating services and an additional 4 combined systems

2.1.3 Bikesharing

First efforts to provide bicycles that can be shared among users within a city are reported from the Netherlands. In 1965, 50 white bicycles were introduced in Amsterdam, free to use for everyone in the city center. There were no stations and locks, and no membership was required. Everyone could use the bikes. In Shaheen and Guzman (2011), this system is classified as the *first-generation bikesharing*. However, soon after its launch, the system was suspended due to theft and vandalism (Shaheen and Guzman, 2011).

The *second generation* aimed at avoiding the first generation's mistakes and introduced a coin-deposit system with designated stations to rent and return the bikes. A small deposit was required to unlock these bicycles that were first introduced in 1995 in Copenhagen (Shaheen and Guzman, 2011).

Similar to the development of carsharing, emerging information and communication technologies (ICT) allowed bikesharing to develop further into the *third generation*, which

incorporates the new possibilities of information, reservation, and rental or return processes using first phone calls and later mobile internet devices. This technological development enabled both refined station-based systems as well as free-floating bikesharing, where bikes can be returned everywhere within a business area. Also, in contrast to the previous generations, the customers are no longer anonymous, which reduces the risk of vandalism and theft dramatically. Prominent examples of ICT-based systems are Vélib in Paris, France, the BIXI system in Montréal, Canada, or the free-floating service Call-a-Bike in many German cities (DeMaio, 2009, Shaheen and Guzman, 2011).

Shaheen and Guzman (2011) suggest that the *fourth generation* builds upon the existing technology of the *third generation* and emphasizes the *"seamless integration of bikesharing with public transportation and other alternative modes, such as taxis and carsharing"*. Furthermore, they include coordination with timetables and schedules as well as integrated payment, e.g. using a smartcard.

This development shows a trend towards more technology but also more integration with other modes. Thus, mobility stations, which will be described in the next section, seem to be the logical consequence of maturing carsharing and bikesharing systems.

2.2 Mobility Stations

The concept of mobility stations is relatively new, and there is no final definition yet. Roughly, the stations can be described as *"visible points of connection of modes of transport other than private cars, where these modes are connected with physical proximity"* (translated from Zukunftsnetz Mobilität NRW 2015).

According to the same source, the main functions of mobility stations are:

- Connection between different modes of transport (main function)
- Communication and marketing
- Information and service
- Meeting point and waiting areas

Other functions include the potential to highlight innovative mobility approaches (E-Mobility, new public transport concepts, pick-up points for ride-hailing/-sharing), and promotion of the sharing economy (Jansen et al., 2015). Cities also expect to increase the quality of urban space around mobility stations and to support sustainable urban development (BBSR, 2015, Jansen et al., 2015).

Jansen et al. (2015) highlight the importance of public transport as the backbone of sustainable mobility that should be present at every mobility station, according to their definition. Sharing services like carsharing and bikesharing are additional services that

complement the public transport system. Mobility stations offer a connection between these services and the public transport system, increase the attractiveness of the transfers to shared modes and optimize the capacity utilization of both shared services and public transport (Jansen et al., 2015).

2.2.1 Modularity and network structure

Mobility stations are a modular concept – not every station has to offer the same services. Stations can exist in different sizes and offer different services (Jansen et al., 2015). In Bremen, the mobility station system consists of two sizes:

- m*obil.punkte* provide carsharing (5-12 parking spots), private bike parking, proximity to public transport stops as well as a 3-meter-high stele that attracts attraction (Luginger, 2016).
- *mobil.pünktchen*, the smaller form of mobility stations in Bremen complement the network and are highlighted in public space with a smaller stele. They provide less space for carsharing (2-3 parking spots) and do not require a direct connection to public transport (Luginger, 2016).

The advantage of this distinction between two (or more) sizes is that the big stations attract attention, generate new users and highlight the quality of the stations' mobility supply while the smaller stations are easier implemented in residential areas because they require less space (Jansen et al., 2015). It is important that the stations are not independent, but embedded in a multimodal mobility system with high-quality public transport, but also extensive networks for pedestrians and cyclists.

Figure 4 shows a schematic network structure of mobility stations in three sizes that are all interlinked.

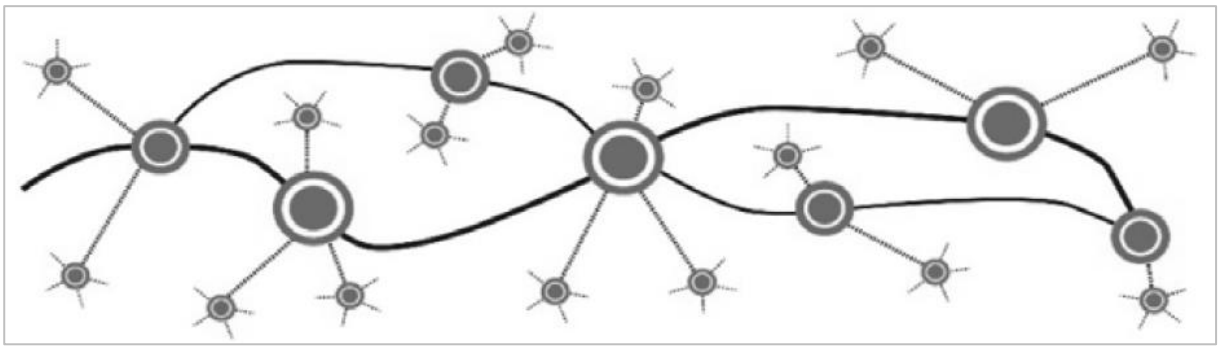

Figure 4: Spatial structure of mobility station network (adapted from Jansen et al., 2015)

Table 3 and Table 4 summarize possible components grouped by the categories *mobility* and *additional services*.

Table 3: Possible components and services of mobility stations: Mobility (own summary on the basis of Zukunftsnetz Mobilität NRW 2015)

Component	Description
Local Public Transport Access	Access to urban public transport systems (commuter train, MRT, LRT, streetcar, bus, etc.) is usually the basis for a mobility station.
Carsharing	Both free-floating and station-based carsharing services offer vehicles on demand. This can be an important complement to public transport. Mobility stations can provide both a constant supply of vehicles as well as return/parking opportunities. Mobility stations can also serve as connection points for an on-the-fly change between users (*Handshake* by DriveNow)
Bikesharing	Bikesharing systems offer fast first-mile and last-mile connections to (and from) mobility stations as well as direct connections between stations.
Ride Hailing: Taxi / Uber / etc.	Combining public transport with ride-hailing can lead to significant saving in distance- and time-based taxi tariffs. Also, persons without a driver's license can be dependent on these services.
Ridesharing and Carpooling	Ridesharing services experiment with fixed pick-up points (cf. the concept of MatchRider in Germany). Mobility stations can provide these points while offering connections to other modes of transport. The same concept of fixed points can also improve carpooling.
Private bike parking	Private bikes are an important access mode to the stations and need high-quality parking facilities.
Charging facilities	Charging points for electric carsharing vehicles and bikesharing e-bikes enhance the attractiveness of the stations. Further options include charging for private e-bikes and possibly cars.
Cargo bikes	Cargo bike-sharing systems are emerging in many cities. They can add benefits for users that need to transport goods or children by reducing the need for a car.
Private car parking	The combination of private vehicles and public transport is already applied all over the world in the Park+Ride concept. However, in rural settings, private car parking might be a useful addition to mobility stations.

Table 4: Possible components and services of mobility stations: Additional services (own listing on the basis of Zukunftsnetz Mobilität NRW 2015)

Component	Description
Information board / signage	A central information board offers information about the mobility station in the form of maps (incl. bike network, other mobility stations), descriptive text, links, QR-codes, etc. It also serves as an eye-catcher for passersby.
Info screen	Info screens are an 'upgrade' of info boards and can provide all kinds of information related to mobility: maps, real-time departures times, routing, booking of services, registration with services, and many more.
Real-time passenger information	Dynamic information about departures and arrivals improves transfers and enhances passenger satisfaction.
Service and information counter	Service counters are especially relevant for large stations in highly frequented areas. Employees offer information, counseling, ticket sales and help with registration (validation of documents/driver's license) and use of the mobility services.
Attractive waiting areas	This includes seats, weather protection, a public bathroom, vending machines for snacks and drinks, among others.
Wifi hotspot	The use of many mobility services depends on a mobile internet connection. A hotspot ensures fast and reliable internet access and is especially useful for people without a mobile data plan (tourists,…). Power outlets and phone chargers make the station for phones users even more convenient and reduce the perceived waiting times at the station.
Perceived safety	Good lighting and emergency telephones enhance comfort and safety
Secure bike parking	Additional security measures for parked bikes (e.g. bike boxes) are particularly pertinent for expensive e-bikes. Power outlets allow charging of the bike while other modes are used.
Bike service	This ranges from simple facilities like a pump to full-service bike workshops.
Luggage/parcel storage	Heavy luggage or shopping bags can be stored at the station while the user visits other places. Power outlets allow the charging of e-bike batteries (or other devices) in the locked boxes. Parcel services such as DHL Packstation create integration with online shopping and deliveries.
Gastronomy and Shopping	Kiosks and takeaways add place value to the station and improve the comfort of waiting times and transfers.

2.2.2 Different levels of integration

Literature shows that behavior change in transportation is achieved not only by single interventions but rather by offering a broader set of measures (Dacko and Spalteholz, 2014, Spickermann et al., 2014). Thus, mobility stations should be embedded in an integrated mobility system (Jansen et al., 2015). However, "integrated" is not a comprehensive term that is used to describe different approaches in mobility systems. Seven levels of integration of public transport and shared services can be defined as shown in Table 5. In contrast to the source, tariff integration is seen as a separate tier in this study and not as part of marketing while trip planning was integrated into the integration tier.

Table 5: Levels of integration (adapted from Luginger, 2016)

Level of integration	Definition
Physical integration	The different modes intersect at defined places such as train stations or mobility stations.
Marketing	All integrated modes are recognizable with the same marketing concept, corporate identity, logo, etc.
Information	Information is given for all modes by a central service. E.g., an app calculates trips for combined trips such as biking and PT or walking and carsharing.
Tariff	Combined tariffs offer savings if more than one mode is used.
Booking	A central platform allows booking all services integrated into the system (e.g. carsharing and bikesharing)
Access	The user has one medium (e.g. a card) that grants access to different modes integrated into the system.
Billing	The user receives one bill that includes trips of all modes integrated into the system.

This classification was presented by Luginger (2016) and was applied to Bremen, Hamburg, Leipzig, and Offenburg in her study. A similar scheme has been developed by Kamargianni et al. (2016). Integrated mobility systems range from virtual integration only (such as mobile apps that provide multimodal trip recommendations) to integration over all levels within a city.

2.2.3 Goals and expected effects

The overarching goal of mobility stations is a change in the mobility behavior of the city's population. Users of the stations are expected to experience a lower dependency on private cars due to an increase in the attractiveness and quality of public transport, carsharing and bikesharing in the form of an integrated system. This is expected to contribute to a more

efficient and more sustainable transport system in the city, resulting in less private cars (Luginger, 2016). Emissions are avoided, and parking in public space can be reduced.

The effects of carsharing on car ownership and mobility behavior are summarized by Bundesverband CarSharing (2016b). The analyzed studies (Lenz and Bogenberger, 2014, Schreier et al., 2015, and others) conclude that carsharing reduces the number of private cars and that carsharing customers use public transport more often than non-users.

Giesel and Nobis (2016) found out that *"the frequency of use of carsharing and the increasing number of memberships in station-based carsharing providers have a significant influence on whether people choose to shed a car"*.

The question how many private cars are replaced by one carsharing car is difficult to answer. Latest studies estimate replacement ratios (1 shared car replaces x private cars) ranging from 1:2 to 1:20 for station-based carsharing and 1:1 to 1:3.6 for freefloating systems (Bundesverband CarSharing, 2016b).

If not only the direct effect is included ("I shed a car because of carsharing") but also the fact that people decide to abstain from a private car because of carsharing, the effect is higher: the average replacement rate for flexible and partly flexible carsharing ranges from 1:3.3 (conservative scenario) to 1:6.2 (optimistic scenario) (Schreier et al., 2015).

While these figures are all related to the effects of carsharing only, there is one study that analyzed the direct effects of mobility station on car ownership of residents around 500 meters of the stations. This study was part of the pilot project of *mobil.punkte* in Bremen, where two stations were built and evaluated before the system was extended (Luginger, 2016, see also Examples/Bremen below). Two years after the implementation of the pilot system, 30% have shed a private car, and 55% abstained from buying a car because of the stations. Further, the stations reduced parking pressure as well as unnecessary searching for parking space noticeably (Klinger et al., 2016).

In addition to this, Glotz-Richter (2012) summarizes that the benefits of carsharing (especially the reduction of private cars) are the strongest if carsharing is combined with public transport and other sustainable mobility services that offer good accessibility to all mobility services in order to cover complete trip chains. Thus it is to conclude that mobility stations reinforce and strengthen the positive effects of carsharing on car ownership and car use.

2.2.4 Examples

Three examples were selected to illustrate the concept of mobility stations

mobil.punkte, Bremen

The first system of mobility stations in Germany was built in Bremen, starting in the early 2000s. As described in chapter 2.2, the system features stations of two sizes: *mobil.punkt* is the full-size station with carsharing (provided by Cambio), bike parking and public transport while *mobil.pünktchen* is the smaller variant that provides less parking spots for carsharing and does not always have direct access to public transport. As of 2016, ten *mobil.punkte* and 14 *mobil.pünktchen* were installed in Bremen (Luginger, 2016)

Figure 5: mobil.punkt station in Bremen (Luginger, 2016)

Apart from the physical stations, the system in Bremen features a website with information about the system and carsharing. There are discounts for public transport season pass holders that use carsharing.

Switchh, Hamburg

Another well-known example of mobility stations in Germany is Switchh in Hamburg, Germany. Three carsharing services (DriveNow, car2go, cambio) and bikesharing (StadtRad) and the public transport operator HVV are integrated at 11 stations across the city (Luginger, 2016).

The stations feature rail-based public transport, designated carsharing parking spots, and bikesharing racks. The station's surface is painted in green which ensures visibility and recognizability of the stations in public space (c.f. Figure 6). The switchh-card can be used to access two carsharing services and bikesharing, and it serves as a public transport pass. Switchh requires a monthly fee of 8.90€ and grants 20 minutes of carsharing both for DriveNow and car2go. Bikesharing is free to use for 30 minutes each trip. The HVV app integrates transit information with locations of bikesharing and carsharing (HVV, 2017).

Figure 6: Switchh station Berliner Tor (image: switchh.de)

Similar concepts exist in Germany in Leipzig (*Leipzig mobil)* and Offenburg (*Einfach Mobil) (Luginger, 2016, Heller, 2016)*.

Yélo, La Rochelle, France

A good international example for a very extensively integrated system is the French city of La Rochelle, where public transport is combined with bikesharing, carsharing and other services in the *yélo* system. In contrast to the German systems, yélo offers a complete 'mobility package' that goes beyond carsharing and bikesharing: the entire public and shared transportation services are part of the brand and integrated on various levels as summarized in Table 6.

Figure 7: Yélo, La Rochelle (image: yelo.agglo-larochelle.fr)

Table 6: The yélo system (as described by Communauté d'Agglomération de La Rochelle (2017))

Level of integration	**Components**
Physical integration	Hubs unite public transport and sharing services around train stations and other important points. However, there is no focus on actual mobility stations.
Marketing	All services that are part of *yélo* are painted with the same yellow color. Marketing campaigns are integrated, and the logo is seen on al mobility services.
Information	An information booth offers information and counseling about all mobility services available in town. The yélo website contributes multimodal trip planning and all information regarding about the partners in the system. Also, a telephone hotline helps with real-time trip planning and informs about services nearby.
Tariff integration	Various packages exist, combining the integrated modes on a monthly basis.
Booking	The central web platform, as well as the phone hotline, allow booking of carsharing vehicles.
Access	The yélo card, available to all residents for free at the yélo booth, offers access to public transport, carsharing, bikesharing and P+R parking. It can also be used as monthly or yearly transit pass.
Billing	The dashboard on the yélo website offers billing information and an integrated overview of all trips and their costs.

3 Area of investigation

The study area consists of the City of Würzburg, located in the region *Lower Franconia* in the state of Bavaria, Germany. The area around Würzburg and Schweinfurt is referred to as *Mainfranken*. This chapter provides an overview of the city and its transport system.

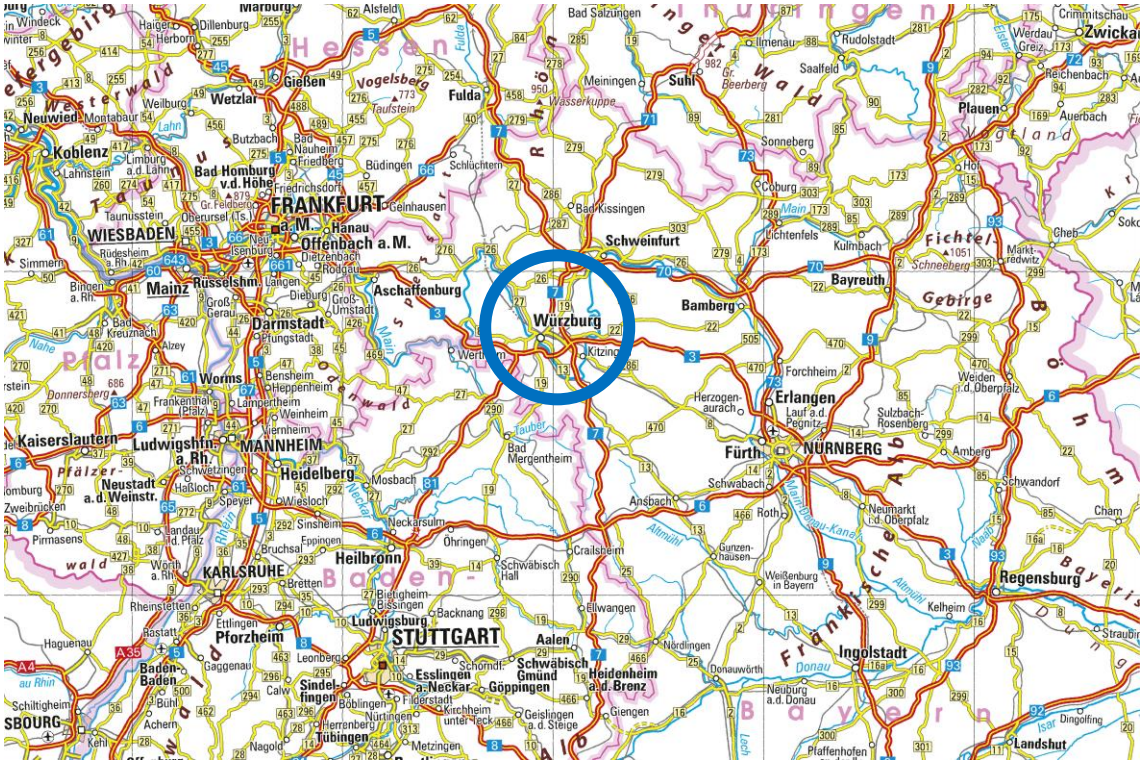

Figure 8: Location of Würzburg (map: Bundesamt für Kartographie und Geodäsie)

3.1 Würzburg: Key facts

Würzburg is the sixth largest city in Bavaria with about 127,000 inhabitants in 84,000 households. The city covers an area of 88 km² of which 34% are counted as built-up area. It serves as an important regional center (*Oberzentrum*) in the region of Lower Franconia and is home to many schools, three universities and 35,500 students, which contribute to the relatively low average age of 42.2 years. Ten hospitals ensure healthcare for Würzburg and the surrounding region of *Mainfranken (Stadt Würzburg, 2016b)*.

The Bavarian growth prognosis for 2035 predicts stable conditions with no significant growth or decline in population while the city will not be exempted from the overall trend of an aging society in Germany and the average age will rise to 44.3 years in 2035 (Bayrisches Landesamt für Statistik, 2016).

Inhabitants are slightly wealthier than the German average (Purchasing Power Index: 103.4), and the unemployment rate is close the nationwide level (4.3%). 118,000 employed persons

live in Würzburg. There are 54,000 in-commuters and 16,000 out-commuters, resulting in a commuter surplus of +38,000 workers. The most important sectors are public and private services (35,000 jobs) and corporate services (18,000 jobs) (Stadt Würzburg, 2016b).

The number of cars registered in the city is around 80,300, resulting in 631 cars per 1,000 inhabitants (Stadt Würzburg, 2016b). This is slightly lower than the German average of 672 vehicles/1,000 inhabitants (Kraftfahrt-Bundesamt, 2016b) but significantly higher than in larger German metropolises, where the car density ranges from 340 vehicles/1,000 inh. in Berlin to 560 in Stuttgart. (Mobil in Deutschland, 2015).

Würzburg is facing major shifts within its urban structure due to the closure of U.S. military facilities and new urban developments in the former military areas. In this process, the former Leighton-Barracks are transformed into the new Hubland area, a livable city district with a university, businesses, and space for 4,500 inhabitants. The main goal that was distilled from participatory workshops is the shift towards more sustainable urban mobility, an area where the city with a car mode share of almost 50%, had major issues in the past (Wappelhorst et al., 2016).

3.2 Transport system

Würzburg has a long tradition as a transport hub. Funded at the river Main in 704 it grew to an important center for trade and economy. Nowadays, it profits from its central location in the center of both Germany and Europe and is connected to many important transportation axes (IHK Würzburg-Schweinfurt, 2009).

The modal split in Würzburg compared to 19 other German cities between 100,000 and 150,000 inhabitants is shown in Figure 9. Data for the comparison cities was obtained from EPOMM (2017) while the Würzburg figure was taken from BAUM Consult GmbH (2012). It is important to mention that the statistics are not perfectly comparable as they were measured in different years, but the comparison allows to set Würzburg into a German context.

The cities are sorted by share of motorized individual transport (MIT).

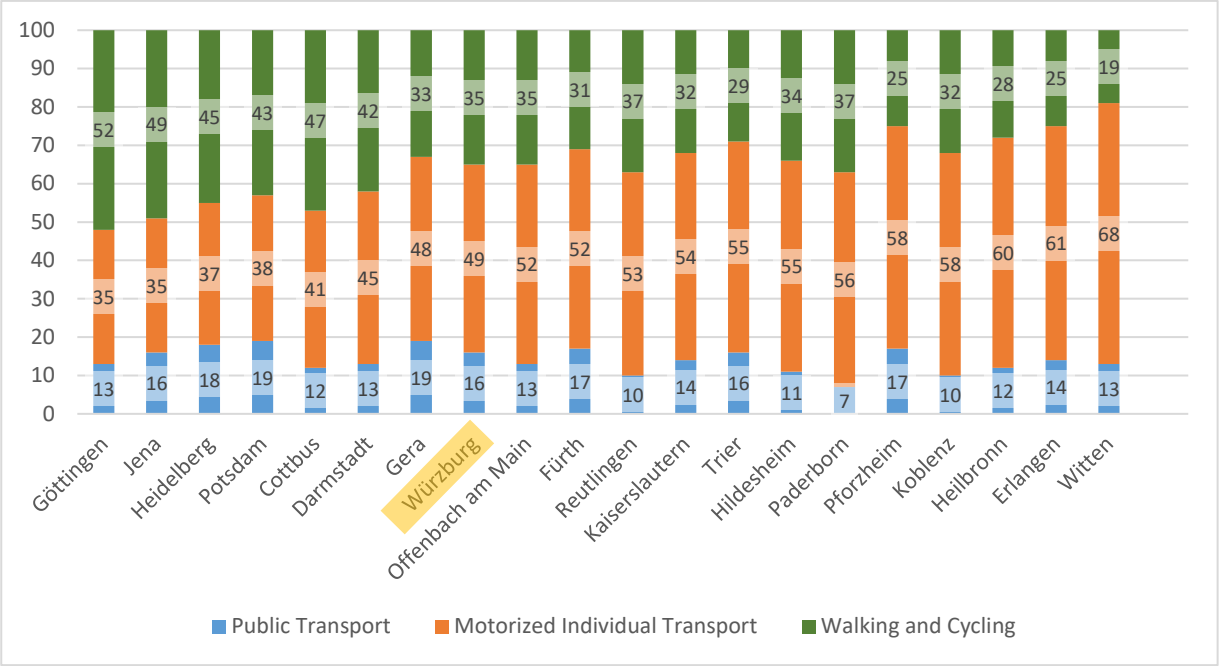

Figure 9: Modal Split Würzburg (2008) (BAUM Consult GmbH, 2012)

The comparison reveals that Würzburg is relatively average, compared to German cities of a comparable size. Sixteen percent of trips are made by public transport, 35% by walking and cycling and the majority of trips (49%) is done by car.

3.2.1 Long-distance transportation

The city is part of the nationwide high-speed rail network and is served hourly by ICE-trains

- on the north-south connection Hamburg – Munich and
- on the north-west to south-east corridor from the Ruhr are towards Vienna and Budapest (DB Fernverkehr AG, 2016).

Regional trains connect towards Heilbronn/Stuttgart, Fürth, Fulda, Erfurt and others (DB Regio AG, 2016).

Würzburg is also an important node in street transportation. The federal motorways (*Autobahn)*

- A3, connecting the Netherlands and Austria,
- A7, from Denmark to Austria and
- A81, Würzburg to Switzerland/Lake Constance are connected to Würzburg.

In addition, there is access to the federal highways (*Bundesstraße*) B8, B13, B19, B22, and B27.

Less important for person transport is the river Main, though it is part of the European waterway network. In the city, there are further two small regional airports, which serve mostly business-related and private air traffic (Stadt Würzburg, 2016b).

3.2.2 Public Transport in Würzburg and the Region

Five streetcar lines with a total length of 42 km provide the backbone of public transport in the city, complemented by 19 bus lines with a length of 191 km (Stadt Würzburg, 2016b). Both services are in operation since 1924 by the *Würzburger Straßenbahn GmbH (WSB)*, which is owned by the City of Würzburg (26%) and the public services provider *Würzburger Versorgungs- und Verkehrs-GmbH* (WVV) (74%) (WVV, 2017). In 2015, a total of 30.5 million passengers were transported by trains and buses in Würzburg (WVV, 2016).

A map of the streetcar network is provided in Figure 10.

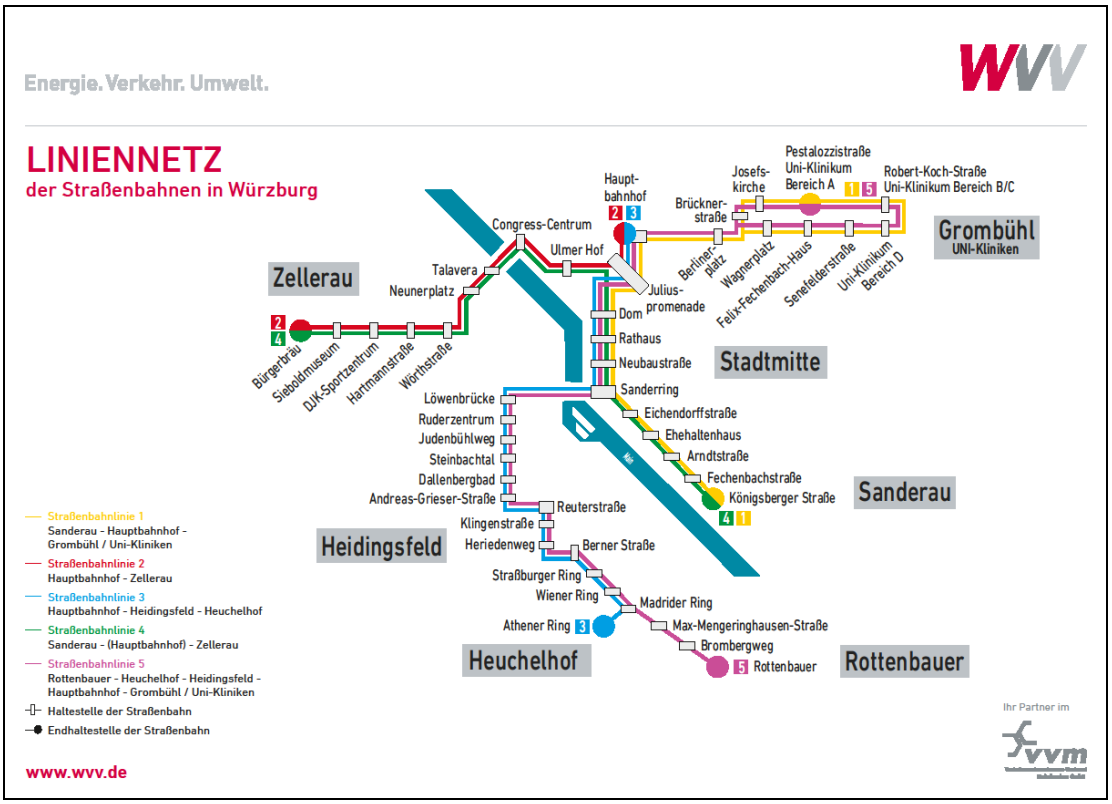

Figure 10: Streetcar network in Würzburg (image: WVV)

Various companies provide regional bus connections to the surrounding cities and villages. Since 2004, all public transport services in the Mainfranken region are part of the transport association *Verkehrsunternehmens-Verbund Mainfranken (VVM),* which offers an integrated schedule and tariff for 120 bus lines, eight regional train lines and five streetcar lines in the counties Main-Spessart, Kitzingen, Würzburg and in the city of Würzburg. It covers an area

of approximately 1000 km² and unites 25 different companies, serving 54 million travelers per year (VVM, 2017). For a map of the business area see Figure 11.

Figure 11: VVM area (VVM, 2016)

The organizational structure of the different stakeholders of public transport in Würzburg is displayed in Figure 12.

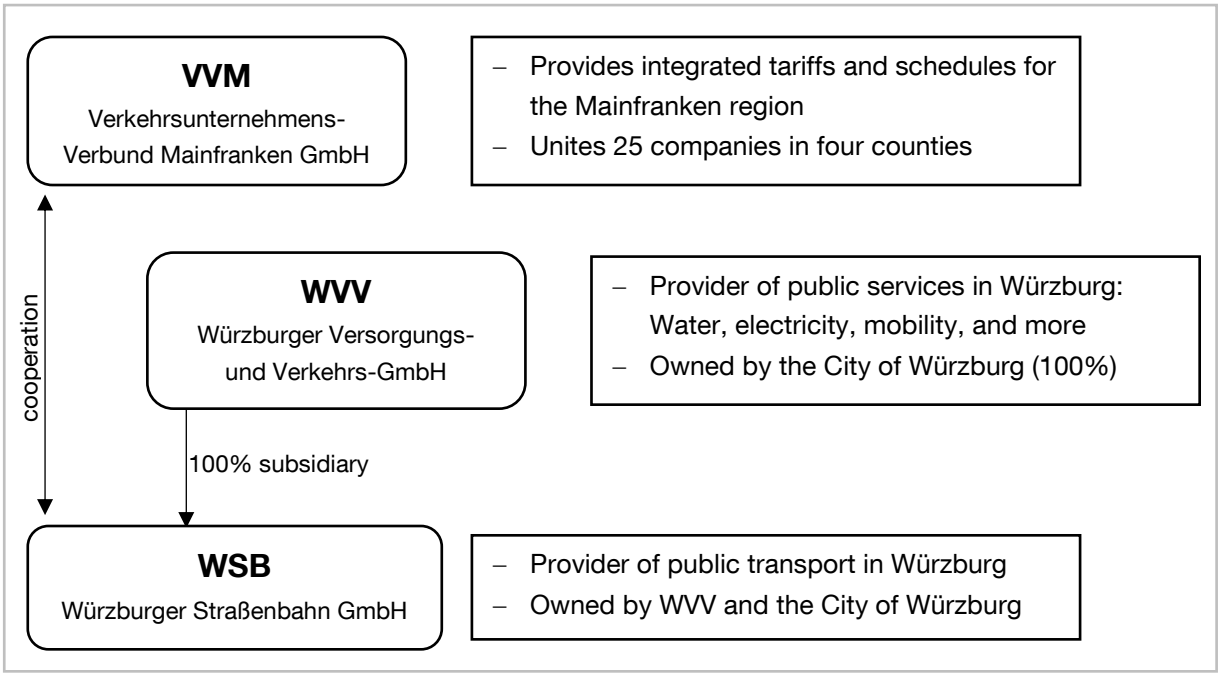

Figure 12: Constellation of public transport in Würzburg

3.2.3 Shared mobility services

The shared mobility services in Würzburg are bikesharing and carsharing. Both services are described in this section.

Bikesharing: Nextbike and Call-a-bike

The first bikesharing service in Würzburg started in 2009 in the form of Call-a-Bike, provided by Deutsche Bahn. Ten bikes are available to registered customers at one station located at the central train station. As this is the only Call-a-Bike station in Würzburg, all rentals have to start and end at this place (Bahn Aktuell, 2009).

In June 2015, nextbike started operations in Würzburg. At first, there were four stations with around 40 bikes and with the opening of mobility stations, the number of stations was increased to 13, along with around 80 bicycles (c.f. chapter 5.2.1).

Nextbike operates in many countries all over the world, and after the initial registration, customers can use the system everywhere. Bikes can be booked using a mobile app (Android, iOS, and Windows 10 Mobile) or by calling a hotline. Users can rent up to four bikes simultaneously.

Trips always have to start and end at a designated station, but it does not have to be the same station – one-way trips are possible. For regular users, each 30 min cost 1€, and the maximum rate for 24h is 9€. For frequent users, the first 30 min of every trip are free for an annual fee of 48€ (Nextbike, 2017).

Carsharing: Scouter, Flinkster, and others

First carsharing efforts were initiated in 2007 in the form of a private initiative called “Kay-Bee CarSharing”. It grew quickly to three cars with around 50 users and was followed by *Flinkster*, a nationwide carsharing service started by Deutsche Bahn. *Flinkster* provided four vehicles at the city’s central train station (Main Post, 2013).

In 2013, the company *Sharegroup,* who was also the local operator of *Flinkster*, bought these three cars and extended the fleet to 16 vehicles operating under the *Flinkster* brand (WürzburgWiki, 2017).

Since 2015, *Sharegroup* operates the carsharing service in Würzburg as part of the *scouter* brand, which is still a part of the *Flinkster* network but has its own branding, marketing, and pricing. Interoperability is ensured, so users of *Flinkster* can use scouter without an additional registration, and the other way around.

The registration fee is 29€, and a monthly fee of 5€ qualifies for the company's standard pricing scheme (Table 7). If users decide against the monthly fee, hourly rates are increased by 0.50€ and daily rates by 5€.

Table 7: Scouter pricing structure (Scouter, 2017)

	Special	S	M	L
Per hour (7-24h)	1€	2€	3€	4€
Per hour (0-7h)	0,50€	0,50€	0,50€	0,50€
Day (24h)	20€	20€	30€	40€
Week	100€	100€	150€	200€
Per Km (1-100)	29 cent incl. fuel			
Per Km (>101)	22 cent incl. fuel			

Special discounts exist for students, Bahncard holders, families, companies and some public transport seasons pass holders. *Flinkster* customers are subject to different prices (Scouter, 2017).

Users can register and validate their driver's license in an online process. Cars can be booked in advance or spontaneously, using either the mobile app (Android, iOS), the website or the hotline. The cars open with a smart card or by mobile app. *Scouter* is a station-based carsharing service with currently around 30 cars at 15 stations. Thus, cars always have to be returned to the same station where the rental started.

The extension of the carsharing system was stimulated by pilot projects led by the City, where new housing developments were allowed to build less parking than required by the land-use plan if they guaranteed a certain level of carsharing services at the building. This model saved construction costs for the development companies and created financial security for the carsharing service that has to invest in new cars and cover their operation costs (Cochet-Weinandt and Pfertner, 2017).

In an exemplary construction done by the City's *StadtBau* housing society, one carsharing car replaced seven private car parking spots (Cochet-Weinandt and Pfertner, 2017).

Private carsharing via *Drivy* exists in Würzburg on a smaller scale (WürzburgWiki, 2017).

3.3 Integrated mobility in Würzburg

Integrated mobility services have been implemented in large cities over the last years (e.g. mobil.punkte in Bremen, switchh in Hamburg) (Luginger, 2016). Now, smaller cities such as Würzburg are exploring the opportunities and benefits that these new mobility options can bring to their cities.

3.3.1 Development and implementation of mobility stations

The first documented approach towards building mobility stations is based on the good experiences with the integration of carsharing and housing development and was formulated 2012 in a concept paper for mobility stations in the inner city ("Innenstadtkonzept Mobilstationen" by Dietrich et al., 2012)

In the same year, the idea was included City's climate action plan ("Klimaschutzkonzept"), where the concept of mobility stations as a measure to counteract increasing vehicle kilometers traveled and rising numbers of cars in Würzburg was defined as a measure to reduce emissions in Würzburg. According to this concept, mobility stations should help creating a mobility system that is more sustainable and less car-dependent and thus contribute to reaching the overarching goal of reducing the city's 1990 CO_2 emissions by 50% until 2020 (BAUM Consult GmbH, 2012).

Back then, only rudimentary carsharing existed (3 cars of "Kay-bee" and 4 *Flinkster* cars at the central station) and bikesharing was not present at all in town.

In 2015, after a collaboration of various departments at the city administration (urban planning, environmental protection, and climate protection), the concept was implemented (Cochet-Weinandt and Pfertner, 2017).

The City planned the locations of the stations, the design, and the overall concept. During the process, a grant from the Federal Ministry for the Environment was acquired, which covered 50% of the total costs of approximately 70,000€ (Cochet-Weinandt and Pfertner, 2017).

As reported in the expert interview with the responsible planner (Cochet-Weinandt and Pfertner, 2017), the locations were selected by the following criteria:

- High urban density with mixed use and local supplies
- Connection to the streetcar network,
- High on-street parking demand,
- Useful distribution of stations across the city.

From a legal perspective, mobility stations are not yet included in the relevant regulations (street design manuals, building codes, etc.) and thus there is no legal framework to reserve parking in public space for carsharing. A workaround that was applied in Würzburg is the declaration of mobility stations as a pilot project over five years so that the parking places remain public space during the evaluation period. After five years, according to this framework, the areas have to be converted into private space to keep the stations active. However, with a carsharing law currently under development in Germany, there will likely be a way to reserve parking for carsharing in public space in a few years and the conversion will not be necessary (Cochet-Weinandt and Pfertner, 2017).

A disadvantage of the current situation is the fact that even though there are “no parking except for carsharing” signs, there is no legal foundation to have cars towed away in case of illegal parking. This highlights the importance of the bollards that protect the spots.

Würzburger Stadtverkehrs GmbH (*SVG*, part of *WVV* and thus a subsidiary of the City – cf. Figure 12) was commissioned to build and to operate the stations. This includes the selection and contracting of the companies for carsharing and bikesharing as well as the maintenance of the station and the liability for the premises (maintenance, winter services, etc.).

Scouter and nextbike have contracts for five years and are obliged to provide their services at the nine mobility stations. In the case of low demand, scouter is allowed to reduce the number of cars at a station from two to one. All other carsharing and bikesharing stations are independent decisions (Cochet-Weinandt and Pfertner, 2017).

3.3.2 Ideas, goals and expected effects of mobility stations

According to the concept paper, a dense network of mobility stations should provide tailored, individual mobility options to Würzburg’s residents and visitors. For each purpose and destination, the stations are expected to offer the right mode of transport to its users. Carsharing and bikesharing should be integrated into the public transport system and a common brand with integrated marketing should represent the environmentally-friendly modes of transport in the city (Dietrich et al., 2012).

The following goals were formulated in the concept of Dietrich et al. (2012):

- Image-boost for the city
    - The multimodal service will gain importance in the future and will eventually be a location factor analog to the motorway connection or access to the high-speed rail network. Especially shared services with electric propulsion are associated with a modern and sustainable mobility system.
- Relief for the environment and improved traffic flow
    - Environmental benefits result from the modern carsharing fleet with vehicles that are smaller and more efficient than the average car in Germany as well as from changes in mobility behavior. Less private car use will improve traffic flows.
- Relief in stationary traffic
    - Private cars are parked on average 95% of a day while carsharing vehicles are used more frequently. On average, 35 carsharing users share a car and members of these services are less likely to own a private car. Studies show that for every carsharing vehicle, 4-8 private autos are replaced. With average parking spots ranging around 12.5 m², each carsharing car frees 37-90 m² of public space.

- Better mobility for broad social layers
    - Multimodal travel behavior is linked to huge savings compared to the costs of owning, using and maintaining a private car. As the provision of basic mobility is considered a public service in Germany, the inclusion of carsharing improves these services and enhances accessibility for everyone in the city.
- Integration with public transport
    - The spatial focus of mobility stations is at public transport stops, especially streetcar stations. This will promote and improve the overall system of carsharing, bikesharing, and public transport. Integration in the dimensions space, information, and organization will also attract new public transport customers.

3.3.3 Description of the current system by level of integration

Since September 2015, nine mobility stations exist in Würzburg. All of them feature bikesharing, carsharing, and proximity to public transport. The streetcar network is operated by *WSB*, *nextbike* provides bikesharing and *scouter* is the carsharing company, owned by *Sharegroup GmbH*, which is integrated in the system.

Figure 13: Mobilstationen logo

Figure 14 shows a map of the mobility stations as well as the streetcar network.

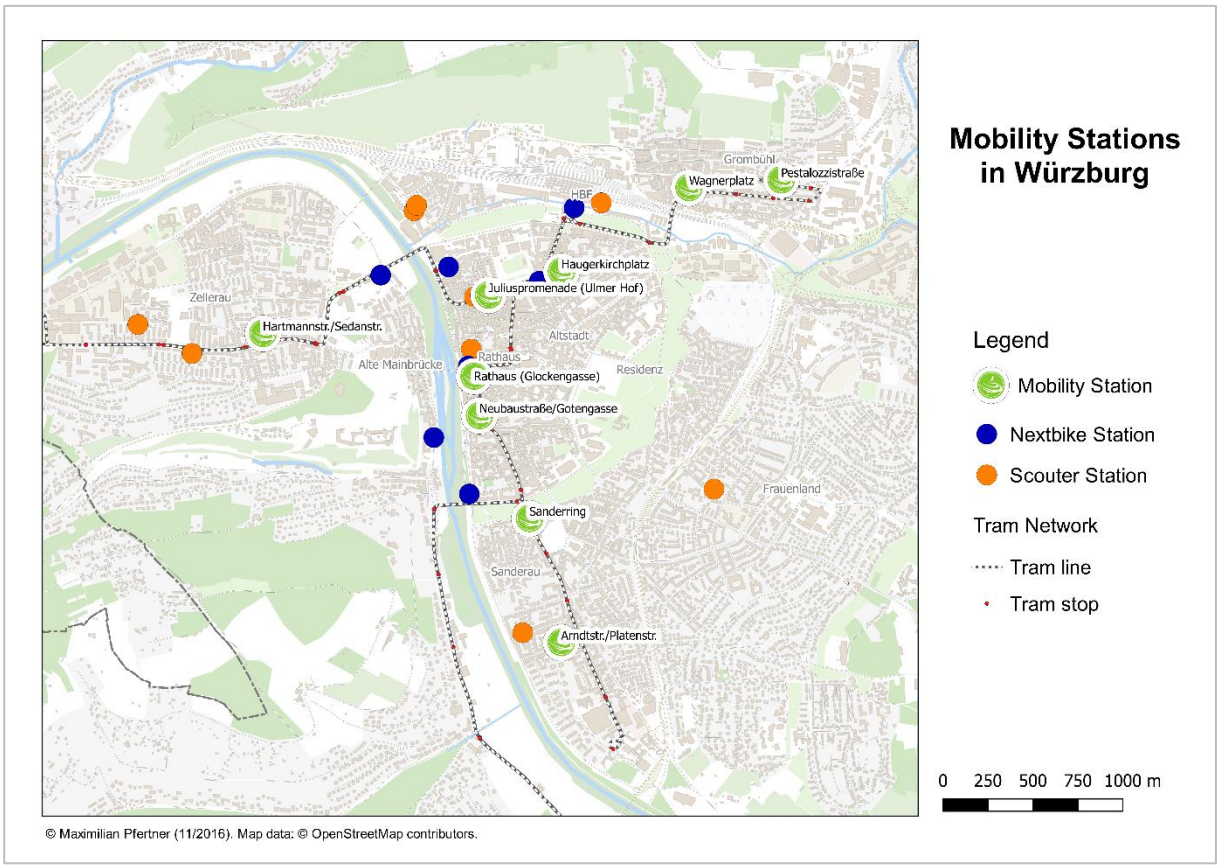

Figure 14: Map of Würzburg and mobility stations (map: City of Würzburg)

As of March 2017, *Scouter* has 18 stations in Würzburg, so nine carsharing stations are not mobility stations. *Nextbike* operates 16 stations in total, resulting in seven stations that are not located at mobility stations. Figure 15 shows the station *Juliuspromenade*.

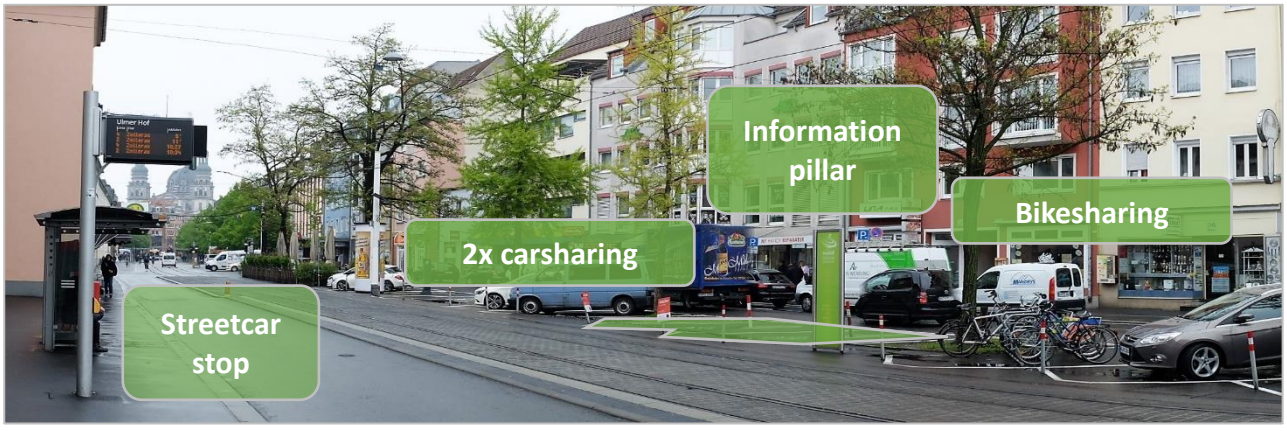

Figure 15: Station Juliuspromenade (own picture)

An overview of all mobility stations with photos, number of vehicles and the urban structure of its surrounding is provided in Table 8. More photos are attached in Appendix 1.

Table 8: List of mobility stations in Würzburg

Name	Carsharing current supply (capacity)	Bikesharing	Public Transport	Area	Image
Arndtstraße	1 car (max. 1)	Yes, without rack	5 minutes walking (streetcar)	residential area	
Hartmannstraße	1 car (max. 2)	Yes	5 minutes walking (streetcar)	residential area (mixed use)	
Haugerkirchplatz	2 cars (max. 2)	Yes	1 min walking (bus) / 3 min (streetcar)	inner city, mixed use	
Neubaustraße	1 car (max. 1)	Yes	5 minutes walking (streetcar)	mixed use	
Pestalozzistraße	1 car (max. 2)	Yes, without rack	next to station (streetcar + bus)	residential area	
Rathaus (Glockengasse)	1 car (max. 2)	Yes	3 minutes walking (streetcar)	inner city, pedestrian zone	
Sanderring	1 car (max. 1)	Yes	3 minutes walking (streetcar)	at arterial street, next to park, swimming pool and school	
Ulmer Hof	2 cars (max. 2)	Yes	at the station	inner city	
Wagnerplatz	1 car (max. 2)	Yes	at the station (streetcar + bus)	mixed use	

Physical integration

Physical integration is the main focus of the mobility stations in Würzburg. All stations connect the shared mobility services physically with the streetcar network. However, some stations require 5 minutes walking to reach the closest streetcar stop (c.f. Table 8).

The info post accounts for visibility in public space and serves as the focus point of the stations. Parking spaces for carsharing are equipped with sign posts and physically protected from abuse by foldable barriers. Shared bicycles can be returned at designated bike racks or in their immediate surrounding.

Collapsible bollards (shown in Figure 16) protect the reserved parking spots from illegal parking. A key to lock/unlock the bollards is found in the car.

Figure 16: Collapsible bollards at the station Juliuspromenade (own picture)

Information / Virtual integration

All stations are equipped with an information pillar (Figure 17) in the characteristic green color and the *Mobilstation* logo (Figure 13). The front side of the post shows a map of the station's surroundings that highlights:

- The name of the mobility station and the nextbike station number
- Other mobility stations nearby
- Taxi stands
- Other nextbike and scouter stations
- Streetcar lines and stops
- Selected street names and important POIs.

A smaller overview map of the entire city is also included. An exemplary map is presented in Figure 18.

Figure 17: Information pillar (own image)

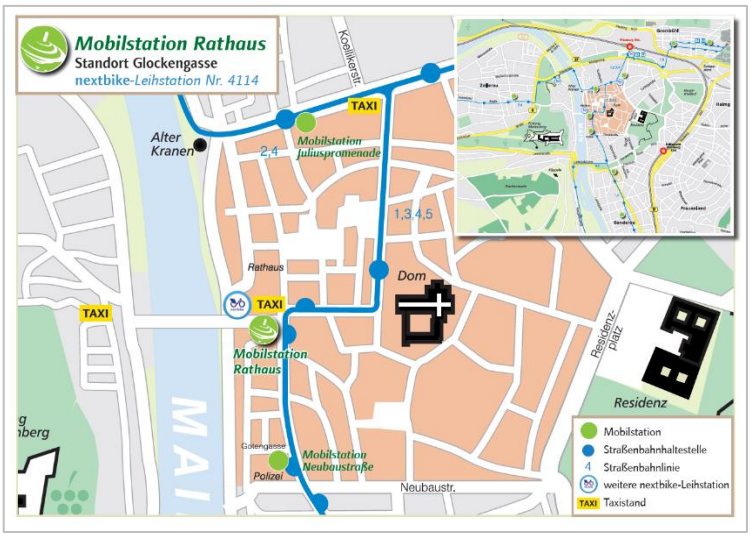

Figure 18: Map of the mobility station "Rathaus" (image: City of Würzburg)

Information about all included mobility services is provided on an information sheet that is attached to all posts. It highlights the most relevant information about public transport, carsharing, bikesharing, taxis, and walking such as internet links and phone numbers. Logos of all partners and the slogan of the stations (*"Zentral mobil: teilen-wechseln-kombinieren"* – "mobile in the center: sharing – interchanging – combining") complement the information sheet that is presented in Figure 19.

Figure 19: Information sheet (image: City of Würzburg)

A QR code links to the city's website about mobility stations, where basic information about the concept and an interactive map can be found. The participating services of WVV, nextbike and scouter are not directly available on the website but there are links to the provider's homepages.

As explained in the expert interview, a main idea of the information pillar is that the information sheets are exchangeable. If a partner is added or removed, the information sheet can be changed easily (Cochet-Weinandt and Pfertner, 2017).

All partners of the system provide mobile apps, but no integration exists among the services of WVV, scouter and nextbike. WVV's *Mein Franken* app offers information about public transport, carsharing can be booked through the scouter app (and the *Flinkster* app), and nextbike also has its own app.

The City of Würzburg provides a multimodal map that shows mobility stations, carsharing, bikesharing, streetcar stops, taxi stands, electric charging and parking in Würzburg. Figure 20 shows a screenshot of this website.

Figure 20: Multimodal map on the City's website (image: wuerzburg.de)

Marketing

Being the initiator of the stations, the City of Würzburg developed a branding scheme for the mobility stations. The brand color is green and is used for the information pillars and the respective maps and information sheets as well as on the website. A spinning top symbolizes the stations (cf. Figure 13, Figure 17, Figure 19).

Aside from the project site (hosted on the City of Würzburg's website), there is no integrated website or reference of the mobility stations. Neither WVV nor nextbike or scouter present the stations in a prominent way.

However, mobility stations are mentioned by WVV and scouter to promote their tariff combination *WVVmobil*. The WVV logo is also found on scouter cars (Figure 21).

Figure 21: WVV logo on scouter car (own image)

Tariff integration

The combination called *WVVmobil* offers free registration (instead of 29€), no monthly charge (instead of 5€ per month) and free CO_2 compensation for holders of monthly public transport tickets that join scouter. Bikesharing, however, is not included in the offer.

Scouter provides some integration to long-distance transportation in the form of discounts for holders of *Bahncards* of Deutsche Bahn (Scouter, 2017)

Registration and Billing

The registration with the scouter carsharing service can partly be done at the WVV customer center. After the online registration, customers have the possibility to get their driver's license validated at the customer center. The user pays the fare directly to the respective provider. Integrated billing is currently not available.

Access

Integrated access, e.g. by offering a smart card or an app that can be used to access carsharing and bikesharing is not available.

Level of integration – strengths and weaknesses

Table 10 (next page) presents a rating of each level of integration for the mobility stations in Würzburg. A '1' in the table stands for full integration, '0' for no integration. The rating is based a scheme developed by Luginger (2016) that differentiates between the levels of integration presented in Table 9.

Table 9: Classification of integration by Luginger (2016)

Level	Description	Range
Level 0	No integration	0%
Level 1	Low integration	1-33%
Level 2	Partial integration	34-66%
Level 3	High integration	67-99%
Level 4	Full integration	100%

Table 10: Classification of Würzburg's mobility stations (template by Luginger (2016))

	Physical	Marketing		Information		Registration		Trip planning				Access		Billing
		Brand Identity	Tariff offers	on-site	Website	Service Center	Website	Website	App	Website	App	Card	App	
Bike (B+R)	1													
Public Transport	1	0,5	1	1	1			0	0	0	0	0	0	0
Carsharing	1	0,5	1	1	1	1	0,5	0	0	0	0	0	0	0
Bikesharing	1	0,25	0	1	1	0	0,5	0	0	0	0	0	0	0
Taxi	0	0	0	1	0			0	0	0	0			0
Sum	80%	31%	50%	100%	75%	50%	20%	0%	0%	0%	0%	0%	0%	0%
Level of integration	Level 3	Level 1	Level 2	Level 4	Level 3	Level 2	Level 1	Level 0						
Sum: Level of Integration	**Level 4**	**Level 2**		**Level 3**		**Level 2**		**Level 0**						
Level of integration	**Full**	**Partial**		**High**		**Partial**		**No**				**No**		

The classification according to Luginger's system reveals that the biggest strength of mobility stations in Würzburg is their physical integration as well as integrated information, provided mainly at the information pillars and via the project's website.

Marketing and integrated registration processes are classified as *partially* integrated while integrated trip planning, access, and billing are not part of the mobility stations in Würzburg.

It is to emphasize that a concept does not have to be integrated in all tiers to be successful. The scheme just highlights the levels of integration in order to get an overview of strengths of existing integrations and potential for more integrated services.

Table 11compares the mobility stations in Würzburg with the examples that Luginger (2016) analyzed.

Table 11: Comparison of integrated mobility services

Levels of integration	**mobil.punkt (Bremen)**	**switchh 2.0 (Hamburg)**	**EinfachMobil (Offenburg)**	**Leipzig mobil (Leipzig)**	**Mobilstationen (Würzburg)**
Physical	Full	High	Full	Full	Full
Marketing	Partial	Partial	High	Partial	Partial
Information	Partial	Partial	Low	High	High
Registration	No	Low	Low	High	Partial
Trip planning	No	Partial	No	Partial	No
Booking	No	Low	Low	Low	No
Access	No	Partial	Low	Full	No
Billing	No	No	No	High	No

The table shows that the system is comparable to Bremen, with a slightly higher integration in the tiers *information* and *registration* while Leipzig mobil is a system that is significantly more integrated than the one in Würzburg.

The common factors that are present in all systems are *physical*, *marketing,* and *information* integration. These factors plus integrated access are recommended by Luginger (2016) as success factors for multimodal mobility stations. Thus, the stations in Würzburg are lacking one of the success factors (*access)* according to this source. It is to note that mobil.punkte in Bremen are seen as a success story of integrated mobility in Germany (Jansen et al., 2015), even though they provide the lowest level of integration in this comparison.

4 Methodology

This chapter presents an overview of the methods applied in this study.

4.1 Literature research, expert interview and site visits

The first meeting with representatives from the City of Würzburg, Justus-Maximilian-Universität Würzburg (JMU) and WSB was held in October 2016. The appointment included coordination of the research topics, the definition of responsibilities, and a site visit to one of the mobility stations.

In the next step, literature research was done using online search in scientific literature, government documents, websites and newspapers. Previous work about integrated multimodal mobility services done at the department facilitated the process.

In May 2017, the second site visit took place. All mobility stations were visited, photos were taken and the area was classified (cf. Table 8, Appendix 1).

Also, the City's planner in charge of the mobility station concept, Adrien Cochet-Weinandt, was interviewed about

- Goals and motivation of mobility stations in Würzburg
- Implementation process
- Legal aspects
- Problems and benefits
- The role of the city administration.

A summary of the interview (in German) is provided in Appendix 2.

4.1 Backend data analysis

Anonymous backend data was obtained directly from the companies scouter and nextbike.

4.1.1 Nextbike

The bikesharing dataset includes 2,266 trips from July 2015 to November 2016. This enables a comparison of the use of bikesharing before the implantation of mobility stations (July to September '15) and after. The following trip attributes are included:

- Start/end time
- Start/end station
- Fare

- Pseudonymous user ID
- Bike ID
- User lives in Würzburg: Yes/No

All trips shorter than 3 minutes (n=424) were removed from the dataset as these rentals were defined errors or failed bookings. Thus, the actual number of included trips is 1842. For November 2016, only data for the first two weeks of the month was provided, to this month was excluded from monthly statistics.

The dataset with of all trips was further aggregated by day to enable daily/weekly/monthly statistics.

Historical weather data obtained from the German Weather Service (Deutscher Wetterdienst, 2017) was linked to the aggregated daily data to examine the influence of the weather on the use of bikesharing.

4.1.2 Scouter

Carsharing data includes 11,468 trips from January 2015 to October 2016. Thus, this also allows a before and after analysis of carsharing use in Würzburg. Each rental includes the following information:

- Pseudonymous user ID
- Car ID
- Date and time of booking (start and end)
- Date and time of use (start and end)
- Kilometers travelled
- Station
- Type of customer (scouter/Flinkster)

Both datasets were provided as .xlsx files and were analyzed in Microsoft Excel 2016, R-Studio 3.1 and IBM SPSS 21.

4.1.3 Introduction to boxplots

In order to compare two or more variables (e.g. nextbike stations and mobility stations), boxplot diagrams are used in the result section. In some cases, this visual representation allows a better comparison of two groups. Figure 22 shows an example of a boxplot along with an explanation of its key elements:

- The horizontal bar in the middle represents the median value of the group
- The upper and the lower edge of the box represent the upper/lower quantile

- The horizontal lines over/under the boxes (“whisker”) show the extreme values (minimum and maximum)
- Circles represent outliers in the data, stars mark extreme outliers

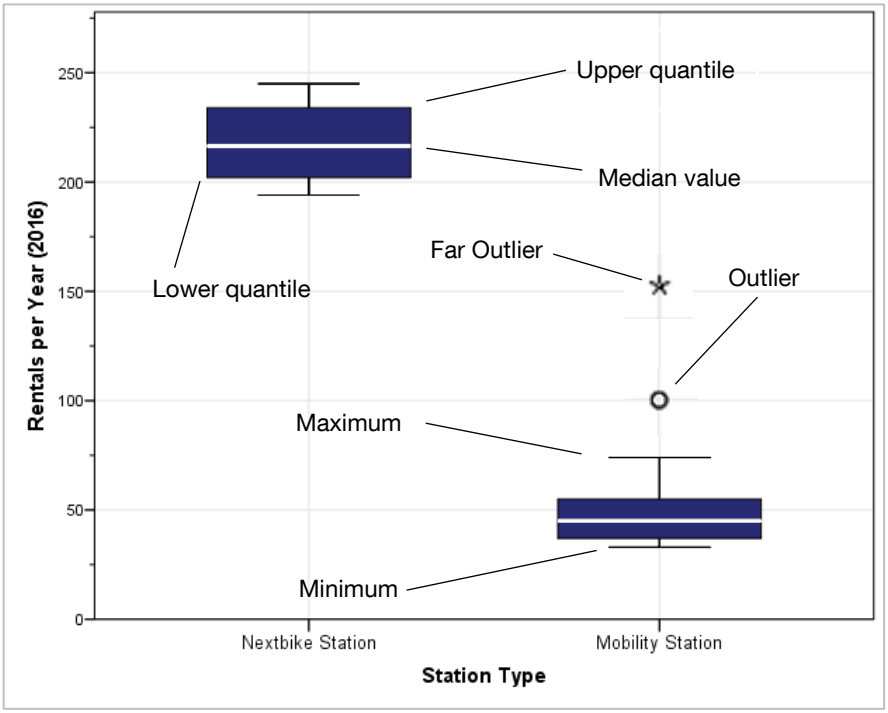

Figure 22: Example of a box plot - Yearly rentals by station type

4.2 Survey of users and non-users

An online survey was developed in cooperation with the University of Würzburg (JMU) to generate synergies and to reach a bigger audience. While this thesis focuses on the users of shared mobility services in Würzburg, JMU’s study analyzes the non-users not only in Würzburg but also in the entire region of Lower Franconia in cooperation with the chamber of commerce (IHK).

JMU provided the technical infrastructure, and the survey was hosted on the university’s online survey system (EFS Survey, Version Fall 2016. Questback GmbH).

The joint survey of users and non-users includes in total up to 75 questions in 15 sections (Table 12). However, the actual number of questions is due to filters and conditions significantly lower. The entire questionnaire is attached in Appendix 3 for further reference.

4.2.1 Incentive

To improve the response rate, an incentive in the form of a sweepstake was introduced. The participating companies sponsored:

- 1x 1.5-hour-ride in a party tram in value of 150€ (sponsored by WVV)
- 10x 50€ gift card for Würzburg's swimming pools (sponsored by WVV)
- 10x 25€ scouter carsharing gift card (sponsored by scouter)

Participants were asked to fill in their name and email address in a separate form, after the completion of the survey. This way data privacy is ensured as the contact information is not stored in the same database as the survey responses. After the draw of the winners, the contact data will be deleted permanently.

4.2.2 Distribution

The main form of distribution for the users of mobility stations was a direct email invitation sent by the carsharing and bikesharing companies to their members in Würzburg. Due to an opt-in rule, only users who actively declared that they want to receive newsletters could be contacted by nextbike.

As JMU's part of the study includes also non-users, a broader approach was added to the distribution concept:

- A flyer with an invitation to the questionnaire and a QR-code was designed and printed 2,500 times. It was sent by mail to WVV pass holders enclosed with their annual renewal of the ticket and distributed in the customer center.
- A press release was distributed by the City of Würzburg, the chamber of commerce (IHK Würzburg-Schweinfurt) and the University of Würzburg. This resulted in various articles in local newspapers and blogs.
- Scouter, nextbike and WVV published the survey link on their websites and social media accounts.

4.2.3 Questions

The main topics of the survey are

- general mobility behavior
- membership and use of shared mobility services
- use of mobility stations
- opinions about mobility stations
- personal attitudes
- demographic information.

More details are provided in Table 12 and the entire questionnaire (in German) is attached in Appendix 3.

Table 12: Overview of the questionnaire

Section	Number of questions	Filter	Keywords
Welcome	-		-
Mode choice (general)	8	-	Place of residence, use of different modes by purpose
CS/BS membership	1	Only BS/CS users	Membership with all available CS/BS companies (scouter, nextbike, Flinkster, Drivy, etc.)
General questions about shared mobility	5	Depends on place of residence and CS/BS use	Preferences: freefloating vs. station-based; electric sharing services, sharing in rural ares, etc.
Sharing in Schweinfurt	2	Only Schweinfurt residents	-
Non-users	6	Only non-users	Reasons for disuse
Knowledge of mobility stations	2	-	Do people know mobility stations in general? Do they know those in Würzburg?
Use of mobility stations	3	People that know the stations	How did they become aware of the stations? Have they use CS/BS there?
Use of mobility stations II	3	People than know and have used the stations	Which stations do people know/use? Do they remember their last trip at a station?
Last Trip for non-mobility-station-users	9 (BS) + 7 (CS)	Users that do not remember the last trip at a station	Do they remember another trip? If yes: start (station + location), access mode, purpose, end (station + location), egress mode, replaced mode.
Last trip for station-users	9 (BS) + 7 (CS)	Users that do remember the last trip at a station	start (station + location), access mode, purpose, end (station + location), egress mode, replaced mode.
Opinions about mobility stations	7	Partly: only users of CS and/or BS	Importance of features (BS, CS,PT, WiFi, Visibility, etc.); statements about changes in mobility behavior; problems, personal comments, more stations? if yes: where? / if no: why not?
Personal attitudes	1	-	General attitudes about mobility, sharing, different modes, etc. (scale: agree-disagree)
Demography	14	-	Gender, age, household size, (changes in) car availability, (changes in) car use, bike availability, transit pass, post code, location of work/education
Additional: WVV questions	7	Additional part after discharge/thank you page and sweepstake	Level of satisfaction, preferred way of ticket purchase, means of information, combined offers, mobile app, *WVVmobil,*
Total:	**up to 75 questions**	**Due to filters and conditions, the actual number was significantly lower in most cases**	

4.2.4 Responses

854 people filled out the survey (incl. non-complete answers). For this study, only the answers of 167 respondents who were defined as users of bikesharing and/or carsharing by stating to use these services at least “less frequently than monthly” were taken into account for most of the results. The non-user part of the cohort is analyzed by JMU, but some non-users results are also provided in the *Results* section for a better understanding of the user group.

The user group consists of 146 CS users, 47 BS users and 26 persons who used both services. Filtering for individuals who use scouter and nextbike in Würzburg, there were 84 scouter users and 14 nextbike customers.

4.2.5 Analysis

The online platform EFS Survey provided the survey results as a .sav file along with an SPSS Syntax template for easy analysis. However, this template was not suitable for detailed scientific analysis, as key elements like missing responses were missing. Thus, an own SPSS syntax script was created for a comprehensive analysis of survey data.

With this script, the survey results were processed in IBM SPSS 21. Some analysis and graphs were created in Microsoft Excel 2016.

Mapping of starts and destination of trip chains

In the last trip section of the survey, users were asked for the start points before reaching the stations as well as their destinations after returning a car or a bike at a station. This information was collected as an open question and thus some processing of these results was necessary in order to present them on a map. The process can be described in the following way:

1. Extraction of the relevant responses with SPSS, export as .csv file
2. Manual data cleaning in Excel (removal of non-usable responses like “at home”)
3. Geocoding the cleaned addresses and POIs using the Google Maps API with an R script obtained from Lynn (2013)
4. Mapping the points with QGIS 2.12. (Quantum GIS Development Team, 2015) and connecting the mobility stations with the respective origins and destinations using the “Hub Lines” tool provided in the MMQGIS plugin developed by Minn (2015).

The maps are presented in chapter 5.3.3.

4.3 Calculation of reduced CO_2 emissions

Mobility stations contribute to reductions of carbon dioxide emissions mainly in two ways:

- lower CO_2 emissions per vehicle-kilometer due to smaller, more efficient vehicles in the carsharing fleet compared to the average private car
- reduced number of private vehicle-kilometers due to more attractive alternatives and a lower car dependency.

On the other hand, new emissions are caused by trips that are shifted from public transport (and other low-emission modes) to carsharing.

Generally, transport-related emissions can be estimated by the formula

$$E = \sum_i Activity_i \times Emission\ Factor_i$$

Where the total emissions E are the sum of all activities (A), given e.g. in vehicle-kilometers multiplied by an emission factor (EF), given e.g. in gram per kilometer. In terms of car traffic, activities could be vehicle-kilometers driven and the emission factor is given as grams of CO_2 per vehicle-kilometer.

Thus, the following steps were taken in order to estimate the amount of saved CO_2 emissions:

Calculation of emission factors

- The absolute numbers of cars in Würzburg by cubic capacity classes and fuel type was obtained from Kraftfahrt-Bundesamt (2016a) and is presented in Table 13.

Table 13: Number of of private vehicles by cubic capacity and fuel type

Würzburg (City)	<=1399 cm²	1400-1999 cm²	>=2000cm²	unknown
Gas	11661	20251	7060	0
Diesel	6479	11251	3922	0
others	0	0	0	1238

The absolute numbers were converted into percentages as shown in Table 14.

Table 14: Distribution of private vehicles by cubic capacity and fuel type

Würzburg (City)	<=1399 cm²	1400-1999 cm²	>=2000cm²	unknown
Gas	19%	33%	11%	0%
Diesel	10%	18%	6%	0%
others	0%	0%	0%	2%

- Emission factors for these cubic capacity classes and fuel types were obtained from the ProBas program (Umweltbundesamt, 2017), a project of Germany's Federal Environmental Agency. These emission factors are a result of the European TREMOD model (Knörr et al., 2012) and are also used in the well-known HBEFA (Handbook Emission Factors for Road Transport) manual (Hausberger et al., 2009). The factors are summarized in Table 15.

Table 15: Emission factors based on ProBas

CO_2 [g/veh-km]	<=1399 cm²	1400-1999 cm²	>=2000cm²
Gas	149	190	256
Diesel	113	155	214

Combining these factors with the percentages from Table 14 leads to an average emission factor for private cars in Würzburg. The following formula is used:

$$EF_{private\ cars\ Würzburg}\left[\frac{g}{veh\text{-}km}\right] = \sum_{ij} \%_{ij} \times EF_{ij}\left[\frac{g}{veh\text{-}km}\right]$$

where i= fuel type and j= cubic capacity class.

This results in an average emission factor for private cars in Würzburg of **172,9 g CO_2/km**.

- Scouter carsharing fleet: Scouter is certified with *The Blue Angel*, a German environmental label. A condition for the certification is that 90% of all vehicles meet the threshold of 95 g CO_2/km (Der Blaue Engel, 2017). Thus, the assumption of an average fleet emission factor of **100 g CO_2/km** is a good approximation. Comparable carsharing companies such as *cambio* achieve similar values (cambio, 2016).

Kilometers traveled by carsharing and reduced private car trips

Changes in travel behavior were asked in the user survey, where users with access to a private car were asked whether their car usage has changed over the last year. Those who said they have reduced their private car usage were further asked how many kilometers they travel less per year.

Carsharing statistics were obtained from backend data. For the CO_2 calculation, data for one full year from October 15 to October 16 was taken into account to ensure comparability with the changes in travel behavior that were also asked over one year.

Calculation of reduced CO_2 emissions

The final calculation of reduced CO_2 is done by combining the two effects of reduced car dependency and more efficient carsharing vehicles compared to private cars. However, carsharing also shifts trips from public transport and other low-emission modes to automobiles. This effect counts negative in the following equation of the total emission reduction:

$$\begin{aligned} reduced\ Emissions \\ &= saved\ emissions\ from\ higher\ efficiency \\ &- extra\ emissions\ from\ additional\ auto\ trips \\ &+ reduced\ private\ car\ use\ emissions \end{aligned}$$

The three factors can be calculated as follows:

$$saved\ emissions\ from\ higher\ efficiency = \%_{car\ trips\ replaced} \times scouter\ km\ \times (EF_{Private\ Cars} - EF_{scouter})$$

$$extra\ emissions\ from\ additional\ auto\ trips = \%_{other\ modes\ replaced} \times scouter\ km\ \times EF_{scouter}$$

$$reduced\ private\ car\ use\ emissions = \%_{scouter\ users\ who\ reduced\ private\ car\ use} \times n_{scouter\ users\ in\ Würzburg} \times average\ private\ car\ km\ reduction$$

This approach is a very simplified method, especially as there is no vehicle-activity of private cars in Würzburg included. However, with the available data, this is a suitable approach for the aim of this study.

4.4 SWOT Analysis

The analysis of Strengths, Weaknesses, Opportunities, and Threats (SWOT) is a well-known tool used to analyze the performance and the strategic planning of projects. Using a grid scheme (Table 16), positive and negative factors that influence the project are collected, so that researchers can see what is going well, derive ideas for future progress and identify and anticipate weaknesses and problems (Helms and Nixon, 2010).

Table 16: SWOT scheme

	helpful	harmful
internal	**Strenghts**	**Weaknesses**
	-…	-…
	-…	-…
external	**Opportunities**	**Threats**
	-…	-…
	-…	-…

5 Results

The findings generated from the methods presented in the precious chapter will be shown and explained in this chapter.

5.1 User characteristics

This section answers the question “who are the users”. First, demographic parameters are summarized, and then the user’s transportation options and their daily travel behavior are explained.

5.1.1 Personal attributes

Respondents were asked to provide some demographic facts about themselves and their households. Figure 23 shows the proportion of women and men among scouter and nextbike users.

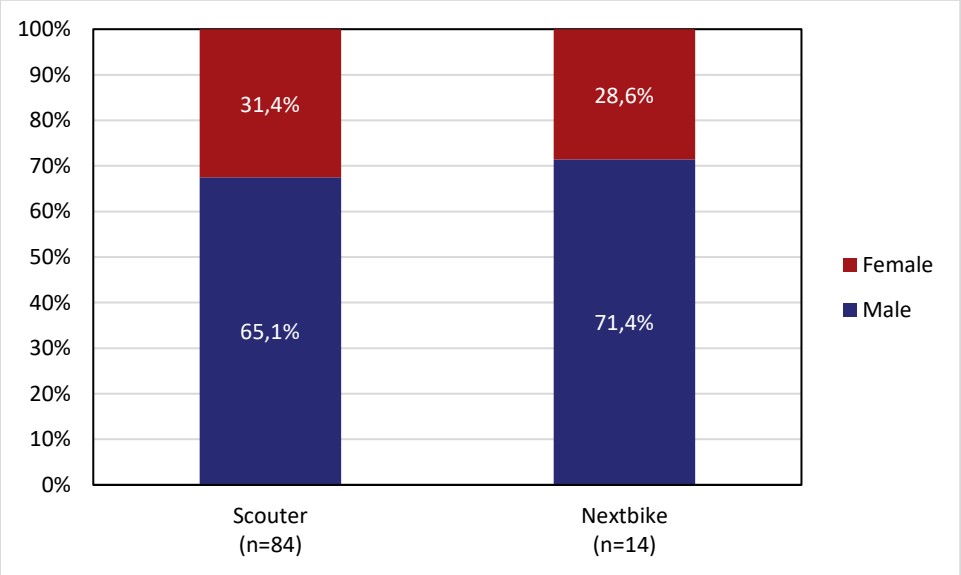

Figure 23: Gender of respondents

As seen previously in other studies (cf. Miramontes et al., 2017 (forthcoming), Kopp, 2015, Schreier et al., 2015), men dominate the sample of both carsharing and bikesharing users. About two thirds of the users of carsharing in Würzburg are male while one third is female. Among nextbike users, 71% are men.

Other studies report that bikesharing users are rather young while station-based carsharing tends to have older customers (Miramontes et al., 2017 (forthcoming)). Figure 24 presents the age structure of scouter and nextbike in Würzburg.

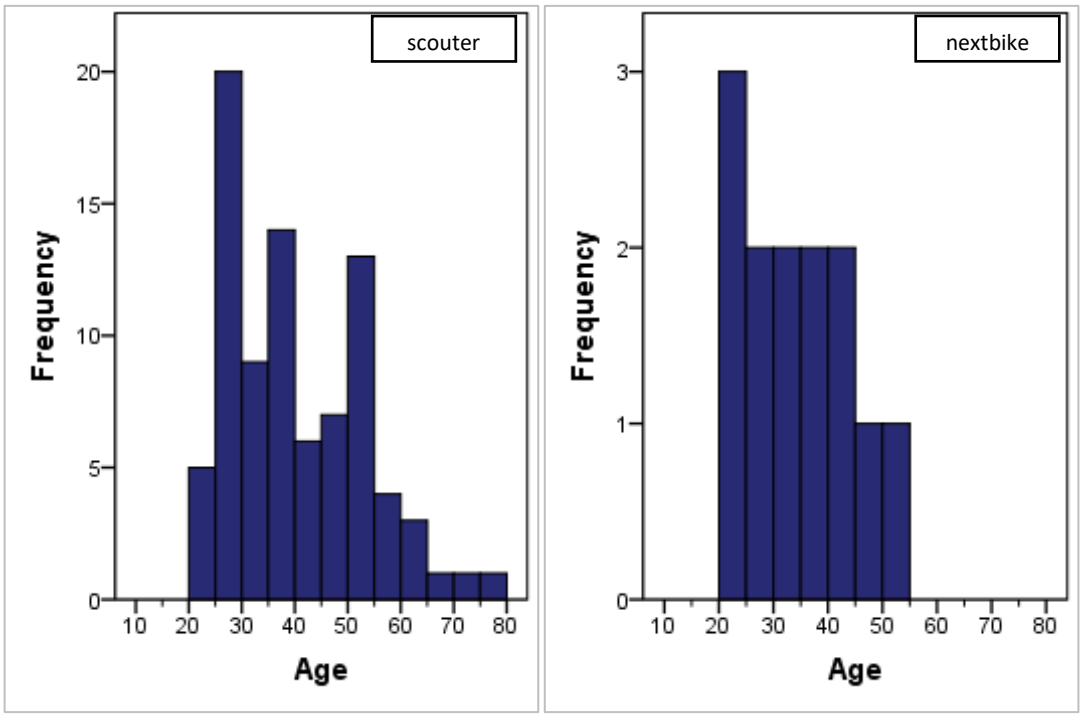

Figure 24: Age distribution scouter (left, n=84) and nextbike (right, n=13)

Many scouter users are between 25 and 55 years old. The service is attractive for various age groups except for the elderly over 65 and people under 20 (who might not have a driver's license).

Nextbike users are commonly between 20 and 55 years old. It is remarkable that there are no users below 20 years part of the sample. The most frequent age among nextbike users is 20-25, and no one is over 55 years old. However, the sample consists only of 13 persons that used nextbike in Würzburg[1] and thus these figures have a low data quality. Table 17 gives more details about the age structures in both groups.

[1] Methodological note: 47 persons in the sample use bikesharing in some way, but only 14 do so in Würzburg. As only these 14 are affected by the mobility stations, the others had to be excluded from this analysis.

Table 17: Age structure of users

		Scouter	Nextbike
N		84	13
Range		20-78	20-54
Mean		39.8	33.6
Median		36.5	33
Percentile	25	28.0	24.0
	50	36.5	33.0
	75	50.0	42.5

Scouter users have a median age of 38.5 years. 25% are younger than 28 and 75% are younger than 50. Nextbike users are slightly younger, with a median age of 33. 25% of all bikesharing users are younger than 24 and 75% are younger than 42.5 years.

Thus, the users of shared mobility services show slightly different demographics than users in previous studies. While scouter attracts the typical target group of station-based carsharing (Riegler et al., 2016), the bikesharing users in Würzburg are older than users in other cities such as Munich (Miramontes et al., 2017 (forthcoming)). However, the use of scouter in Würzburg is dominated by visitors. According to local observations, the characteristics of nextbike use are often touristic, so a higher age can partly be explained by this fact (Cochet-Weinandt and Pfertner, 2017).

An important determinant of travel behavior is the household size and whether the household has children or not (Handy et al., 2005). Figure 25 and Figure 26 show these household characteristics.

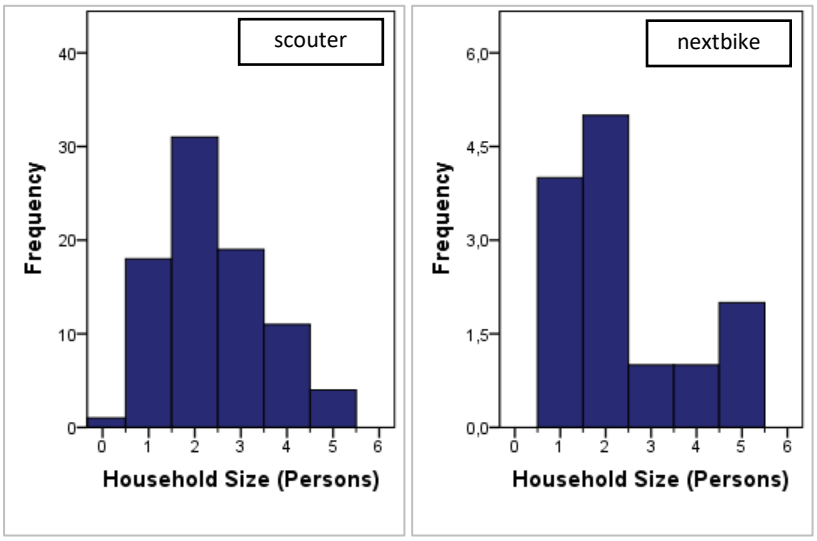

Figure 25: Household size scouter (left, n=84) and nextbike (right, n=13)

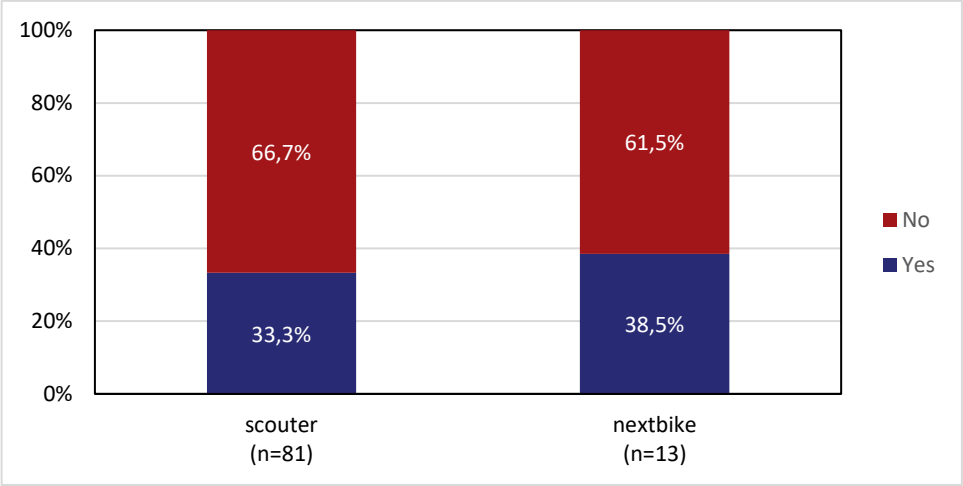

Figure 26: Households with children

In both groups, two-person-households are most common. Second frequent are three-person households in carsharing users, followed by single households. Nextbike users often live alone while the number of users living together with more than two persons is lower.

Most users of all services do not have children under 18 in their household. The share is slightly bigger in nextbike users (62% without children) than scouter customers (67%).

The last personal demographic information asked in the survey is about the location of home and work. Figure 27 and Figure 28 present the results for scouter and nextbike.

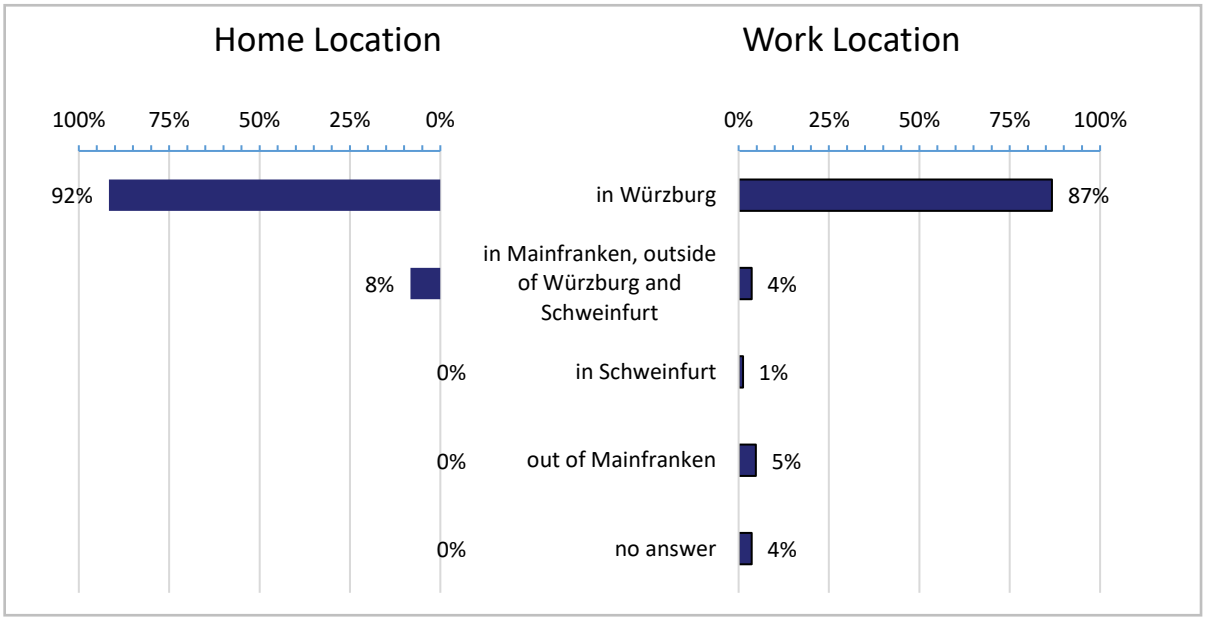

Figure 27: Home and work locations (scouter, n=84)

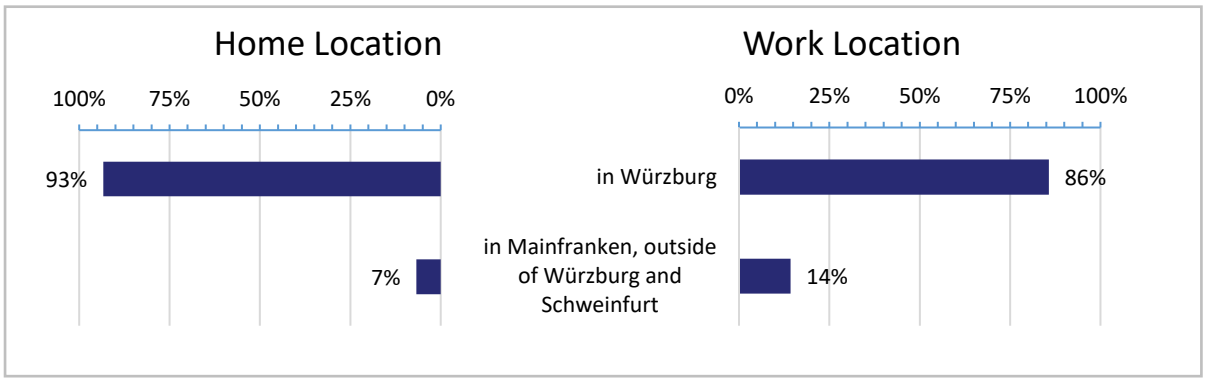

Figure 28: Home and work locations (nextbike, n=14). Other options (cf. Figure 13) all 0%.

The vast majority of users in both groups lives in Würzburg. Seven to eight percent live in the surrounding Mainfranken region. Carsharing users mostly work in Würzburg, too, while some commute to other work locations. 86% of nextbike users work in Würzburg and 14% work in Mainfranken. It is clear from these results, that mobility stations are mainly attractive for people who live in the surrounding of these stations. Visitors, who live in other regions and come to Würzburg just for a limited time, are another user group that is not included in this question.

5.1.2 Transportation options and travel behavior

Aside from demographic attributes, available travel options are shaping the individual travel behavior. This section will summarize the availability of various modes of transport to the respondents and provide insights into the users' travel behavior.

Transportation options

All carsharing users and 87% of bikesharing customers that took part in the study have a driver's license. The actual availability of a car is shown in Figure 29.

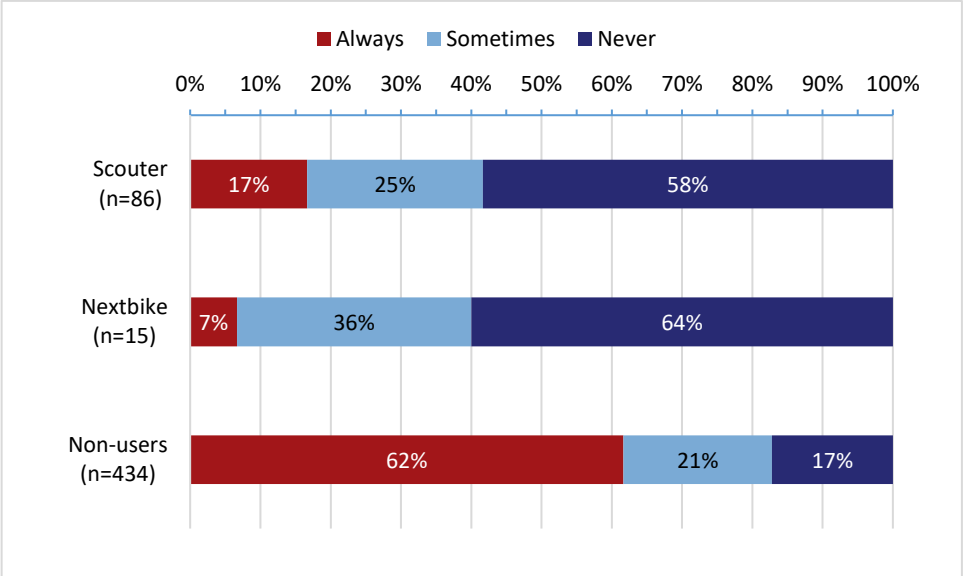

Figure 29: Car availability of users and non-users

While 62% of non-users of carsharing and bikesharing in Würzburg have *always* access to a private car, the share of car-owners is significantly lower in the users of sharing services. Around 60% of both scouter and nextbike users state that they *never* have a private car available. 17% of carsharing customers have *always* a car at hand, and 25% *sometimes*.

The fact that more than 90% of sharing users live in Würzburg (c.f. Figure 27, Figure 28) is biasing this result, especially taking into account that more than 30% of non-users live in non-urban areas of Mainfranken. However, among the non-users who live in Würzburg the share of respondents who have *always* a car available is still higher than 50% (not displayed).

Thus, the car availability is significantly lower in the users of sharing services, compared to non-users.

Bikes are available to most of the households. 88% of carsharing users, 80% of bikesharing customers and 70% of non-users had at least one bike in the household.

The availability of public transport seasons tickets is displayed in Figure 30.

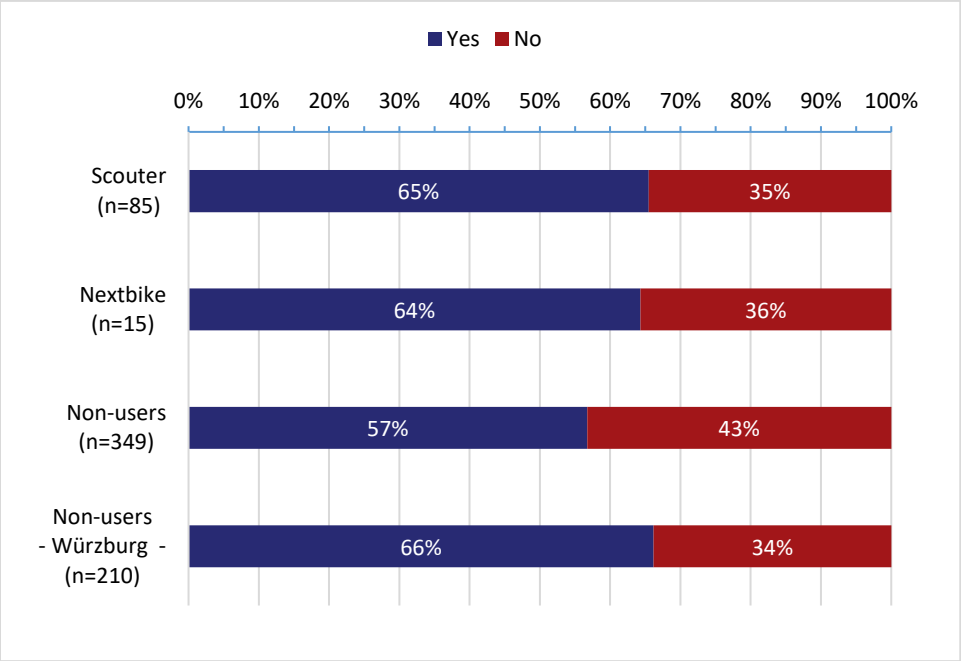

Figure 30: Ownership of public transport season tickets

Results show that the proportions of public transport season pass holders are equal among scouter, nextbike and non-users who live in Würzburg (all around 65%). Only the group of all non-users exhibits a slightly lower season pass ownership (57%).

This indicates that the shared mobility complement public transport rather than replace it. The lower number among all non-users is explicable by the fact that many respondents in this group live outside the big cities of the region, where car dependency is higher.

Figure 31 presents the ratio of respondents who are members of sharing services.

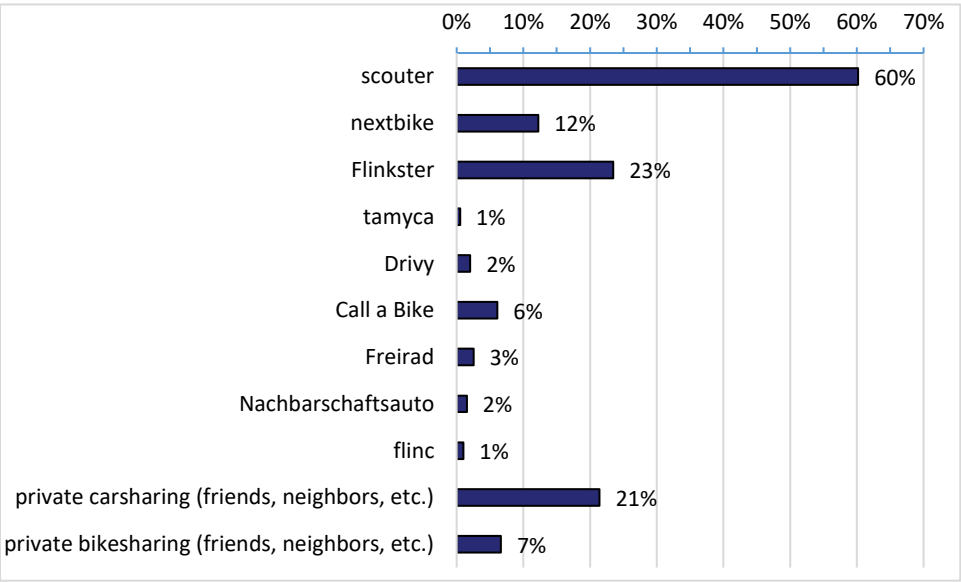

Figure 31: Membership with sharing services (n=196, multiple responses)

Scouter and Flinkster are the most popular services, followed by nextbike and Call a Bike. It is important to mention that invitations were sent directly to customers of scouter and nextbike, so membership with these services is naturally higher in the sample.

Private carsharing is also used in the region. 21% of users use this privately organized form of sharing a vehicle.

Attitudes and opinions

Regarding their attitudes and opinions, there are two remarkable observations in the groups of users and non-users while no significant differences were found between users of carsharing and bikesharing: The first is the high approval rates among all groups towards the following items (see also Figure 32):

- Extension of buses and streetcar lines (>85% approval among all groups)
- Combination of PT season passes with carsharing and bikesharing tariffs (>75% in all groups)
- One card to access and use PT, carsharing and bikesharing (>75% in all groups)
- Electromobility is our future (>75% in all groups)
- There is not enough safe and surveilled bike parking (around 70% in all groups).

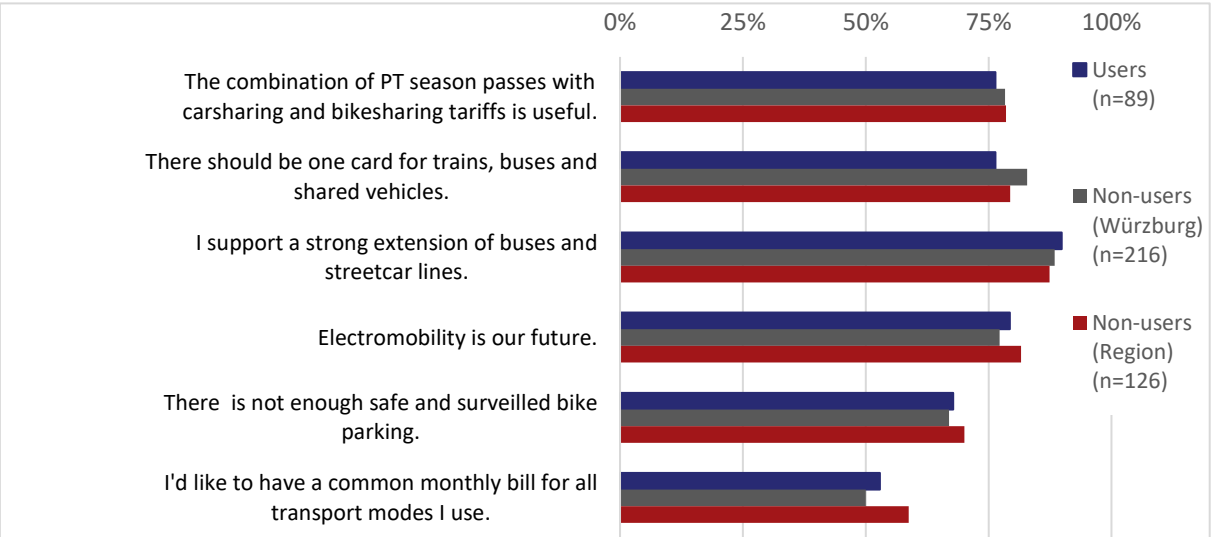

Figure 32: Sum of "totally agree" and "agree" for various statements (I)

These approval rates show that the majority of respondents, no matter if user or non-user, supports public transport investments, more integration among various modes and new technologies like electric vehicles.

The idea of a common bill for all transport modes is more contentious: around 50% of all users groups would like to have this form of billing integration.

The second set of observations is found in those items, where differences between the user groups exist:

- General attitude towards **sharing**: Users are not reluctant towards the general idea to share items among different people. Only 14% state that they do not like it. The refusal of this trend is higher in Würzburg's non-users (30% who do not like sharing) and even higher in inhabitants of the region (45%).
  Being asked for the trend of sharing in transportation, almost 90% of users believe that future mobility is more about *sharing* and less about *owning*. Only around 60% of non-users from both groups agree to this statement.
- **Car dependency** is significantly higher among people that live in the region compared to Würzburg residents. Almost 70% of non-users from the region agree that a car fits their daily routines perfectly. Among non-users and users in Würzburg, the approval rate is considerably lower (35% and 25%).
- **Pragmatism** is found in all user groups. The importance of environmental protection is very high in all groups, but the lowest amongst users of sharing services. Thus, the users' main motivation to use carsharing and bikesharing seems not to be environmental concern but more the individual benefit. The low importance of car brands in all groups contributes to the impression that mobility choices are made pragmatically.
- Non-users from the region show the highest willingness to pay a higher price in exchange for more **independent transport options**. In contrast to this, the agreement among users is significantly lower. This highlights the importance of independence which non-users expect to get from a private car.

The relevant graphs are displayed in Figure 33.

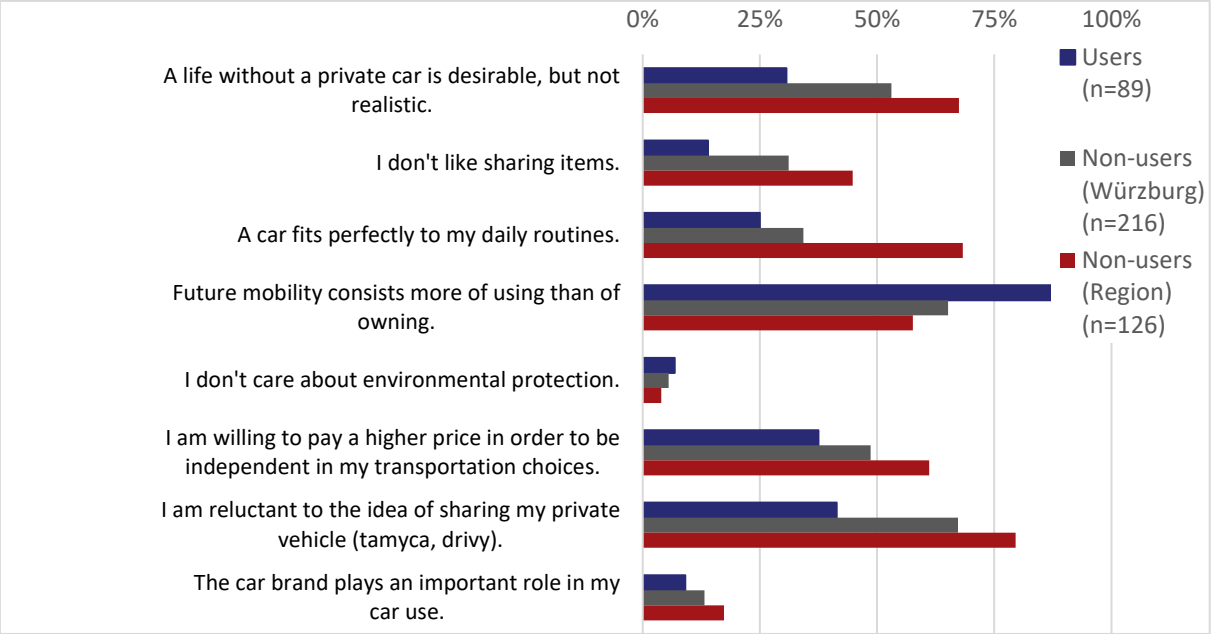

Figure 33: Sum of "totally agree" and "agree" for various statements (II)

Travel behavior

Figure 34 and Figure 35 present insights of the general travel behavior of the various groups.

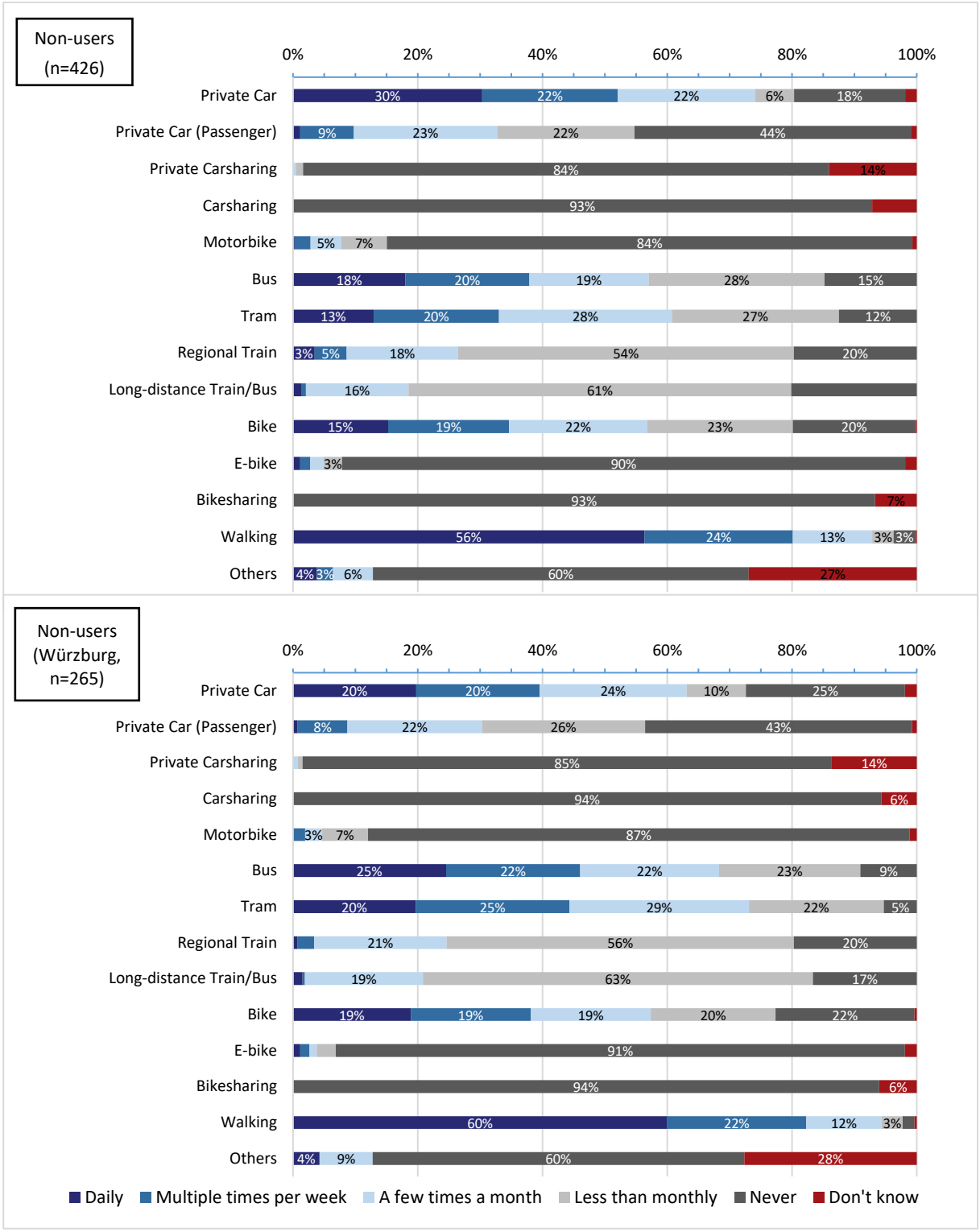

Figure 34: Frequency of use for different modes (non-users)

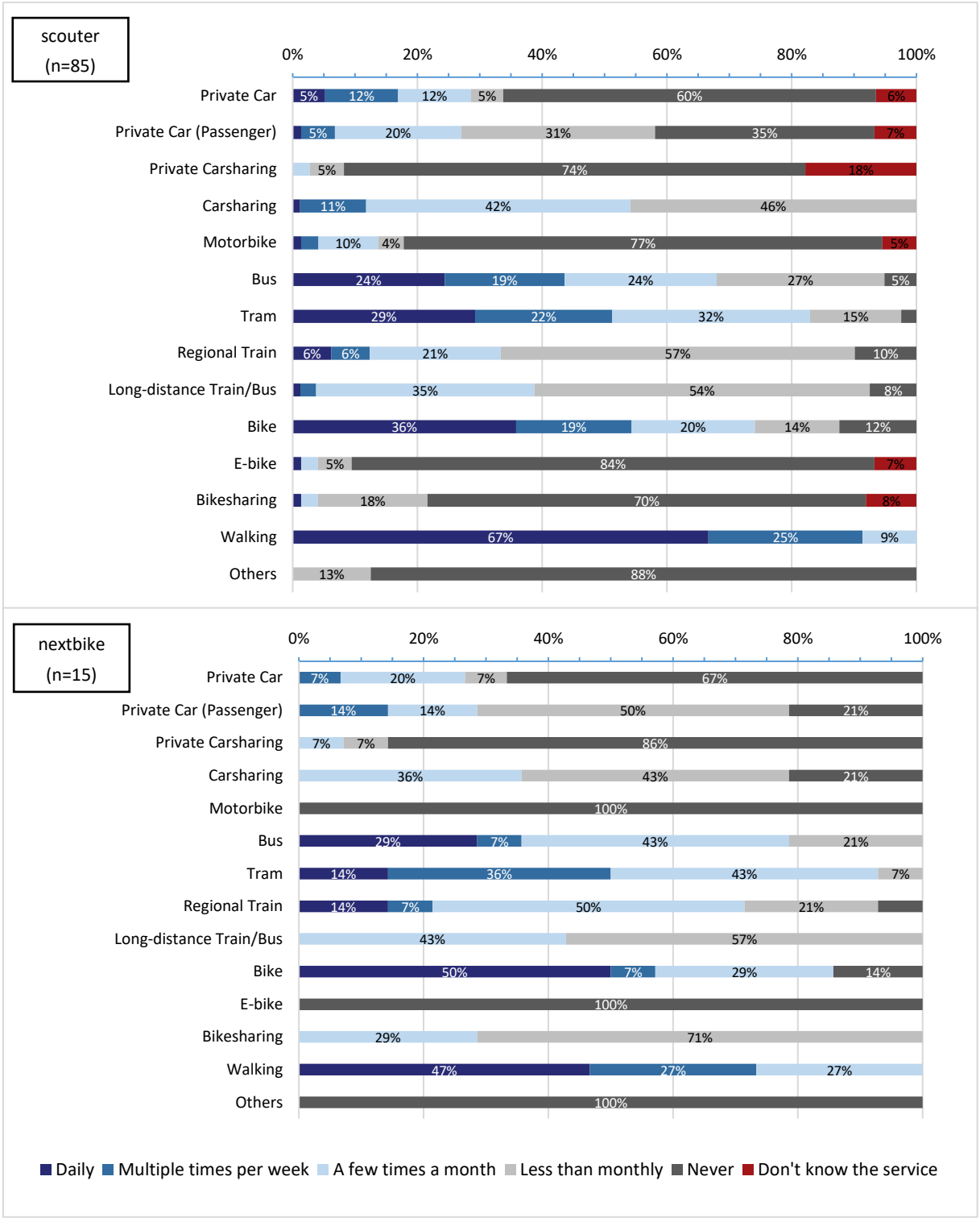

Figure 35: Frequency of use for different modes (users)

A few trends and differences in the mobility behavior of both users and non-users are observable:

- **Private cars:** 55% of all non-users and 40% of non-users from Würzburg use private cars at least “multiple times per week”. Both user groups show significantly lower frequencies and 60% of scouter users even say they “never” use a private car. Thus, users of shared mobility services are found to use private cars significantly less than non-users.
- **Public Transport** usage is relatively equal among all groups. Notable differences exist mainly between people from the region and Würzburg residents, who use buses, trams and regional trains slightly more often. 40-45% of Würzburg residents state they use the tram at least “multiple times per week”.
- **Walking** is the most frequently used form of transportation in all groups.
- **Cycling:** Users of sharing services tend to cycle more often than non-users do: 55% of carsharing users use their bicycle at least “multiple times per week” while only 38% of non-users in Würzburg do so.
- **Carsharing** is well-known, also among the non-users, which know the service in more than 90% of the cases. Users of carsharing use it mostly “less than monthly” (46%) or “monthly” (42%). Only a minority (12%) uses carsharing more often.
- **Bikesharing:** Similar to carsharing, also bikesharing is well-known among non-users. Roughly two-thirds of nextbike customers say they use the service “less than monthly”, the rest uses it “a few times a month”.

All participants, both users and non-users, were further asked which modes of transport they use for the purposes

- work / education,
- business trips,
- shopping / errands and
- leisure.

Multiple modes could be selected. Thus, the result presented in Figure 36 does not show the frequency of use, but the share of respondents who uses a mode for a given purpose in general.

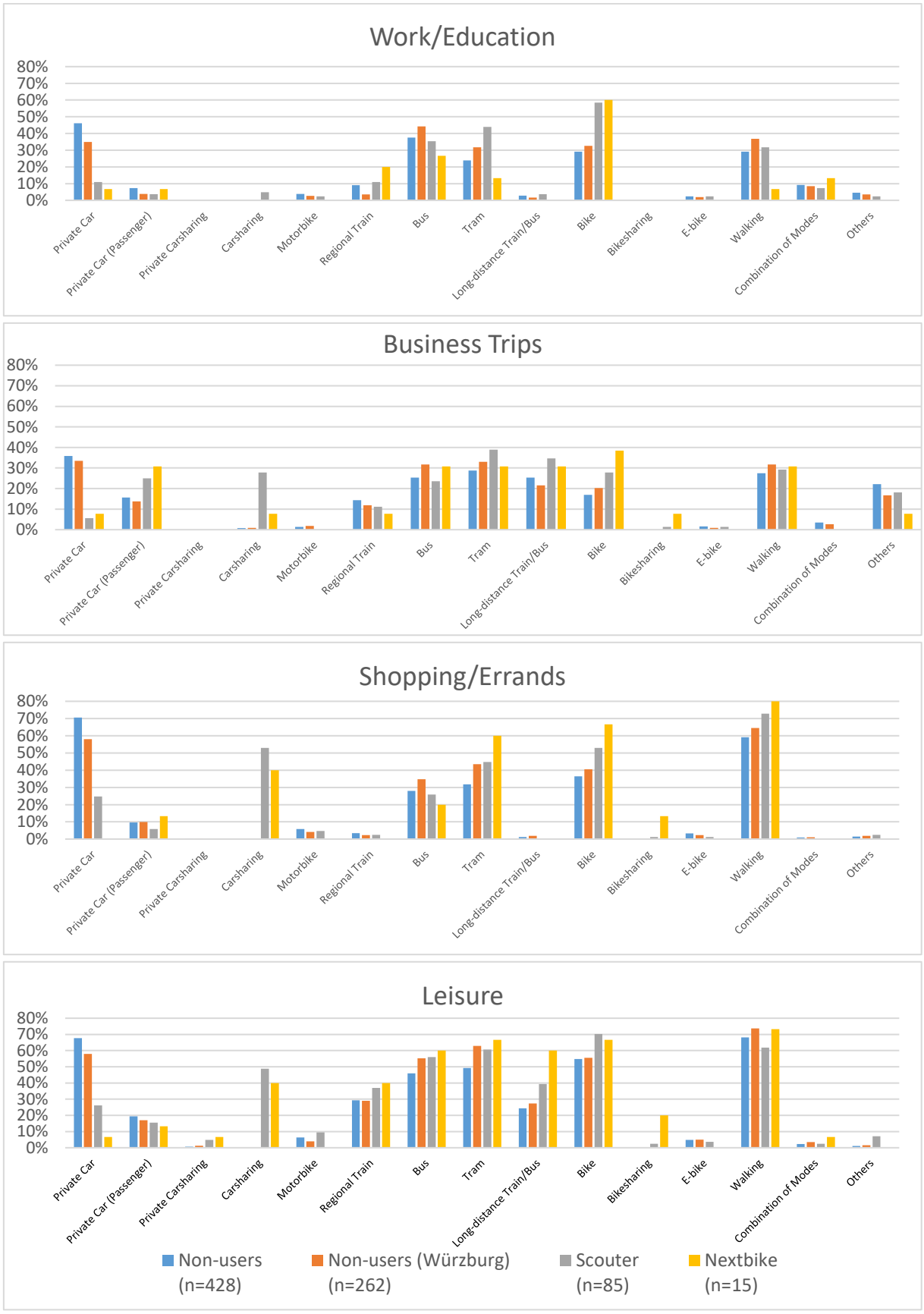

Figure 36: General use of modes for different purposes

Private cars are used by more non-users than users of mobility services. This applies for all trip purposes and also the frequency of use is higher (cf. Figure 34, Figure 35). The group of all non-users, where many respondents live in the region, shows a higher share of car use than the non-users from the city. For all purposes, only few users of carsharing and bikesharing use private cars for any trip purpose.

Instead, users tend to rely on the bicycle, which has the highest share of users on their trips to work and school. Carsharing users also use public transport, especially the tram, for commutes.

Shopping and other errands are done by private car for most non-users while users tend to walk, bike or take public transport on these trips.

Leisure trips are made with a wide variety of modes. Many people in all user groups use walking, bicycling, and public transport for leisure activities. Many non-users also use the private car for these trips.

Carsharing is popular for shopping and leisure activities of carsharing users, but also among bikesharing users. Bikesharing, however, is only used by very few people, almost exclusively by those who were identified as nextbike users.

Thus, it is to conclude that non-users rely on private cars plus public transport, while the car-dependency seems to be higher in those that live outside of Würzburg. Users of sharing services are rather multimodal and use carsharing for shopping/errands and leisure activities while cycling and public transport are used for work/education and also for some business trips.

5.2 Usage of the mobility services

The following chapter presents results from the analysis of backend data.

5.2.1 How is nextbike used in Würzburg?

First, statistics and graphs generated from nextbike data are presented. Figure 37 shows a map of all nextbike stations in Würzburg, including mobility stations.

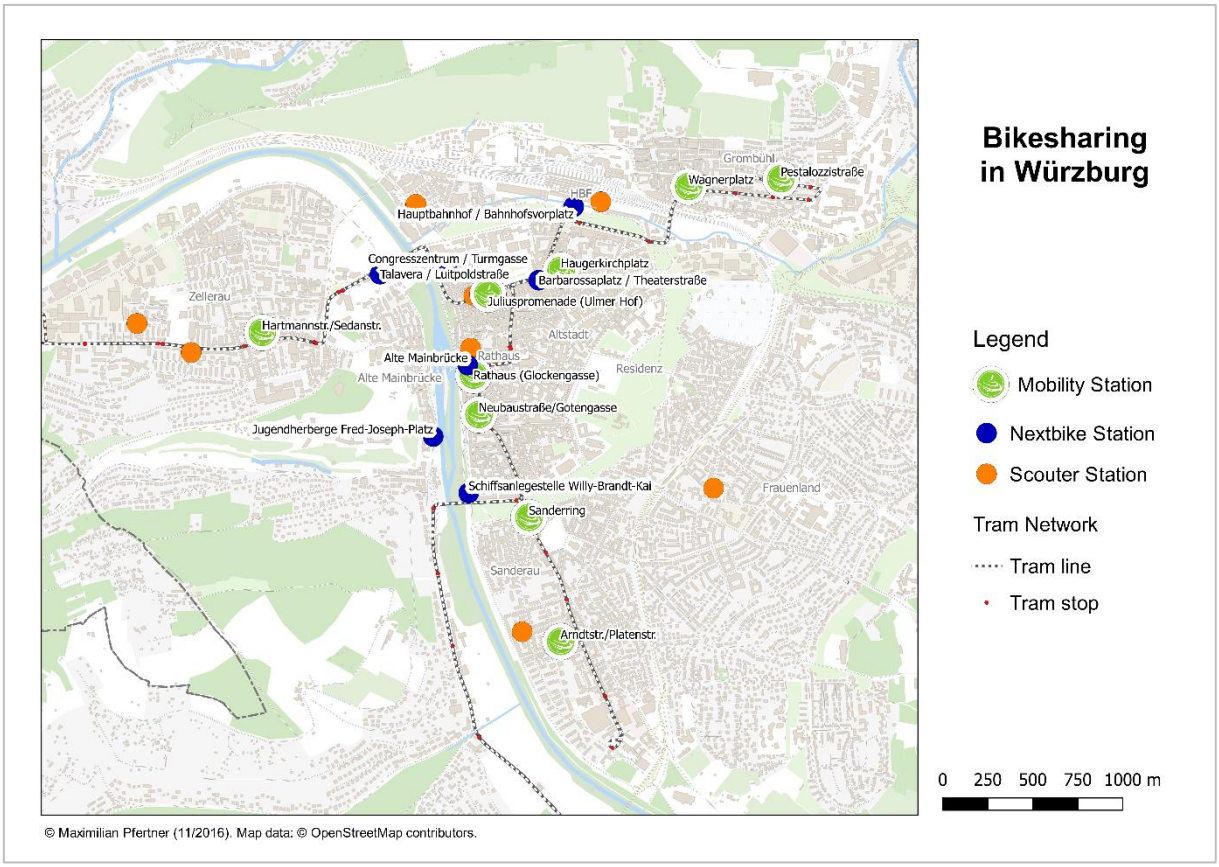

Figure 37: Bikesharing in Würzburg

Stations, bikes, and customers over time

From July to August 2015, there were five nextbike stations in Würzburg. With the implementation of mobility stations in September 2015, the number was increased to 13 stations in total. The number of available bikes ranges from approx. 40 to 80. Both the number of stations and the number of active (=available for rent) bikes are visualized in Figure 38.

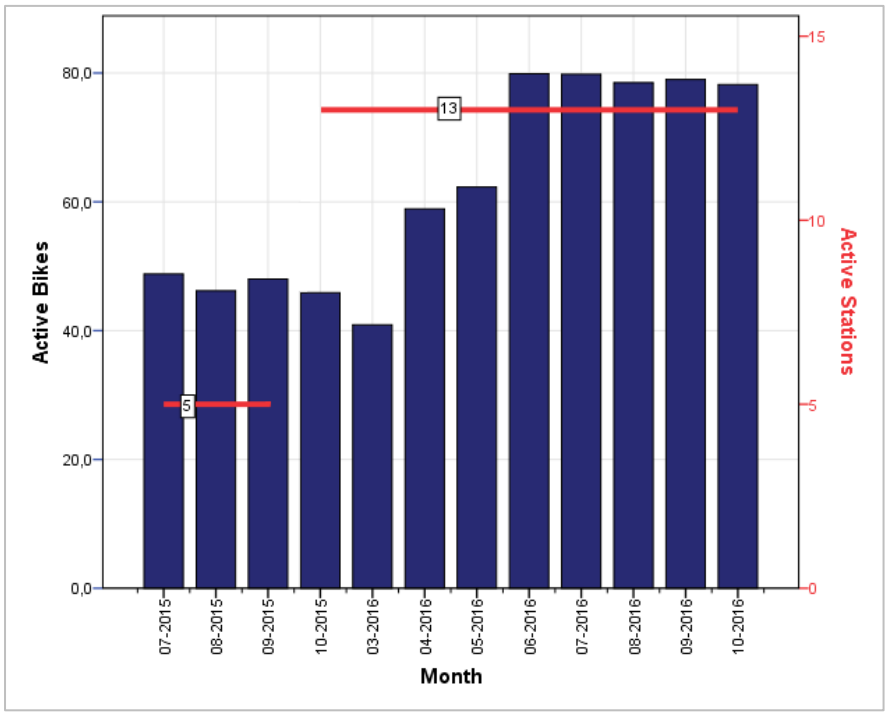

Figure 38: Active bikes and stations per month

The service supply has increased continuously during the spring of 2016 and since June, the system is completely equipped with bicycles.

To compare the stations with each other, Figure 39 shows the absolute numbers of rentals from October 2015 to October 2016 by station and type.

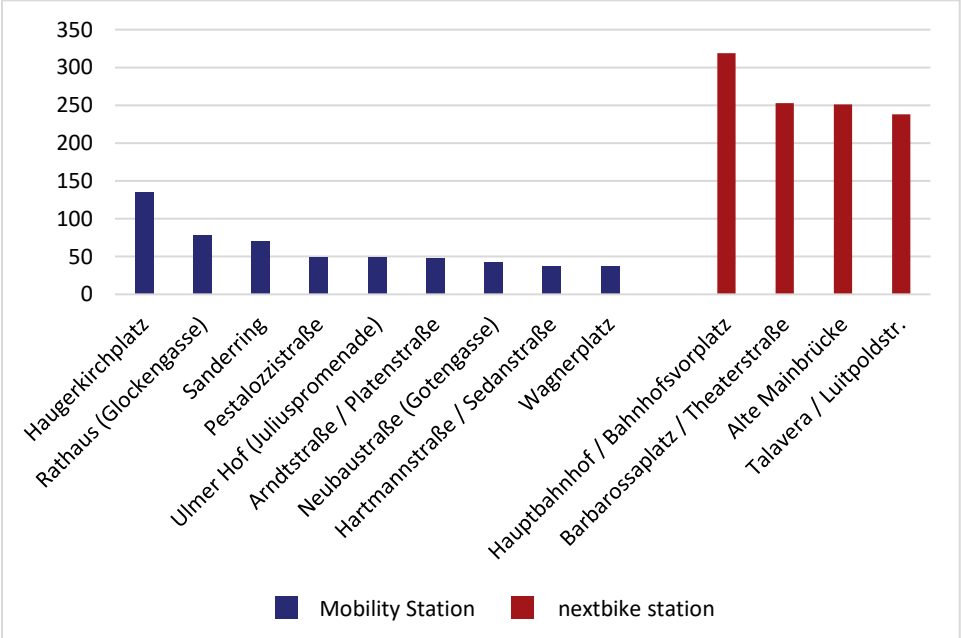

Figure 39: Absolute number of nextbike rentals 10/2015-10/2016

The figure reveals that the absolute numbers at the four nextbike-only stations are higher than those at the mobility stations. This is likely because of the more central locations of nextbike stations compared to mobility stations, which include also carsharing, and do not make sense e.g. at Barbarossaplatz – a very dense, inner-city area where carsharing is not desirable.

The number of registered users who used the service per month (“active users”) is shown in Figure 40. The numbers are grouped by local customers that are registered in Würzburg and external customers that used nextbike in Würzburg but live somewhere else.

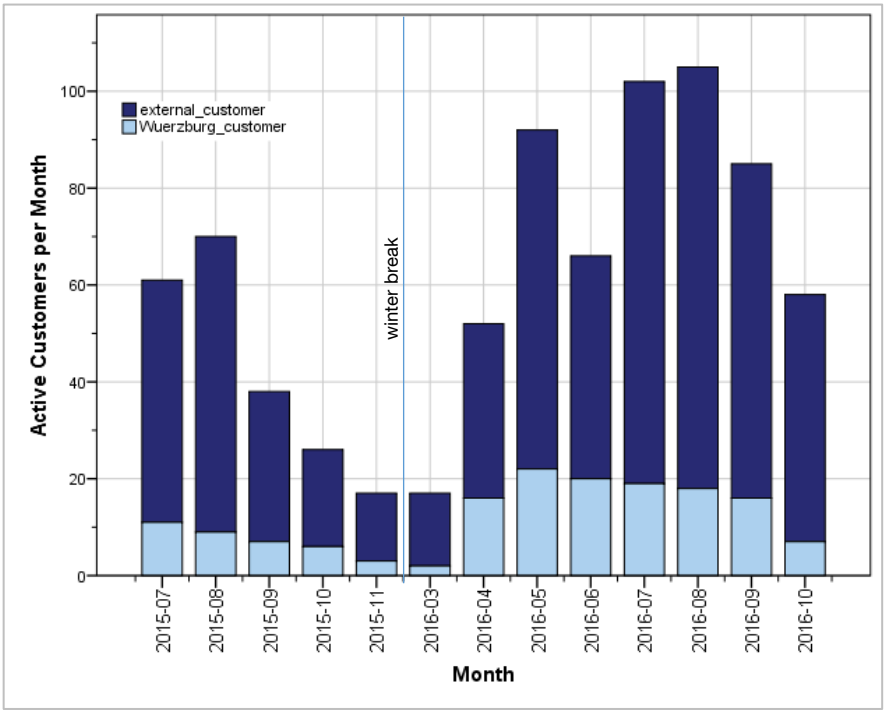

Figure 40: Active customers per month and by origin

The total ratio of rentals by Würzburg residents vs. visitors is 20%:80%. Thus, most users of nextbike in Würzburg are visitors. According to the expert interview, Würzburg attracts many tourists who are frequently seen on nextbikes (Cochet-Weinandt and Pfertner, 2017). However, since the implementation of mobility stations, the share of local customers has grown – an indicator that the stations contribute to making nextbike a viable transport option not only for visitors but also for locals.

The number of total rentals per month ranges from seven in November 2015 to 259 in July 2016 (Figure 41).

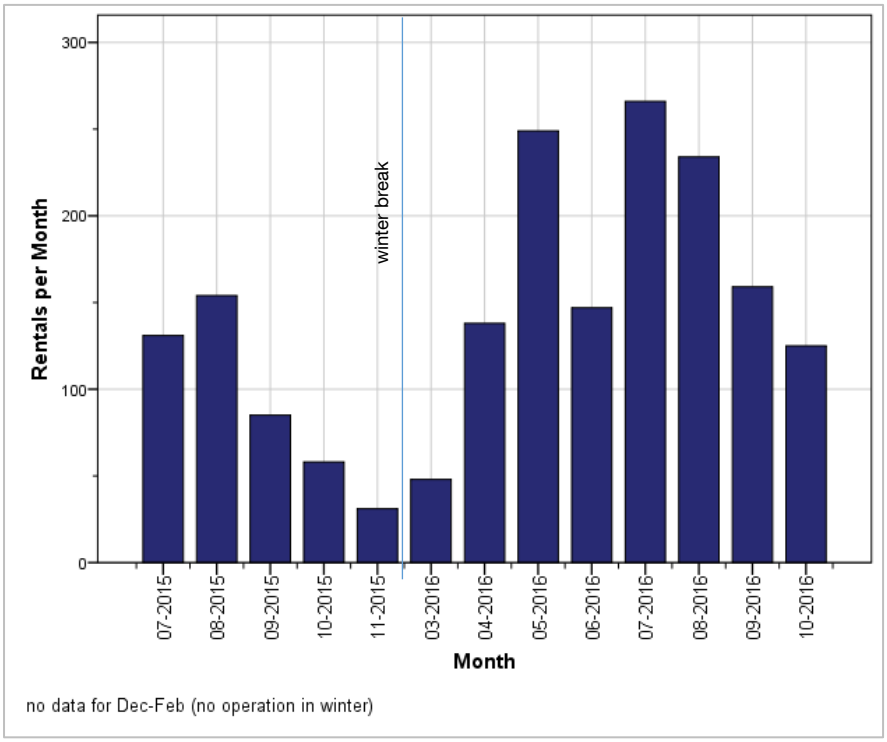

Figure 41: Nextbike rentals per month

With the expansion of the system, the use of nextbike has increased significantly. There seems to be a link to the season, as the usage is considerably higher during the summer months and decreases towards autumn.

Analyzing the average rentals per day compared by months reveals a trend similar to the observations in Figure 41: The numbers are considerably higher during the summer months May – August. Also, a clear increase from 2015 to 2016 is observable.

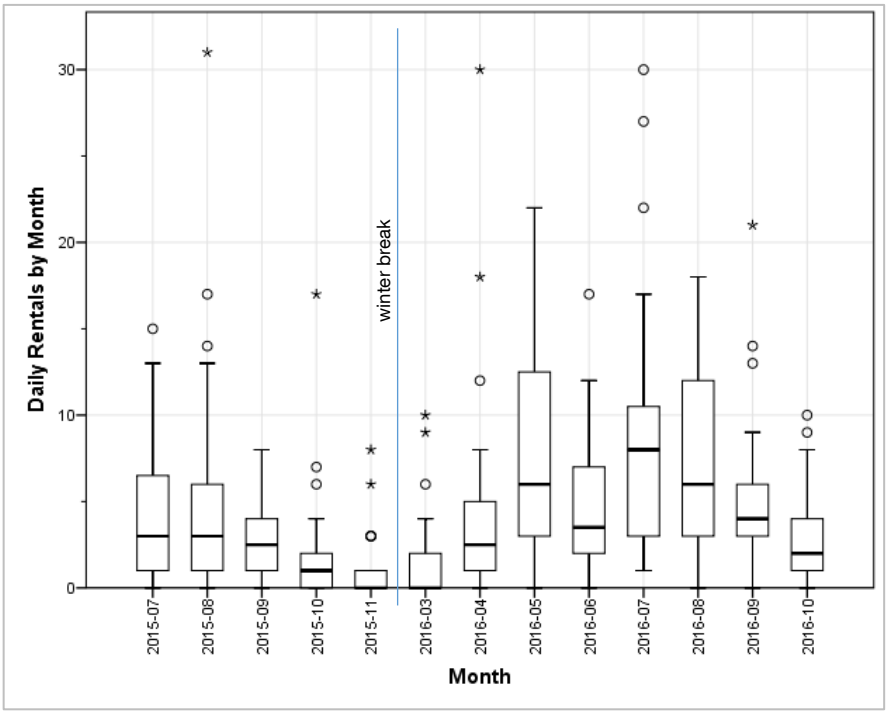

Figure 42: Daily rentals by month (boxplot)

Use of nextbike by type of day

Figure 43 shows the number of trips per day of the week, allowing an analysis of usage patterns at different times during a week, with a focus on the comparison between workdays and weekends.

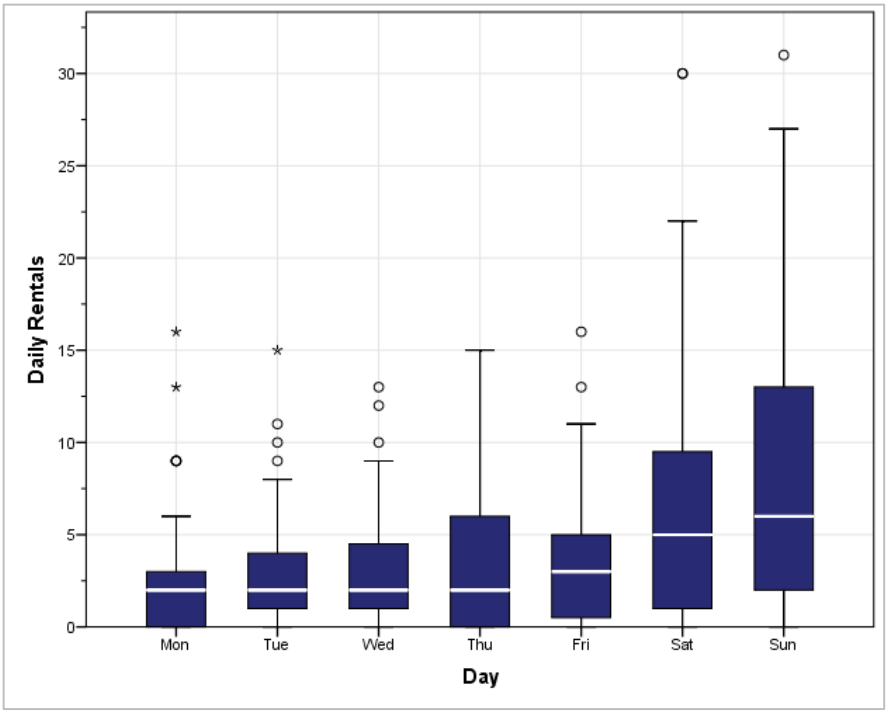

Figure 43: Rentals by weekday

The mean (white line) shows relatively similar usage of nextbike from Monday to Thursday, a slight increase on Friday and considerably higher numbers on Saturday and Sunday. The quantiles and extreme values reveal that on there are Thursdays with a relatively high use of nextbike as well. This could be connected to visitors spending long weekends in Würzburg during the summer months.

As the average number of rentals per day is twice as high during the weekend compared to working days, this hints at the frequent use of nextbike for leisure trips.

Differentiating between local and external nextbike users, in both groups the number of rentals is considerably higher during the weekend compared to workdays (Figure 44).

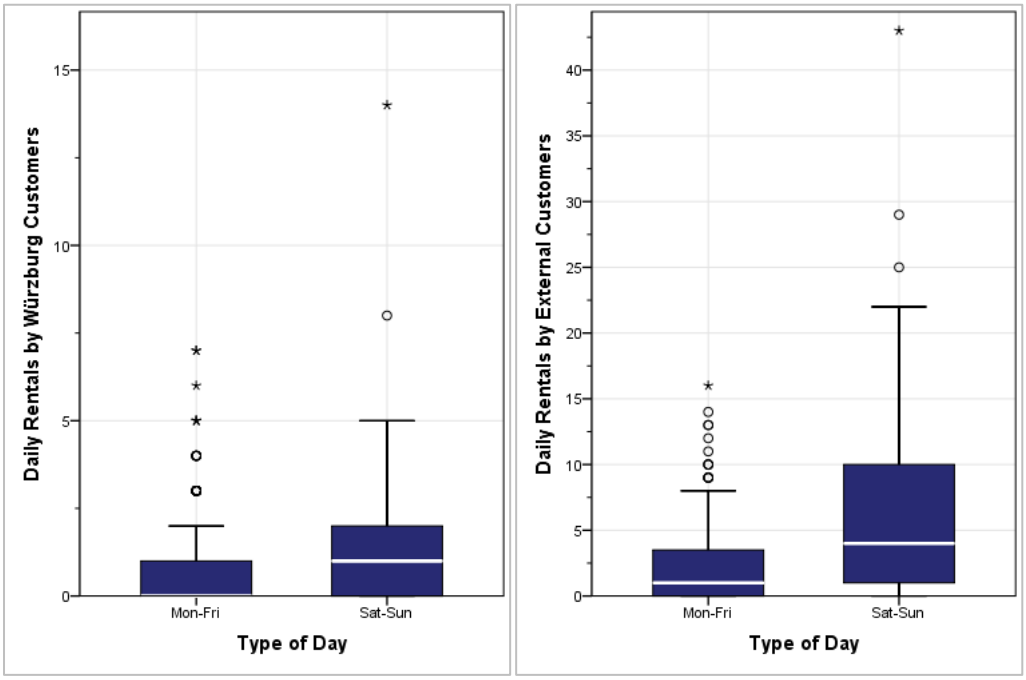

Figure 44: Daily rentals by type of customer and type of day

Both user groups (locals and visitors) use nextbike more on weekends and the mean of daily rentals by local customers on weekdays is close to zero. Utilitarian trips of residents seem to be almost non-existent on many days, and the most popular usage scenario is leisure activity on weekends.

Trip characteristics

Figure 45 shows the distribution of rentals and returns over the course of a day.

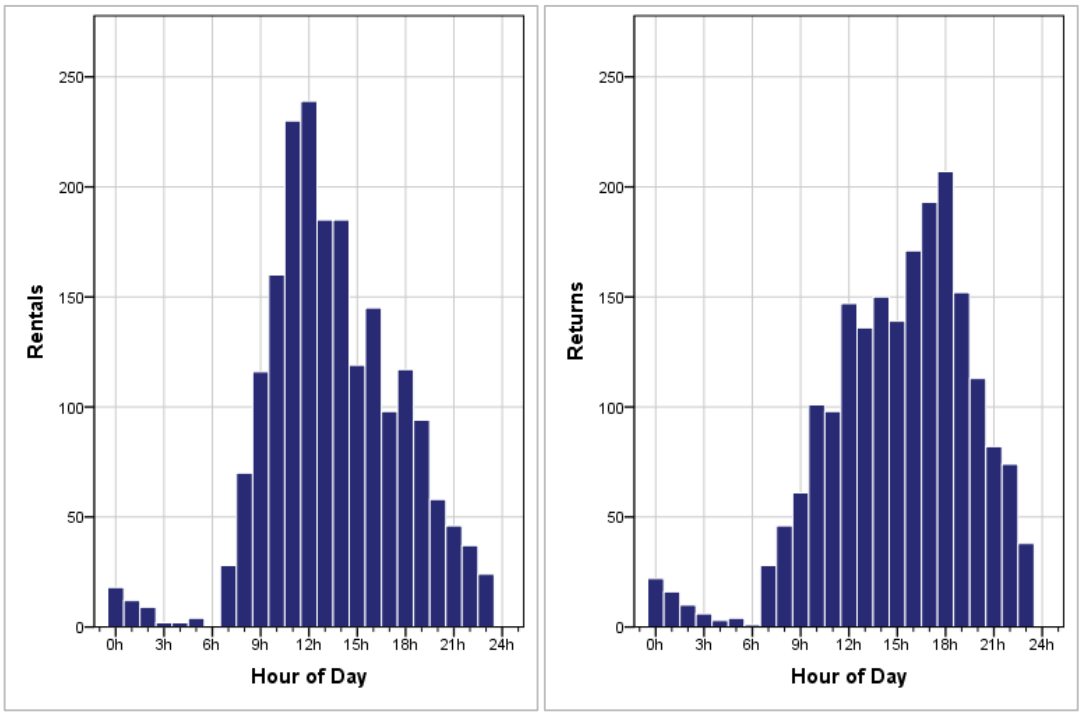

Figure 45: Rentals/returns by hour of day (nextbike)

The peak hours for the start of a nextbike trip are 9, 12 and 13 o'clock; most rentals begin between 8:00 and 20:00. Trips frequently end in the afternoon and evening (13:00-20:00), with a peak at 18:00.

The observed behavior shows that nextbike is used throughout the day, with more rentals beginning around noon and returns peaking in the early evening around 18:00. Night trips are also observable, indicating that a function of nextbike is filling gaps in the city's public transport night lines.

The descriptive statistics of the trip duration are shown in Table 18.

Table 18: Trip duration

Duration of trips (nextbike)				
N	1998	Min		2min
Mean	04h 58min	Max		18d 20h 55min
Median	49min	Percentiles	25	7min
SD	23h 12min		50	49min
Range	18d 20h 53min		75	4h 11min

The trip duration ranges from 2 minutes to more than 18 days. However, it is unclear whether these long bookings happened accidentally or on purpose. The fee for the longest rental (18d

20h) is 171€. However, the absolute number of bookings longer than two days is 14, so these very long trips are not typical usage scenarios for bikesharing in Würzburg.

The median value is the midpoint of the distribution and is less biased by outliers compared to the mean. Thus, in this dataset the median it is a more appropriate value for the average trip duration because extreme outliers exist in the data (rentals with a duration over multiple days). Table 18 shows a median trip duration of 49 minutes in Würzburg. Thus, 50% of all nextbike trips were shorter than 49 minutes. Percentiles also reveal that 25% of all trips were shorter than 7 minutes and 75% were shorter than 4 hours 11 minutes.

Because of the wide range of durations, Figure 46 shows the distribution of the duration of trips on a logarithmical scale.

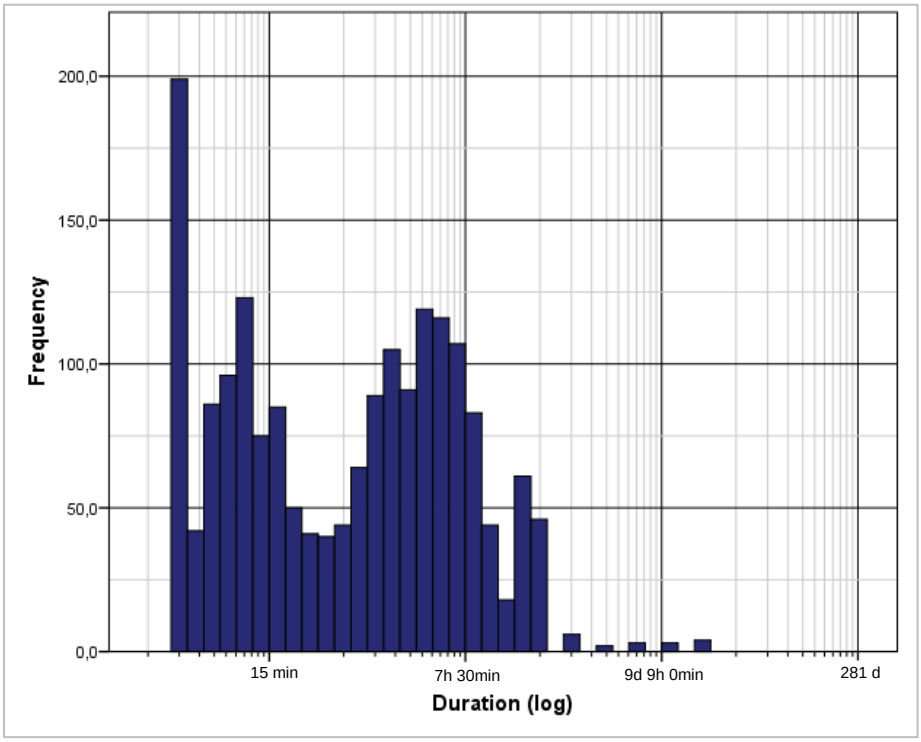

Figure 46: Logarithmic histogram of trip durations (nextbike)

The figure shows that the majority of trips is shorter than 8 hours, with a few outliers renting the bikes over multiple days.

Table 19 presents the trip duration of local and external customers.

Table 19: Trip duration: local vs. external customers

		Local customer	External customer
N		426	1562
Median		28min	1h 05min
Percentiles	25	7min	7 min
	50	28min	1h 05min
	75	3h 06min	4h 33min

External customers rent the bikes on average more than twice as long as local users. This suggests that residents use bikesharing for short trips while visitors tend to make longer bookings and might make multiple trips per booking.

Another significant difference in the behavior of local and external customers it the share of round-trips and one-way trips. One-way trips are typical for shorter trips, e.g. for errands in the city or as a first-mile or last-mile trip in combination with public transport. Round-trips are more likely to be a longer rental, e.g. visitors that arrive by train, rent a bike, visit multiple places in the city, return the bike and board the train again. Figure 47 shows the share of these two trip types by the origin of the customer.

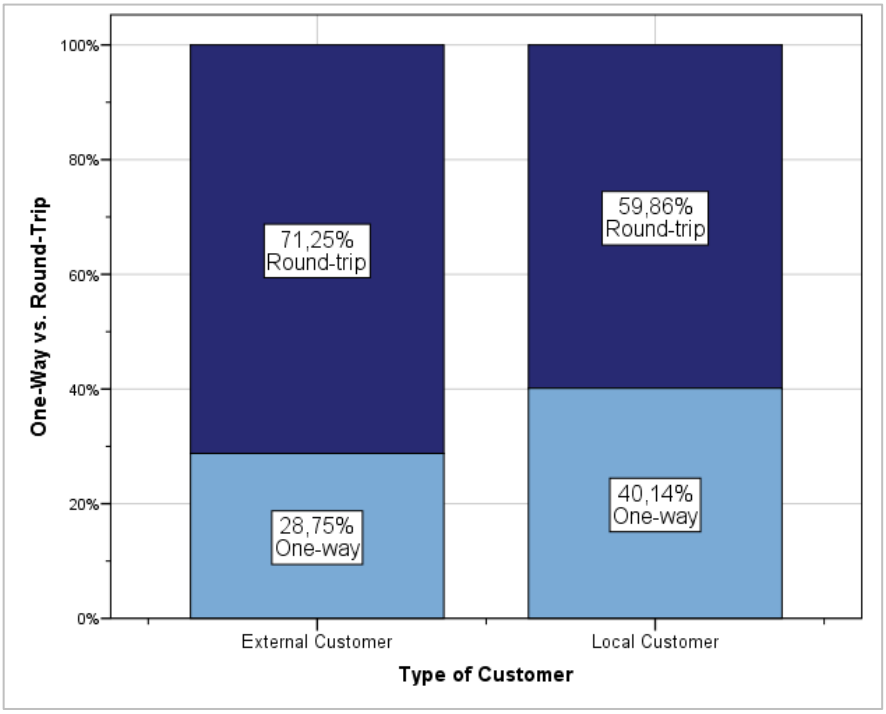

Figure 47: Trip type by origin of customer

The results indicate that local customers make 10% more one-way trips than externals. This leads to the assumption that Würzburg residents tend to use bikesharing for short trips from A to B while visitors use the bikes over a longer period.

External influences on trip frequency

Cyclists are exposed to the weather conditions. Especially in spontaneous trips, users of bikesharing services are usually not equipped with rain-poof clothing and other protective gear. Thus, the weather conditions could have impacts on the use of nextbike in Würzburg. Good weather might attract more users while rain may prevent travelers from using nextbike and the climate in Würzburg could be a possible explanation for low usage of bikesharing.

To determine the influence of weather conditions on the number of nextbike trips per day, a dataset with weather conditions in Würzburg for the observation period was obtained from the German Meteorological Service (Deutscher Wetterdienst, 2017) and linked to the dataset of nextbike rentals per day.

A correlation matrix was then used to examine the influences of the different weather parameters on the number of rentals on each day (Figure 48).

	air temperature	cloud coverage	max. temperature	min. temperature	rain	sunshine	number of rentals
air temperature	1	-0.37	0.98	0.95	-0.04	0.55	0.33
cloud coverage	-0.37	1	-0.49	-0.14	0.26	-0.89	-0.29
max. temperature	0.98	-0.49	1	0.88	-0.08	0.65	0.36
min. temperature	0.95	-0.14	0.88	1	0.04	0.33	0.25
rain	-0.04	0.26	-0.08	0.04	1	-0.22	-0.09
sunshine	0.55	-0.89	0.65	0.33	-0.22	1	0.33
number of rentals	0.33	-0.29	0.36	0.25	-0.09	0.33	1

Figure 48: Correlation matrix of weather data

The matrix shows that air temperature (incl. max. and min. temperatures) and the hours of sunshine have a weak positive impact on the number of rentals. Cloud coverage has a weak negative impact on rentals per day.

Surprisingly, the amount of rain does not influence the number of rentals significantly. The reason for this could be the fact that only the total amount of rain per day is given and if there is rain during the night, which does not keep people from cycling a few hours earlier or later.

Cloud coverage is a better indicator for the overall weather on a day and has thus a stronger influence on the number of rentals.

Figure 49 shows exemplarily a scatterplot of the maximum temperature and its weak influence on the number of rentals per day.

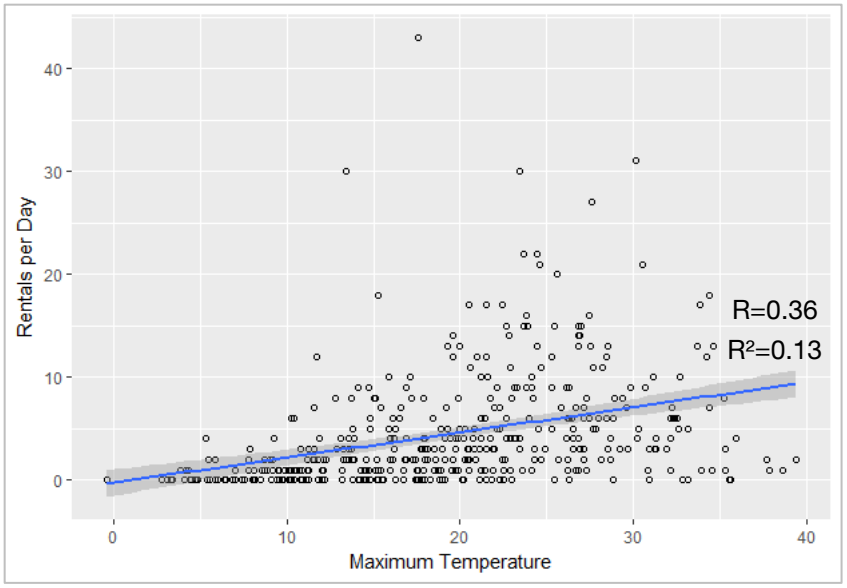

Figure 49: Max. temperature and rentals per day

All weather influences that could be observed are relatively weak, and it is to assume that the climate in Würzburg is not a barrier for the use of bilesharing in the city.

Mobility stations vs. nextbike stations

One assumption derived from the goals and expectation towards mobility stations (cf. 2.2.3) is that due to their visibility and their connection to other modes, mobility stations could attract more customers than other bikesharing stations. Figure 50 shows the number of rentals in 2016 compared by station type. Only data from 2016 was selected because in this period the mobility stations were in full operation.

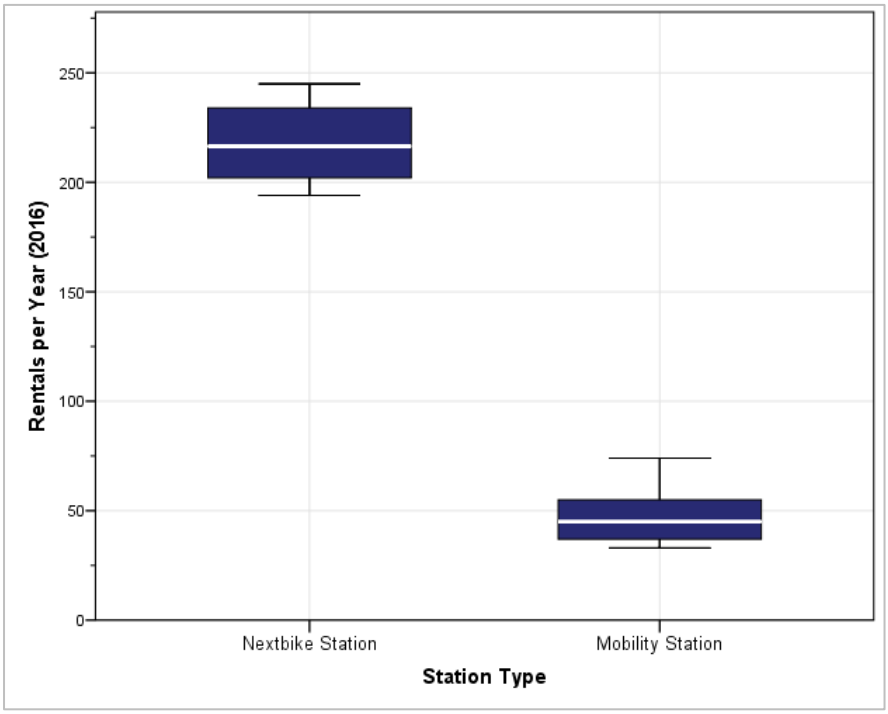

Figure 50: Rentals in 2016 by station type

The number of rentals at mobility stations is on average significantly lower than at the four ‘normal’ nextbike stations. This counter-intuitive result can be explained by the fact that mobility stations are placed in various urban areas while the four nextbike stations are all in highly frequented areas, attractive for the most important user group of tourists (e.g. the central train station).

Thus, no conclusion can be drawn from backend data whether the label “mobility station” attracts more people to a station than a regular nextbike station.

5.2.2 How is scouter used in Würzburg?

The following sections analyze carsharing usage data provided by scouter. Figure 51 shows a map of all scouter stations in Würzburg, including mobility stations.

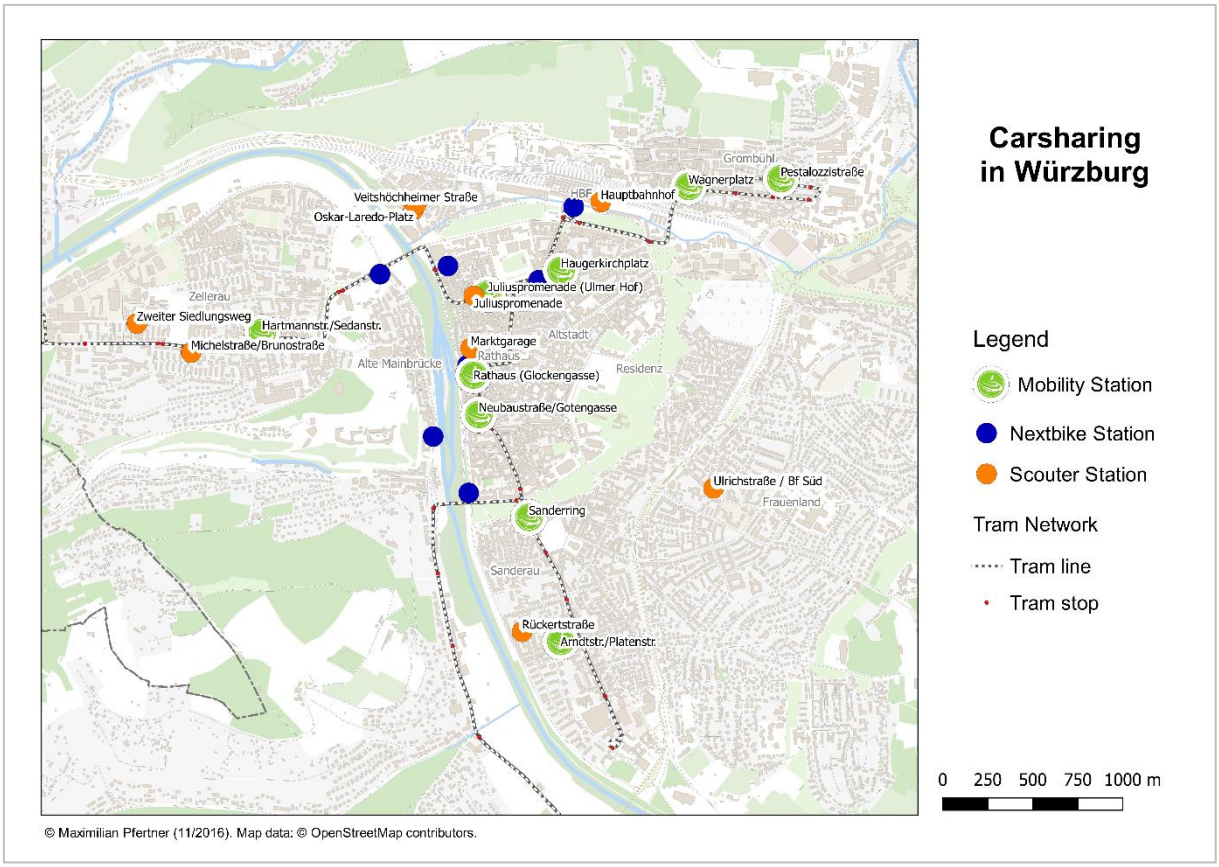

Figure 51: Carsharing in Würzburg

Stations, cars, and customers over time

Before the start of mobility stations in Würzburg, there were nine to eleven scouter stations in town with a total number of 16 to 19 cars. With the opening of the mobility stations, the number was increased to 19 stations with a maximum of 29 cars and stabilized soon after at 15 stations and 24 cars (Figure 52).

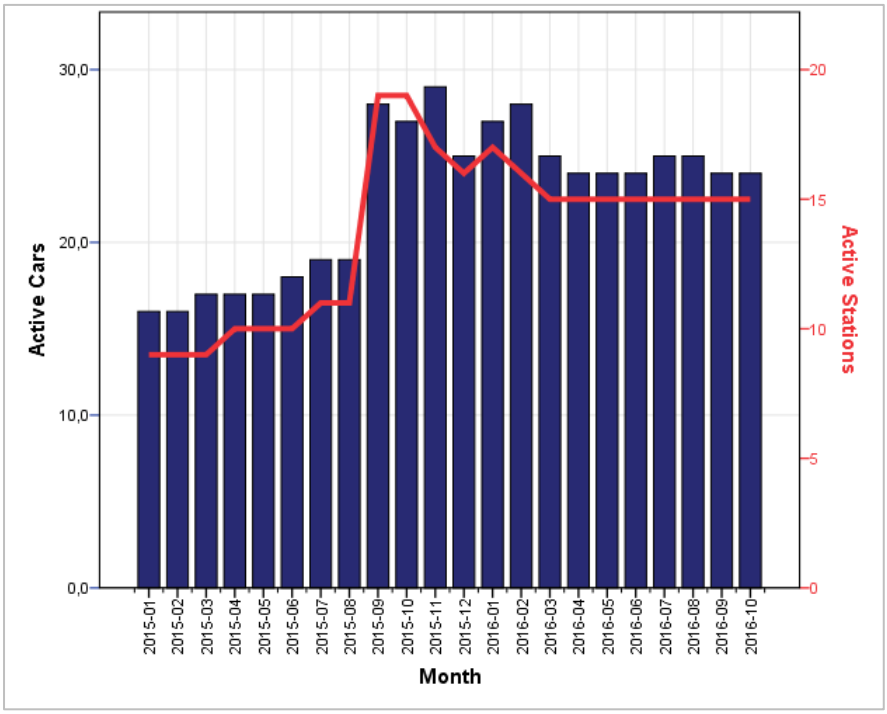

Figure 52: Active cars and stations over time (scouter)

The number of rentals per month has experienced a considerable increase over time. Rentals have doubled over the observation period of 20 months (Figure 53).

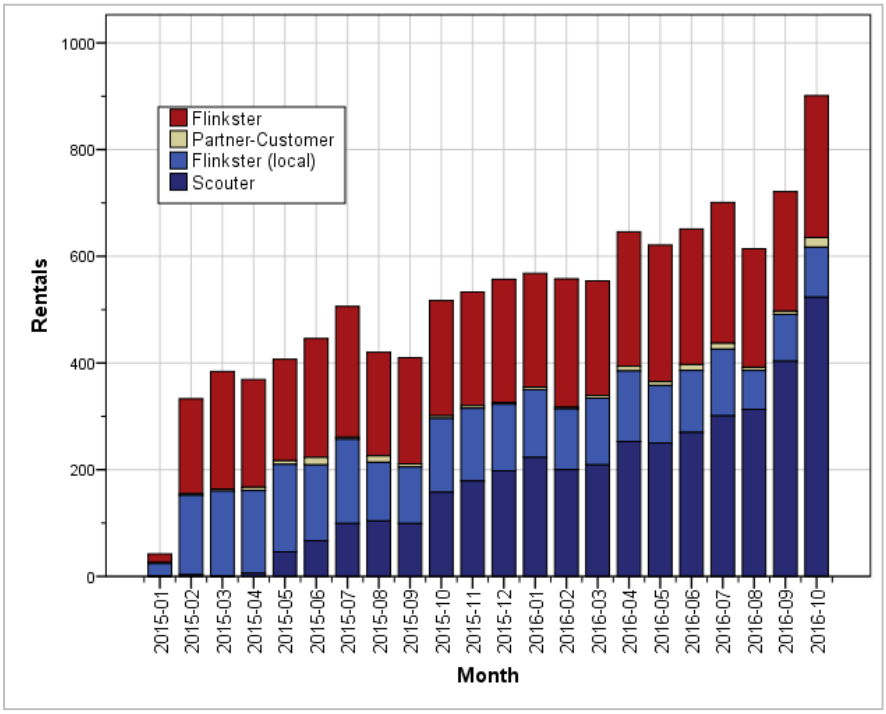

Figure 53: Rentals by month (scouter)

Similar to nextbike, also among scouter users the mobility stations increased the proportion of local users compared to visitors. This observation is examined in detail further below as part of the analysis of users (Figure 57).

The chart of the average daily rentals by month shows a similar trend upwards (Figure 54):

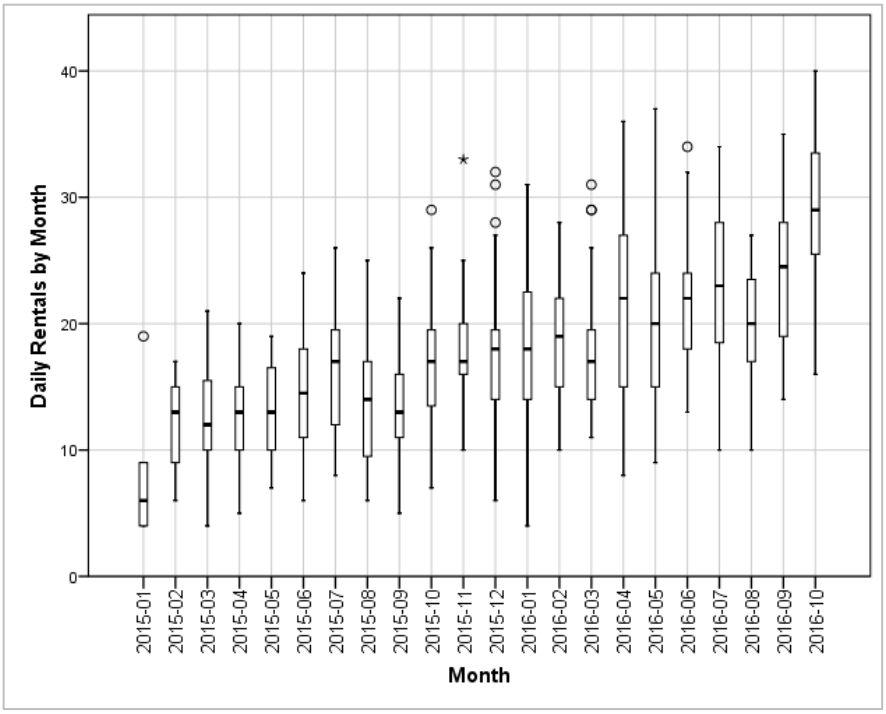

Figure 54: Average rentals by month (scouter)

After the opening of mobility stations in September 2015, the rentals per day have increased. In both years, the rentals decreased in August and September. A possible explanation is that during the vacation period, many users might travel and are not in Würzburg but also that cars are blocked in long-time bookings for holidays with a car.

Figure 55 presents the absolute number of rentals at each station from October 2015 until October 2016 to allow a comparison between the stations and also between the station types.

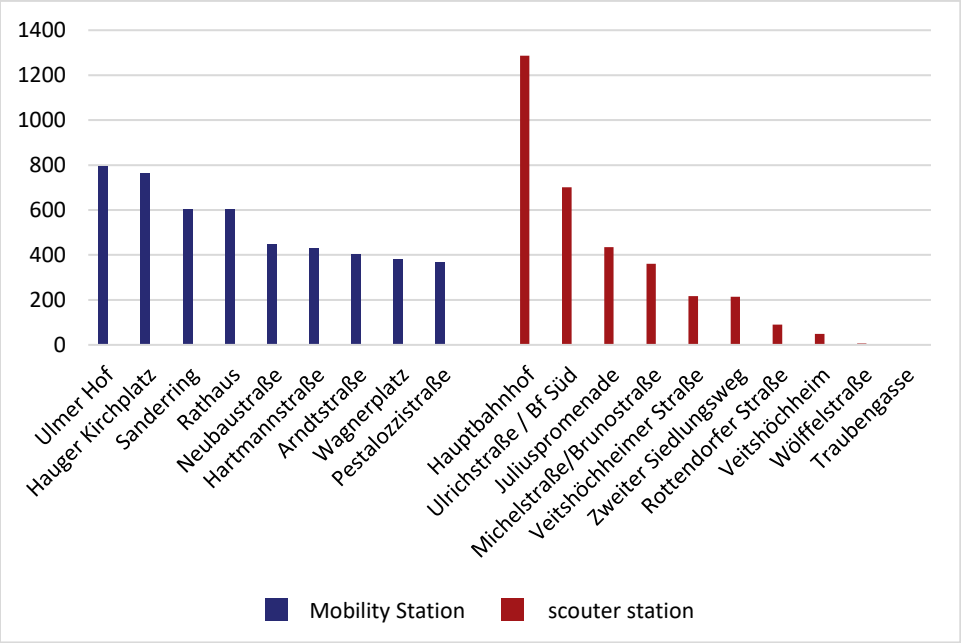

Figure 55: Absolute number of scouter rentals 10/2015-10/2016

The most frequented scouter station is the central train station, followed by Ulmer Hof and Hauger Kirchplatz. While all scouter cars at mobility stations are rented at least 365 times in one year (roughly once per day), other scouter stations also experience lower frequencies.

An analysis of the frequency of rentals by weekday is given in Figure 56:

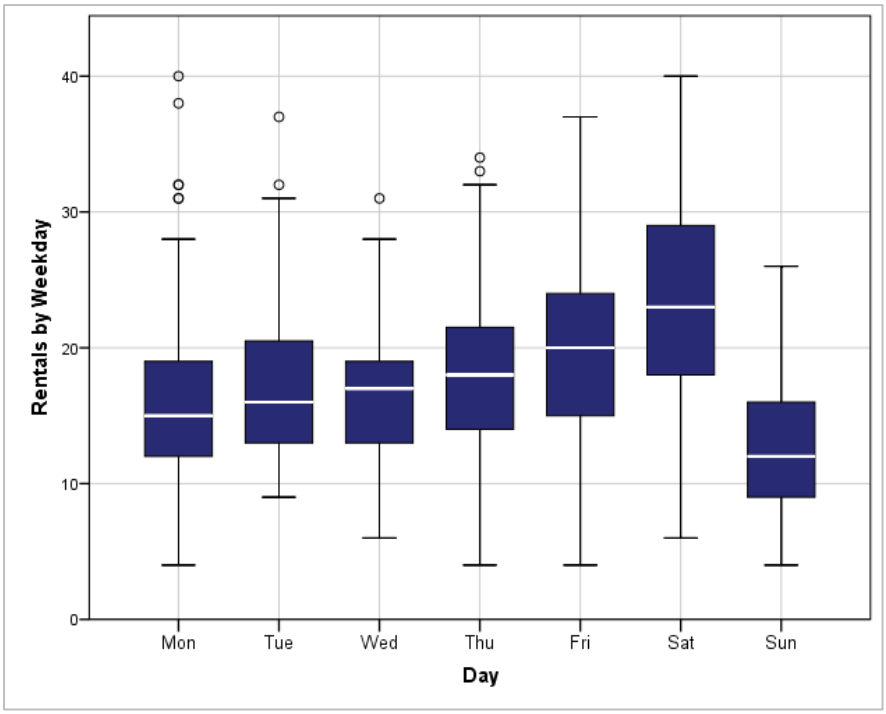

Figure 56: Rentals by weekday (scouter)

The busiest day is Saturday with a median value around 23 rentals per day, after a slight increase on Friday. The number of rentals is from Monday to Thursday relatively equal around 15-18. Sunday is the weekday with the lowest number of scouter rentals with about 12 per day.

According to the user survey, carsharing is used for errands and shopping in the majority of rentals (58% - cf. Figure 65 in section 5.3.1) this explains the low number of rentals on Sundays. Naturally, users have more time for leisure activities and errands that require renting a car on Saturdays, so on Saturdays, the use is the highest. However, diverse usage scenarios ensure also during the week a good capacity utilization.

Scouter is part of the nation-wide *Flinkster* carsharing network, so customers of Deutsche Bahn's carsharing service are entitled to use scouter cars (interoperability). While Figure 53 displays the total number of trips that were made by each customer type, Figure 57 shows the percental share of each user group. An important differentiation is also the origin of the user. Scouter customers are typically living in the region, and Flinkster users are split into local and non-local users.

Over time, an increase of local clients (displayed in blue) is observable, indicating that scouter vehicles were used in around 60% of all rentals by local users. Also, the market share of scouter has grown strongly.

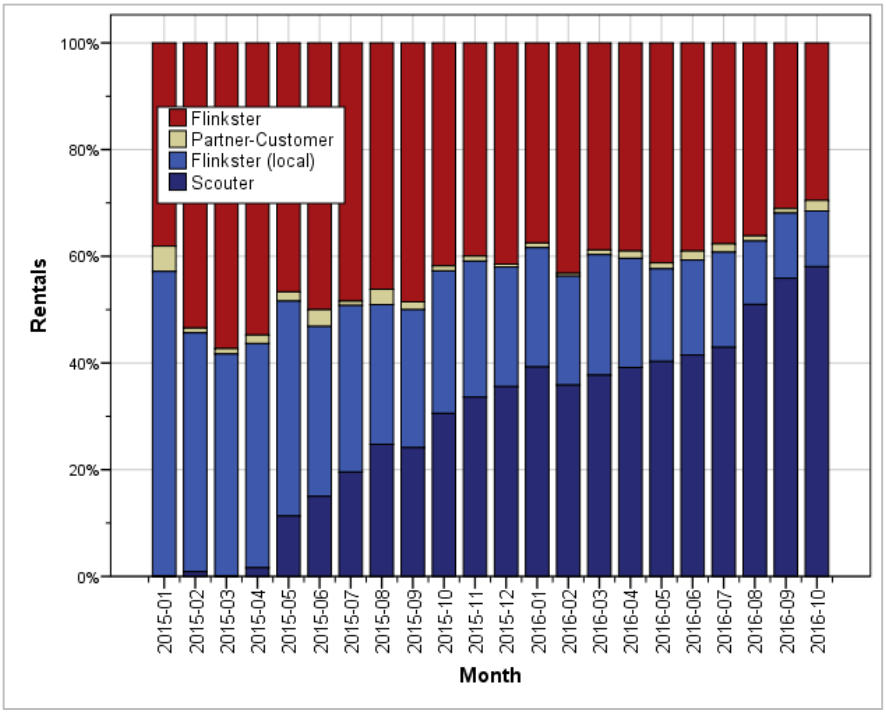

Figure 57: Customer types by month (scouter)

The number of active users by month is shown in Figure 58, along with the average number of monthly trips per customer. January 2015 has been excluded due to a very low number of trips.

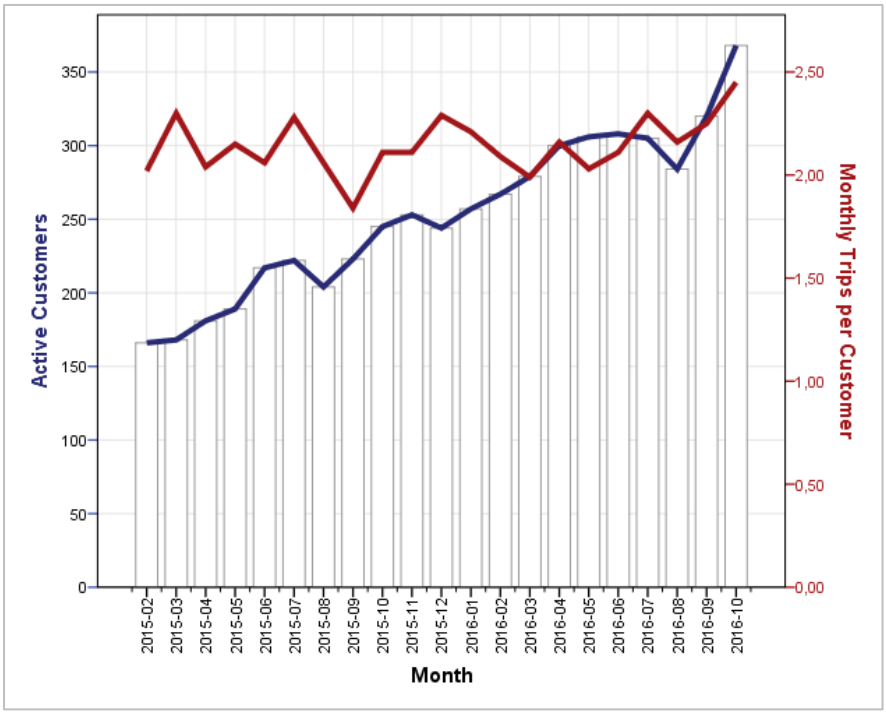

Figure 58: Active users per month (scouter)

The graph shows that the number customers has been growing continuously while the trip rate per customer and month ranges around 2.0-2.5 and is rather constant. It is to assume that the frequency of use did not change significantly because of the mobility stations, but the higher number of customers is responsible for the strong increase of trips per day.

Trip characteristics

The distribution of rentals and returns of scouter cars over the course of a day is visualized in Figure 59.

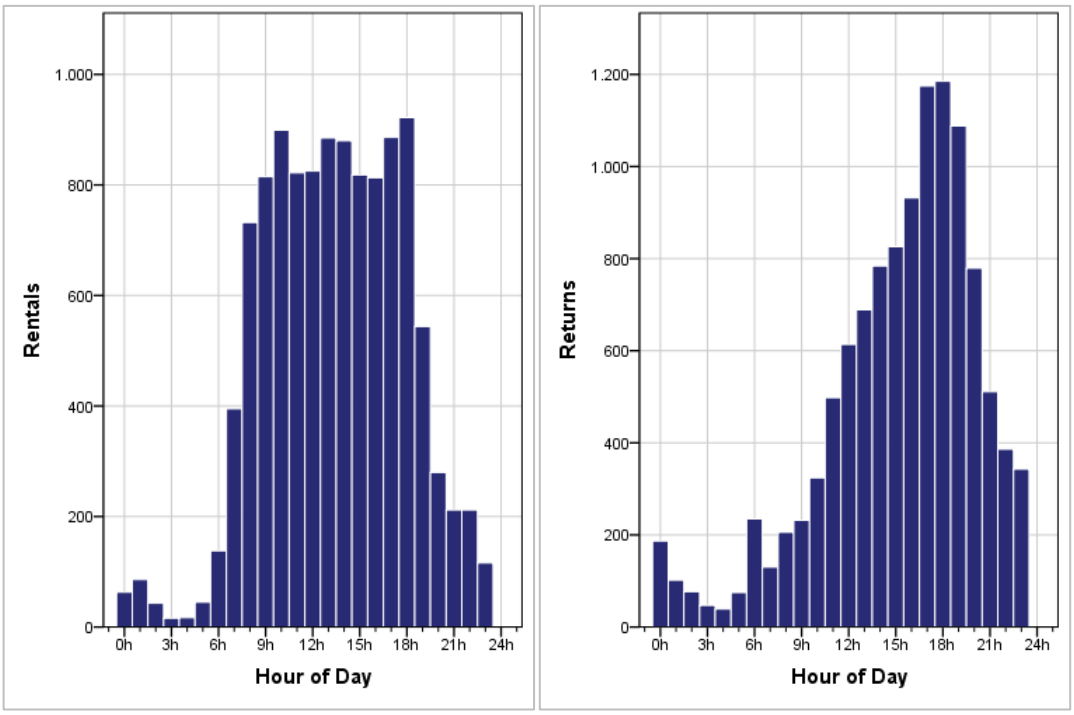

Figure 59: Rentals/returns by hour of day (scouter)

While the rentals are distributed relatively evenly from 7 am to 6 pm, returns peak in the late afternoon around 6 pm.

It is not viable to interpret these distributions without more details about the duration of trips given in Table 20.

Table 20: Trip duration (scouter)

Duration of trips (scouter)				
N	11 468	Min		(0min)
Mean	7h 25min	Max		31d 1h 42min
Median	3h 6min	Percentiles	25	1h 37min
SD	18h 49min		50	3h 6min
Range	31d 1h 42min		75	5h 56min

As expected for station-based carsharing (Riegler et al., 2016), bookings are relatively long, with a median booking duration of slightly more than 3 hours. The standard deviation of almost 19 hours hints at the high variance that is found in the duration of trips: station-based carsharing can be used for trips that take just a few hours but also for weekend journeys and longer periods.

Figure 60 shows the distribution of the duration of trips.

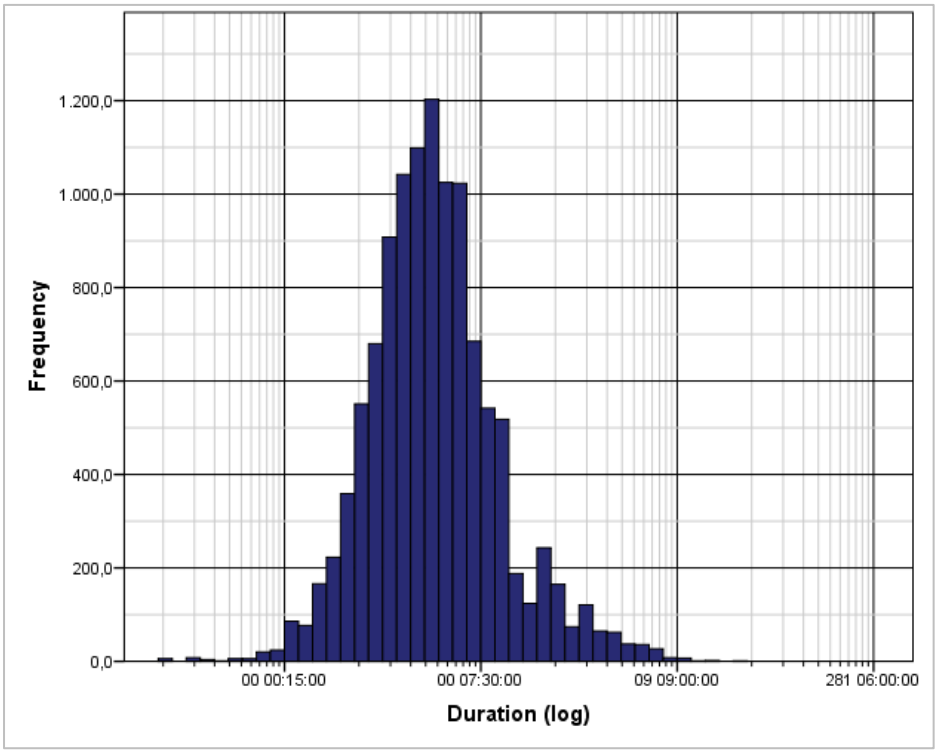

Figure 60: Logarithmic histogram of trip durations (scouter)

Because of the wide range of durations, the logarithmical scale is necessary. Only few trips are shorter than one hour, and the most rentals range around 2-7 hours. Multiple-day rentals are also found in the data but are also rare compared to rentals that start and end within a day.

Analyzing the behavior of the different user groups shows significant differences among scouter users and other groups (Table 21):

Table 21: Mean differences between user groups

Customer	Mean rental duration	Median	N	SD
Flinkster	8h 38min	3h 38min	4734	19h 12min
Flinkster (local)	8h 25min	3h 32min	2669	18h 13min
Scouter	4h 52min	2h 23min	3908	17h 10min
Partner-Customer	17h 39 min	5h 08min	152	1d 13h 39min

The mean (and median) differences reveal significant distinctions between Flinkster customers (both local and non-local), scouter users and partner-customers. Flinkster customers use carsharing in Würzburg for longer trips than scouter customers while the longest average rental durations are found among partner-customers.

Scouter users are expected to be mainly local customers, but it is worth remembering that the service also operates in other German cities. These users show a median rental duration of about 2.5 hours while Flinkster users rent the cars for 3 hours 40 minutes. Analogous to bikesharing, also carsharing visitors tend to make longer rentals than local customers.

Figure 61 shows the distances traveled during the rentals.

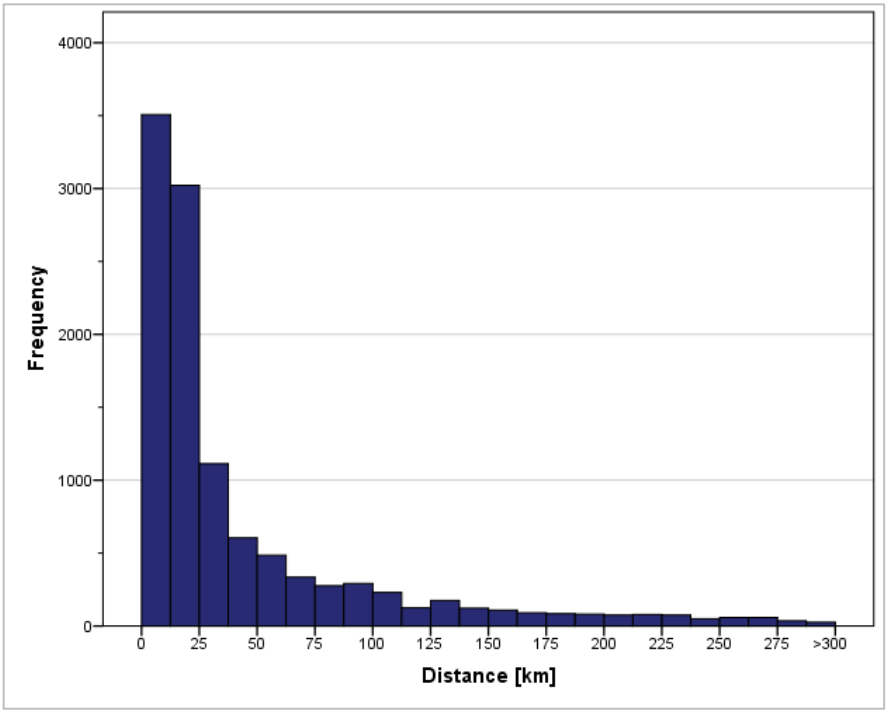

Figure 61: Distance driven per rental (scouter)

In most rentals, the kilometers traveled by car are shorter than 75 kilometers. Many rentals are shorter than 12.5 km. Table 22 provides more details on the distance statistics, both for the overall average and by user type.

Table 22: Kilometers driven per rental (scouter)

		All users	Scouter	Flinkster (local)	Flinkster	Partner-customers
N		11,466	3,906	2,669	4,734	152
Mean		58.7 km	35.5 km	51.3 km	78.7 km	162.0 km
Median		20.0 km	16.0 km	17.0 km	30.0 km	50.5 km
Max.		8,895 km	6,895 km	1,692 km	2,757 km	2,189 km
Percentile	25	11.0 km	9.0 km	11.0 km	14.0 km	6.0 km
	50	20.0 km	16.0 km	17.0 km	30.0 km	50.50 km
	75	59.0 km	32.0 km	41.0 km	104.0 km	216.0 km
	90	154.0 km	73.0 km	114.0 km	212.0 km	368.1 km
	95	241.0 km	115.0 km	229.0 km	282.3 km	726.2 km

This analysis of driven kilometers reveals that local customers (scouter and Flinkster) drive significantly shorter distances during their rentals than externals (Flinkster and partners).

Overall, the median distances show that especially scouter and local Flinkster users use the cars not only for longer trips but also for relatively short trips. Given the fact that these are all return trips, the scouter median distance of 16 km can be interpreted that the user did not leave a radius of 8 km around the station.

Mobility stations vs. scouter stations

Previous analysis shows that since the implementation of mobility station in Würzburg, there was a maximum of 10 regular scouter stations and nine mobility stations present in town.

The development of rentals per month and station, split into scouter stations and mobility stations is visualized in Figure 62.

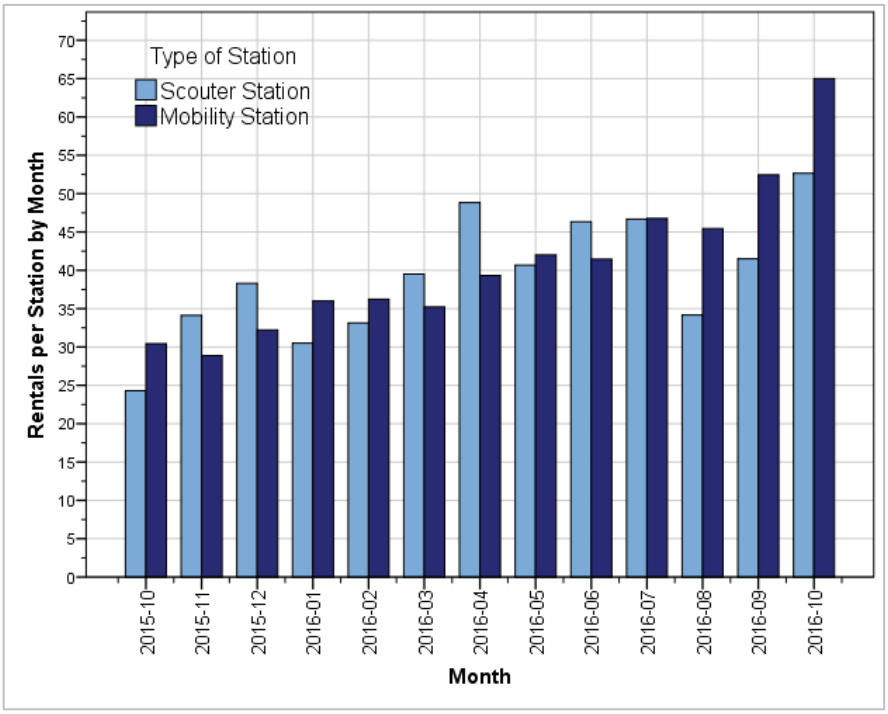

Figure 62: Rentals per station by month (scouter)

Especially in the last three months of the observed period from October 2015 to October 2016, mobility stations were becoming more popular than regular scouter stations. This is an indicator that the mobility stations are well positioned and provide added value for customers compared to scouter stations that are independent of public transport and bikesharing.

5.3 Usage details

This section presents the results of the so-called “Last Trip” section of the user questionnaire. Respondents were asked whether or not they remember the last trip that they did with scouter and nextbike in Würzburg. First, it was asked for the last trip at a mobility station; if this was negated, the question changed to whether the user remembers a trip at any of the bikesharing or carsharing stations in Würzburg.4

If a user remembered a trip, he or she was asked for the following details:

- Start of the trip (open answer: post code, transit stop, street corner, etc.)
- For nextbike: one-way trip (rental and return at different stations) or return?
- Transport mode from start to station (in order to rent a car/bike)
- Station of rental
- Purpose(s) of the trip with the shared mode
- Nextbike (optional for one-way trips): return station
- Mode after return of the shared mode
- Final destination after returning the shared mode (open answer)
- Substituted mode of this trip (multiple choice for scouter)

5.3.1 Last trip: Carsharing

Eighty-one scouter users remembered their last trip at a mobility station and 29 persons remembered their last trip at another scouter station. However, among these 29 persons, 14 actually rented at a mobility station without realizing it. Thus, the “scouter / non-mobility-station” group consists of 15 persons.

The starting points of all trips are visualized in Figure 74 and will be analyzed in Chapter 5.3.3. Figure 63 shows the modes used to reach the stations to start a carsharing rental.

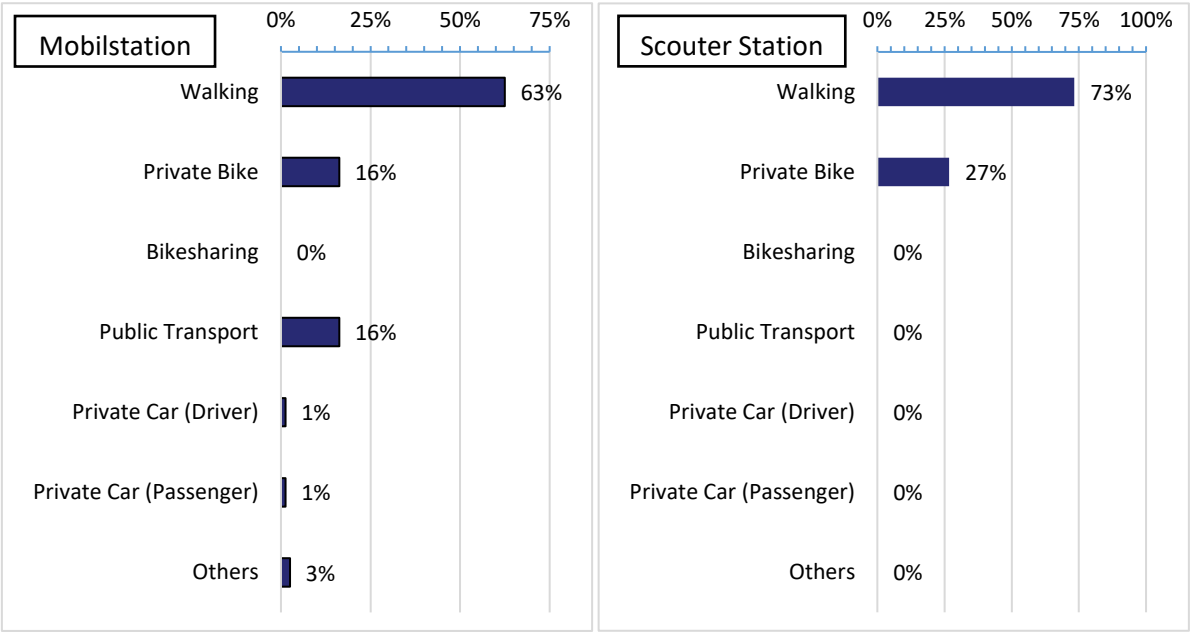

Figure 63: Access mode to mobility stations (left, n=80) and scouter stations (right, n=15). Scouter users.

For both users of mobility stations and other scouter stations, the main access mode is walking. 63% of mobility station users walk to the station, and 73% do so for scouter stations. This highlights the importance of attractive surroundings around the stations and good accessibility on foot.

Also, the private bike plays a significant role in getting to the station, especially in scouter stations (27%). A better integration with a network of bicycle infrastructure could increase this share even more.

Interestingly, 16% of customers arrive by public transport, if the start of their rental is a mobility station. This proves the importance of the integration with the streetcar network as other scouter stations, which are not designed with a connection to public transport, do not attract transit riders at all among the respondents.

Intermodal trips between sharing modes, in this case the combination bikesharing-carsharing, do not take place.

In the context of the last trip section, all nine mobility stations were used. The distribution of stations is visualized in Figure 64.

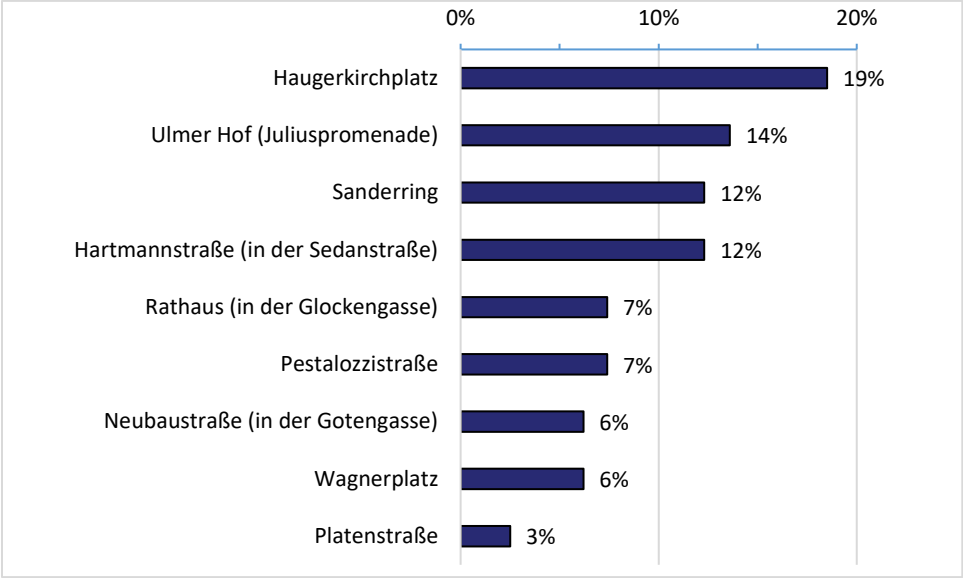

Figure 64: Last trip results by mobility stations (n=81)

Haugerkirchplatz is the station with the most users in this questionnaire, followed by Ulmer Hof, Sanderring, and Hartmannstraße. Platenstraße is the least used in this sample.

Taking the urban form into account (cf. Table 8: List of mobility stations in Würzburg), it is remarkable that the most frequented stations are those that located in the inner city, but not in a pedestrian zone (like the station Rathaus, that is used less frequently). Users seem to appreciate the central location but also the direct connection to major streets.

The stations in more residential contexts are used less often, a fact that is logical because of a lower number of passersby and a lower urban density.

The purpose of the trip was asked in the form of a multiple choice question, as station-based carsharing rentals tend to include more than just one single trip. The result is shown in Figure 65.

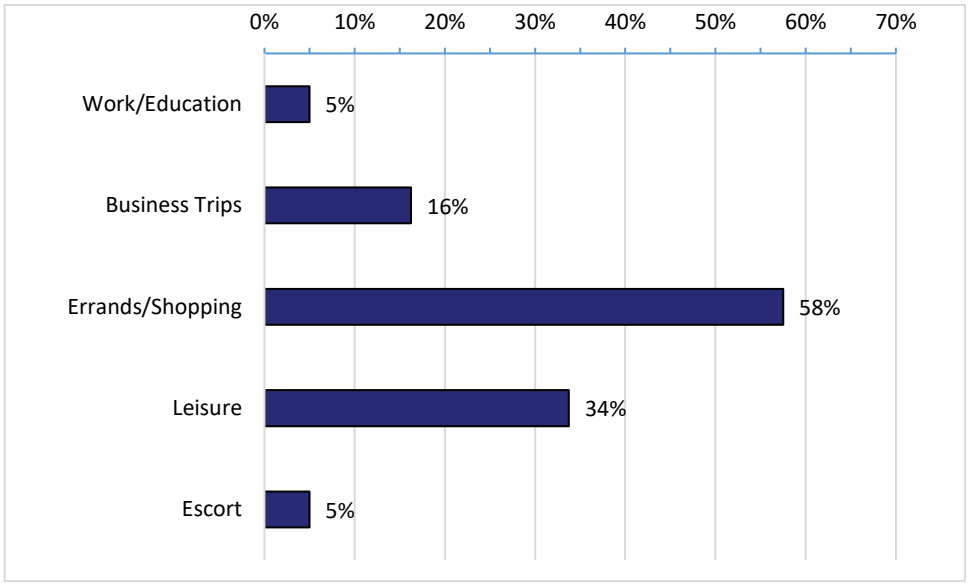

Figure 65: Trip purposes (n=81, multiple responses) (scouter users)

Scouter carsharing is used to run errands/do shopping and for leisure activities in most trips. Trips to work and school play only minor roles and business trips account for 16% of all trips. The reason for this could be that employees of the city administration are using scouter for professional trips, as a replacement for company cars.

Scouter trips at non-mobility-stations (not displayed) are used by 67% of respondents for errands/shopping and 40% leisure activities.

After returning the car to its station, users continued their trips in the following way (Figure 66):

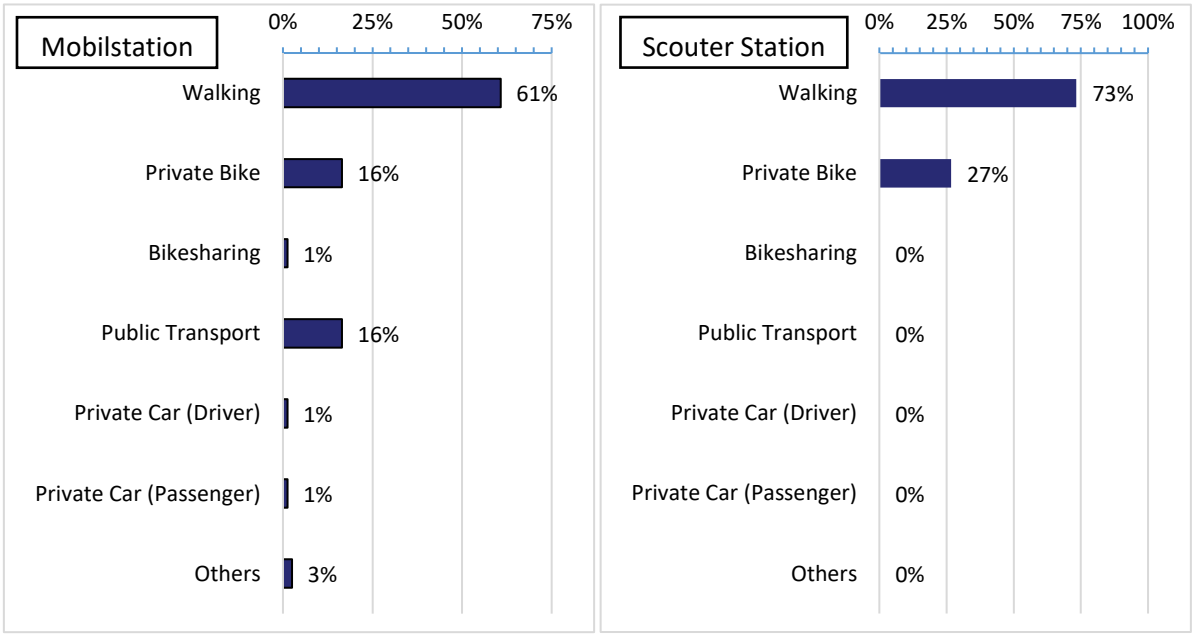

Figure 66: Egress mode from mobility stations (left, n=80) and scouter stations (right, n=15)

The egress mode is very similar to the access mode (shown in Figure 63). Walking is the dominant mode to get from the station (61% at mobility stations) and in second place come private bikes and public transport (each 16% at mobility stations). At scouter-only stations, no one uses public transport but 27% egress the station by private bike. One user (1%) used bikesharing to continue the trip after the return of the carsharing car at a mobility station. The consequences described for the access mode do also apply here.

The destinations reached after leaving the station are mapped in Figure 75 (chapter 5.3.3).

An important effect of all shared mobility services is the question which other modes they substitute. This was asked directly for all trips during the rental. First of all, the number of cases is relatively low, so the results at scouter stations have to be read with caution (Figure 67).

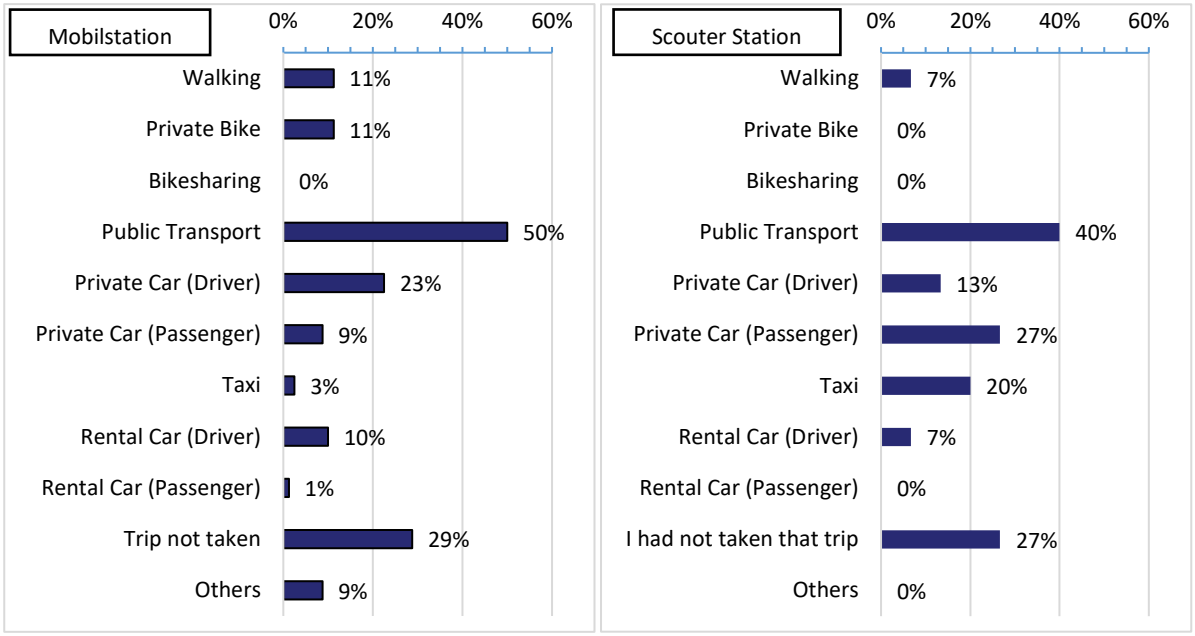

Figure 67: Substituted mode: mobility stations (left, n=80) and scouter stations (right, n=15). Multiple choice.

Fifty percent of all carsharing trips at mobility stations replaced a public transport trip, and 23% replaced a private car trip as driver. Less important, but also playing a role, are rental cars, walking, and private bikes. A third of all trips was induced by the new service. This could frequently happen because cars are rented for a certain purpose, but then – as the car is available - it is used for more purposes.

At scouter stations, aside from public transport also private cars and taxis play a bigger role. However, the low number of cases makes this result only a tendency and not a hard fact.

The question whether the substitution of public transport is good or bad for the city is critical for the evaluation of the overall concept. More details on this are presented in chapter 6.

5.3.2 Last trip: Bikesharing

Due to the low number of bikesharing users among the respondents (47 in total), there were only 13 persons in the sample who remember their last trip with nextbike in Würzburg. Two of them used bikesharing at nextbike-only stations, and 11 users started or ended their trip at a mobility station. Among the mobility station trips, all 11 respondents used nextbike for one-way trips and thus no one returned the bike to the same station where the trip started.

The starting points of all trips are visualized in Figure 74 and will be analyzed in Chapter 5.3.3.

Even though the questionnaire provided questions for non-mobility station trips, these cannot be analyzed because of the low response rate of just two users.

Figure 68 shows the access modes to the stations for nextbike users.

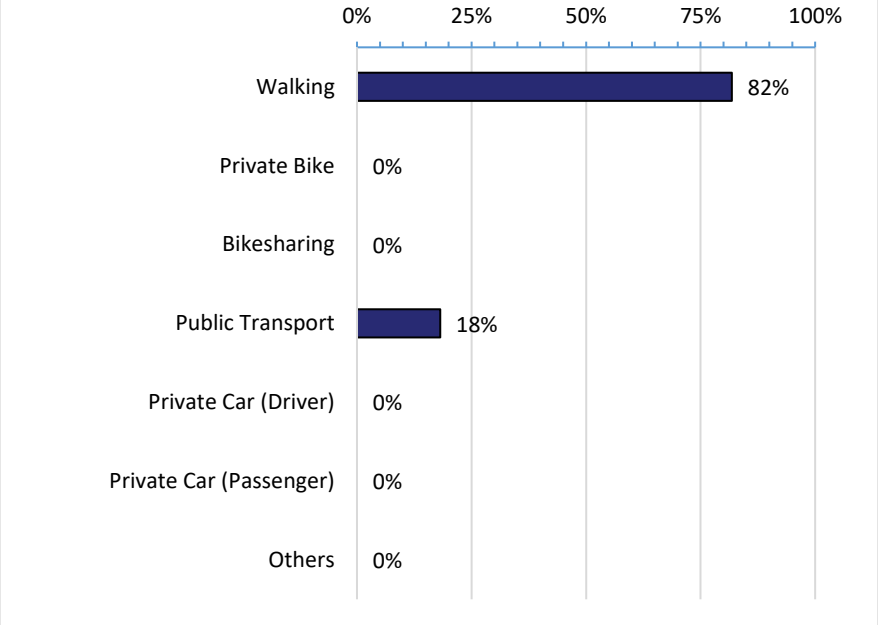

Figure 68: Access mode for nextbike (n=11)

The majority arrives on foot at the station; two respondents accessed the station by public transport to rent a bike there. As with scouter, attractive facilities for pedestrians are crucial for comfortable access to bikesharing. The role as last-mile-mode (18%) shows potential for more use, but convenient last-mile connections with nextbike are limited due to the need for a return station at the final destination.

Among the respondents, all mobility stations were used at least once. Figure 69 shows the distribution of stations for rentals in the last trip section of nextbike users.

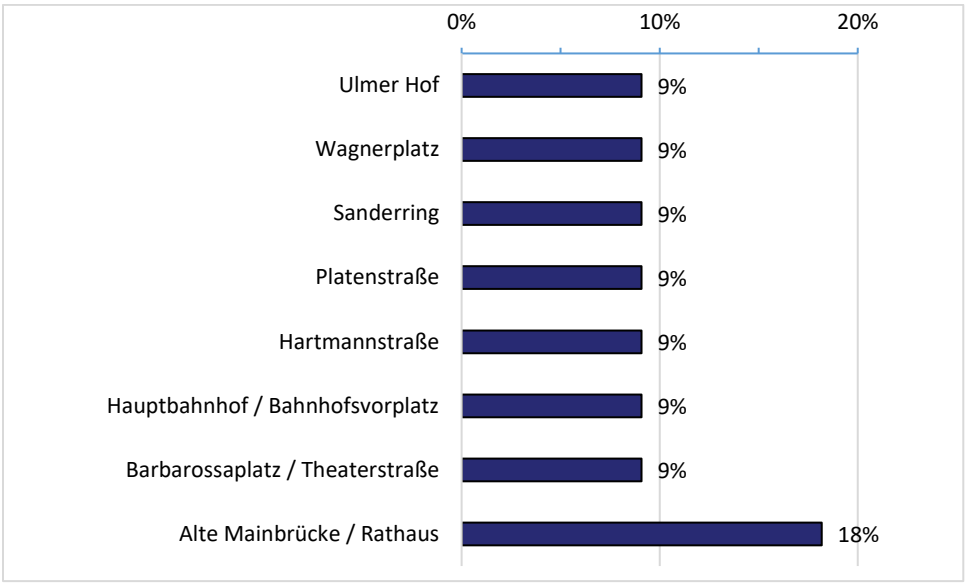

Figure 69: Rental stations (nextbike, n=11)

Thus, the station “Alte Mainbrücke / Rathaus” is the only one that experienced more than one rental from users in this sample while the sample size does not allow further interpretation of these numbers.

Figure 70 presents the findings of trip purposes among nextbike users.

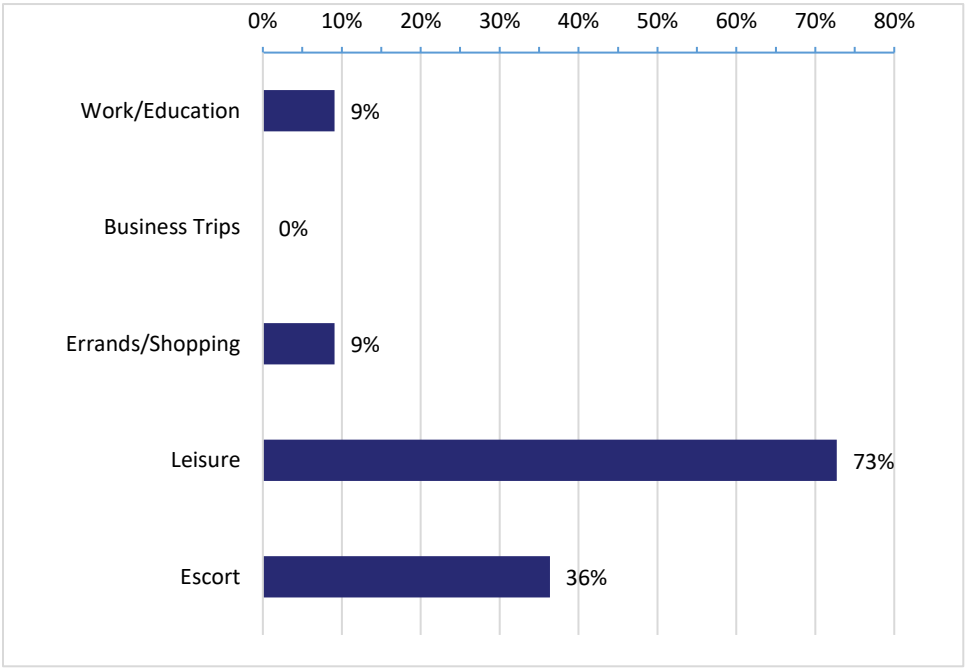

Figure 70: Trip purposes (n=11, multiple responses) (nextbike)

Nextbike is used mainly for leisure and escort trips. Utilitarian trips, such as work, education, and shopping do not play an important role among the responding users, indicating once again recreational use as the dominant reason to use bikesharing in Würzburg.

The stations used to return the bike are shown in Figure 71.

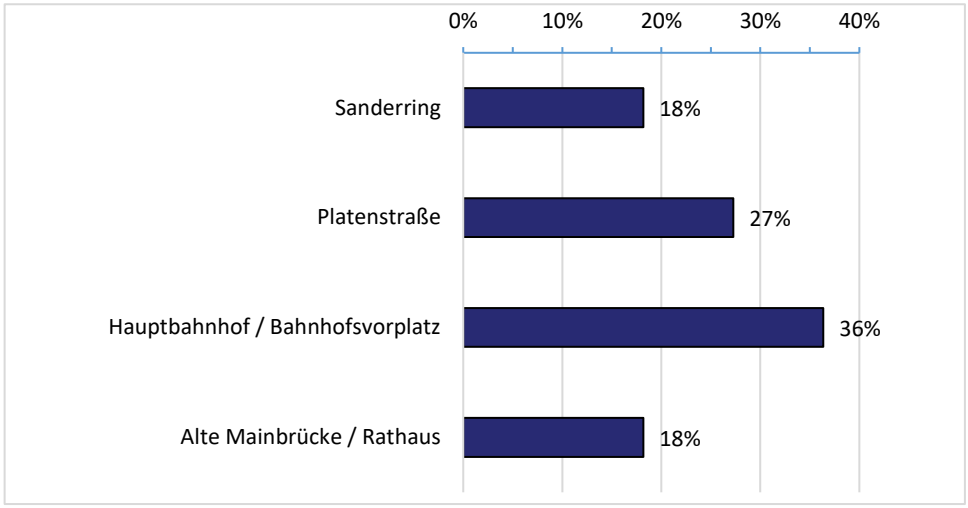

Figure 71: Return stations (n=11) (nextbike)

The main attractor of nextbike trips is the central train station (36% of all rentals ended there). This shows the willingness of users to use nextbike as first-mile-mode for long-distance trips. Interestingly, Platenstraße (27%), a station in a residential area, was the second most frequented destination. Due to the low sample size, it is unclear whether this is a random artifact or not.

Egress modes after the return of a bike are visualized in Figure 72.

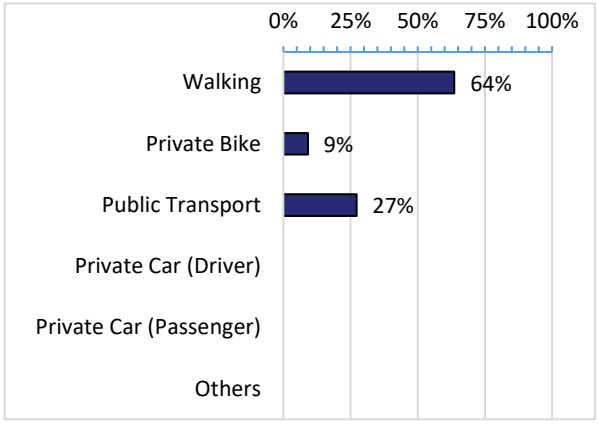

Figure 72: Egress for nextbike (n=11)

Similar to the access mode, walking is the dominant mode of transport after the return of a nextbike bicycle. The share of public transport is slightly higher than for access and one respondent continued by private bike, which has been repaired in a bike shop next to the station. Thus, first-mile connections are more frequent than last-mile trips – possibly because many trips reach the central station.

The destinations reached after leaving the station are mapped in Figure 75 (chapter 5.3.3).

Similar to carsharing, the last question of the last trip section asked for the mode that was replaced by bikesharing. Figure 73 presents the result.

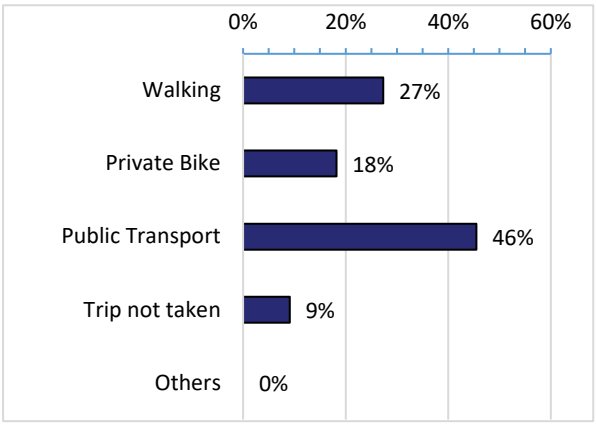

Figure 73: Substituted mode (n=11, single choice) (nextbike)

Approximately 50% of the trips replaced public transport, which is relatively high compared to findings from other carsharing systems (e.g. Munich, (Miramontes et al., 2017 (forthcoming)). Walking was replaced in a third of the cases. Thus, nextbike seems to be used as a standalone one-way mode rather than for a last-mile / first-mile trip that complements public transport. More insights on whether the substitution of public transport is a negative effect for the city are found in chapter 6.

5.3.3 Spatial analysis of origins and destinations

As part of the last trip, users were asked to locate the start point of their trip to the mobility station (before renting a car or bike) as well as their destination after returning a car or a bike at a mobility station. Figure 74 and Figure 75 show thee results, which are dominated by carsharing due to a higher number of responses.

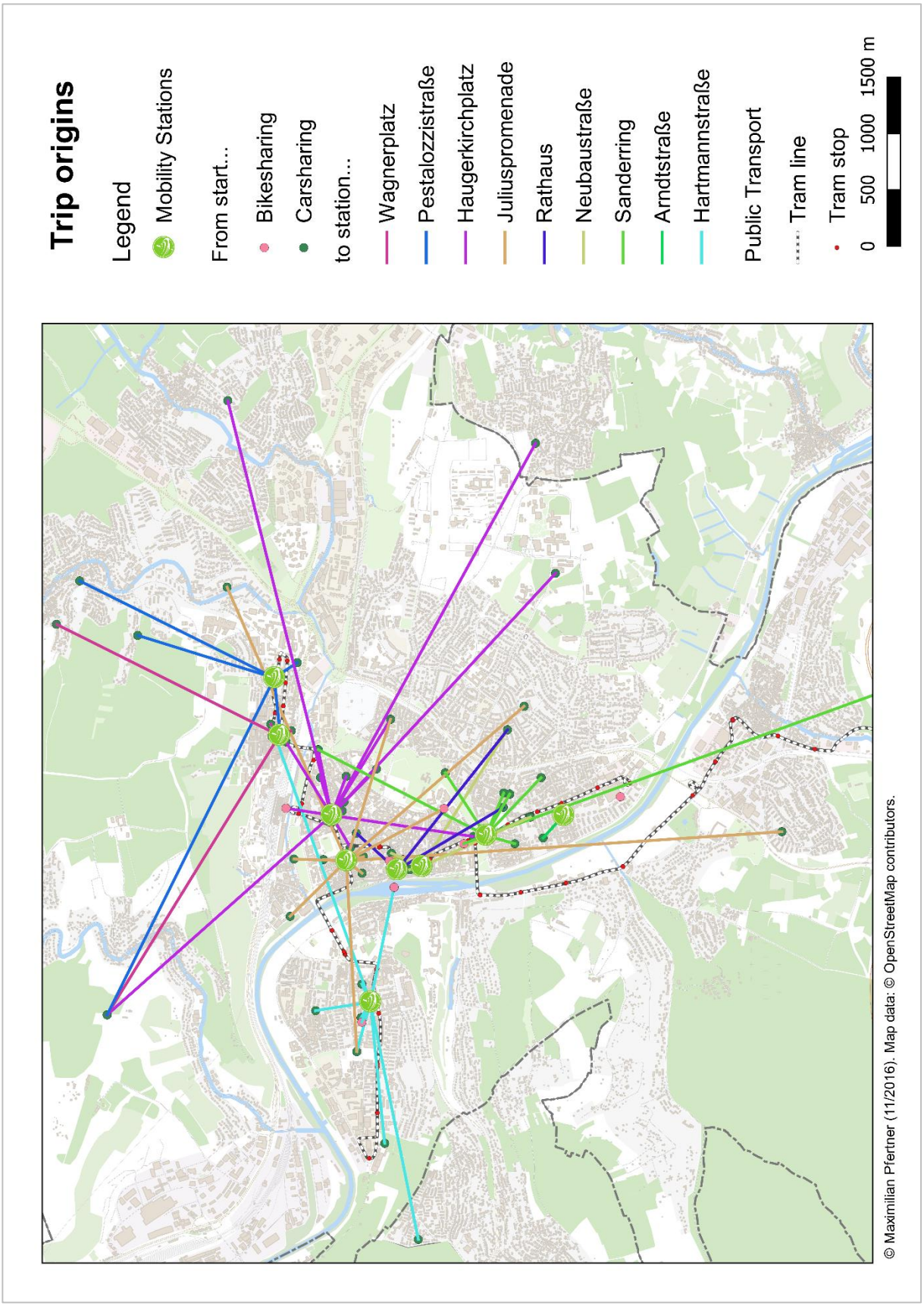

Figure 74: Trip origins before renting a car/bike

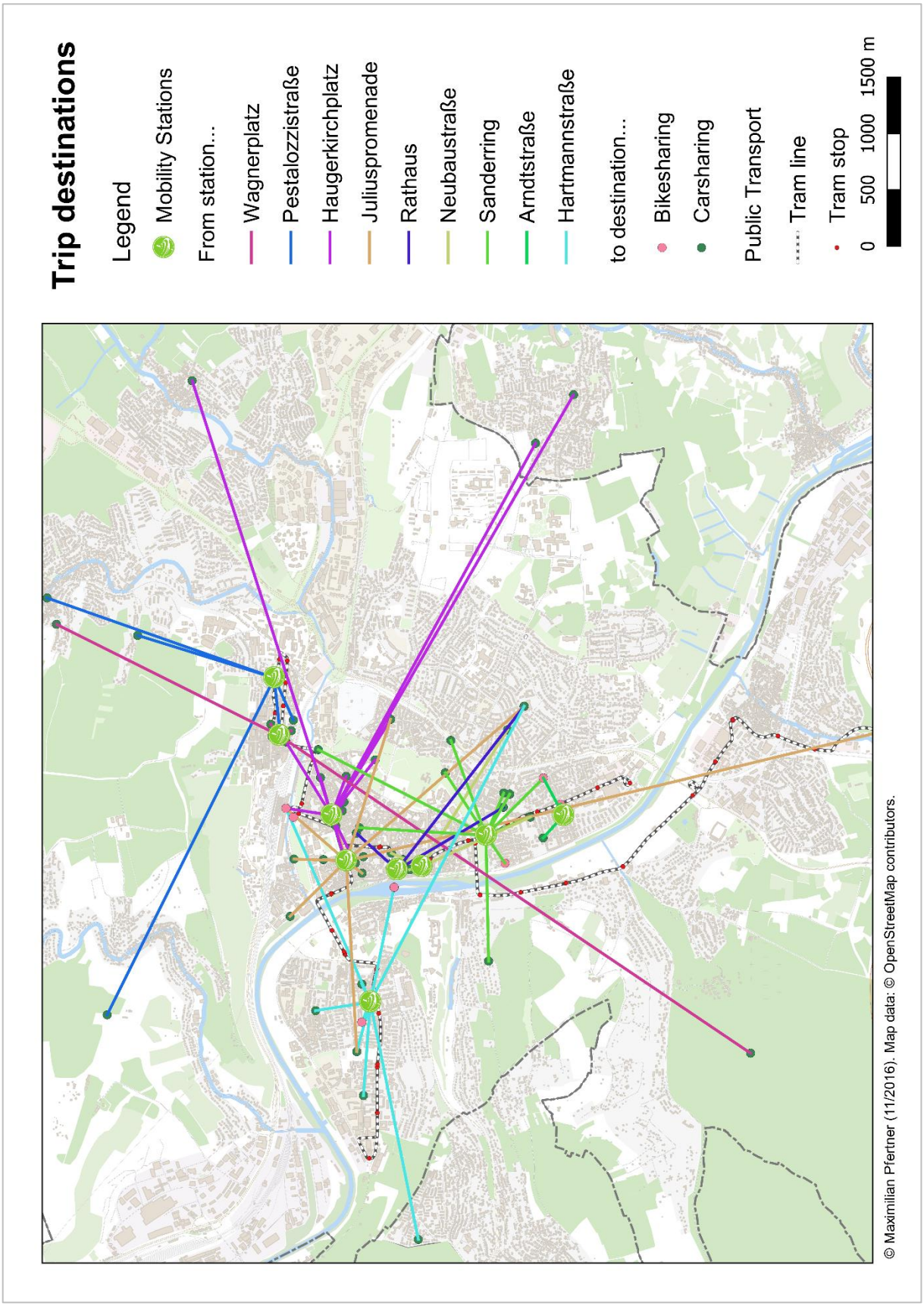

Figure 75: Trip destination after returning a car/bike

The results of the trip to a mobility station (Figure 74) reveal that in most cases, users choose the closest mobility station as a place to start a rental. However, there are also cross-connections throughout the city, where people make a longer trip to reach a station or people from outside the urban area that come to the center in order to start a rental (possibly because of a lack of carsharing at their place of origin).

This behavior hints at a feeder function of public transport that brings users to a station to start a rental there. The importance of a good connection to the streetcar is emphasized by this observation.

The results of the destinations after returning a car or a bike (Figure 75) are similar. Most users make only a relatively short trip (home, in most cases) but there is a significant share of users that have their home location far outside the urban core of Würzburg and not in the immediate surrounding of a mobility station.

5.3.4 Problems reported by the users

Users were asked whether they have experienced problems with mobility stations, carsharing and bikesharing in the past. If they agreed, they could give details in the form of an open question.

As some respondents use e.g. bikesharing in Munich, but not nextbike in Würzburg, filters were applied, so that all replies regarding carsharing and bikesharing concern only problems in Würzburg.

Figure 76 provides an overview of the frequency of problems at the three systems *mobility station*, *carsharing* and *bikesharing*.

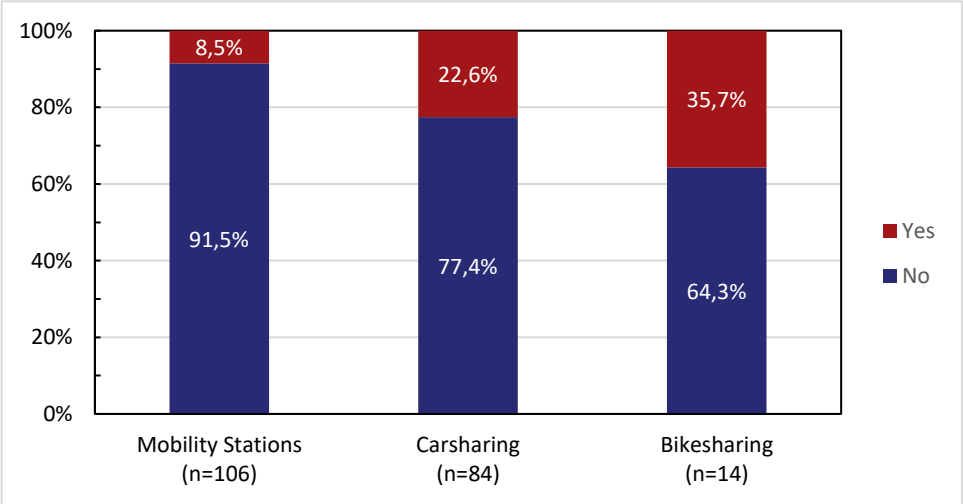

Figure 76: Share of problems reported by the users

In the following paragraphs, the details of the problems will be reported in a summarized way.

Mobility stations

Only few users report problems directly related to the mobility stations (n=9). The main complaint is about private cars blocking the reserved parking for scouter (n=4), and problems with the operation of the bollard that should protect the parking spot from parking offenders (n=2). Two people mention that it was hard to find the station.

Carsharing

Nineteen users report problems with the operation of scouter. These can be classified into three categories:

- Availability of cars (approx. 5 users)
  - Especially on weekends, there is high demand for cars and spontaneous bookings are often not possible. There is a demand for more small cars that come with lower rates.
- Technical problems and operation (approx. 10 users)
  - Reservations did not work, car did not open, battery/gas tank was not full
  - Previous user was late, car was dirty
  - Problems with the app and/or internet connection
- Station-related problems (approx. 5 users)
  - Blocked parking spots, complicated pull-in/pull-out procedures

Bikesharing

Five respondents experienced problems with nextbike. Problems are either related to the operation (such as malfunctions in the app, no responses at the hotline, and no availability of bikes) or to the bikes, where sometimes tires were flat or opening codes did not work on the bike.

5.4 Awareness, perceptions, and opinions

This chapter analyzes the users' awareness of mobility stations, their perceptions and opinions.

Users' awareness

All Würzburg residents who took part in the survey were asked whether they know the idea of mobility stations and if they know that these exist in Würzburg in the form of "Mobilstationen". Figure 77 shows the result of this question, split into users and non-users (in gray).

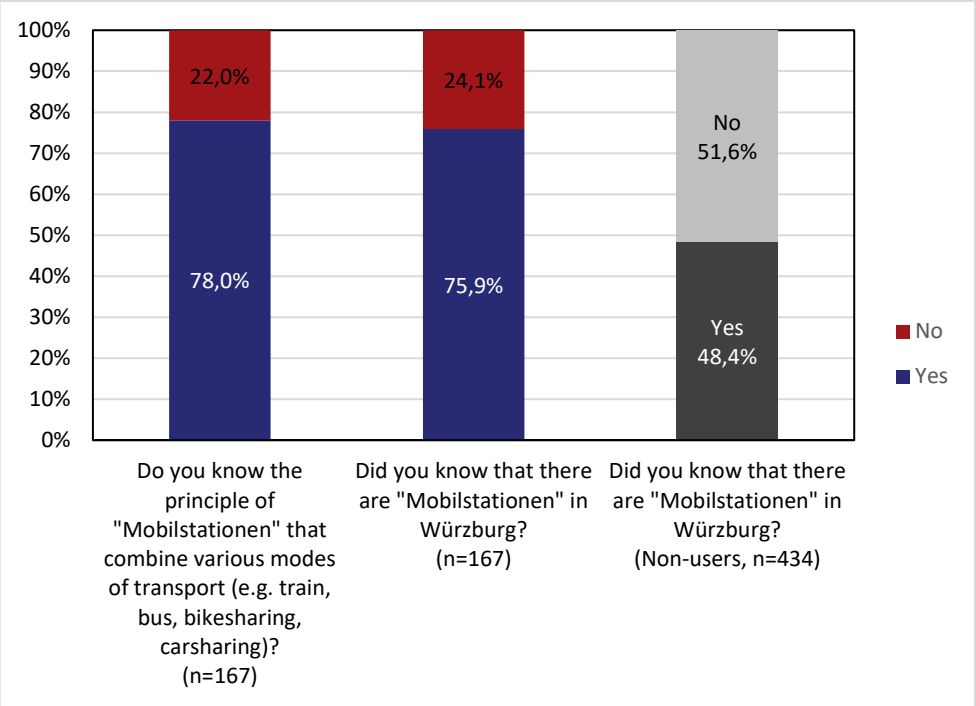

Figure 77: Awareness of mobility stations

Most users (78%) know the principle of the stations and a few less (76%) know that the stations exist in Würzburg. Among non-users of bikesharing and carsharing, 50% know the principle (not displayed), and 48% are aware of mobility stations in Würzburg. This reveals a good awareness of the system both among users, but also at the regional scale. However, more marketing and branding efforts could increase the awareness of users – 24% of users say they don't know the stations. This shows potential for more awareness and the need to increase marketing efforts.

Source of awareness

Users who know the mobility stations in Würzburg were asked how they became aware of them. Figure 78 shows the different sources of awareness.

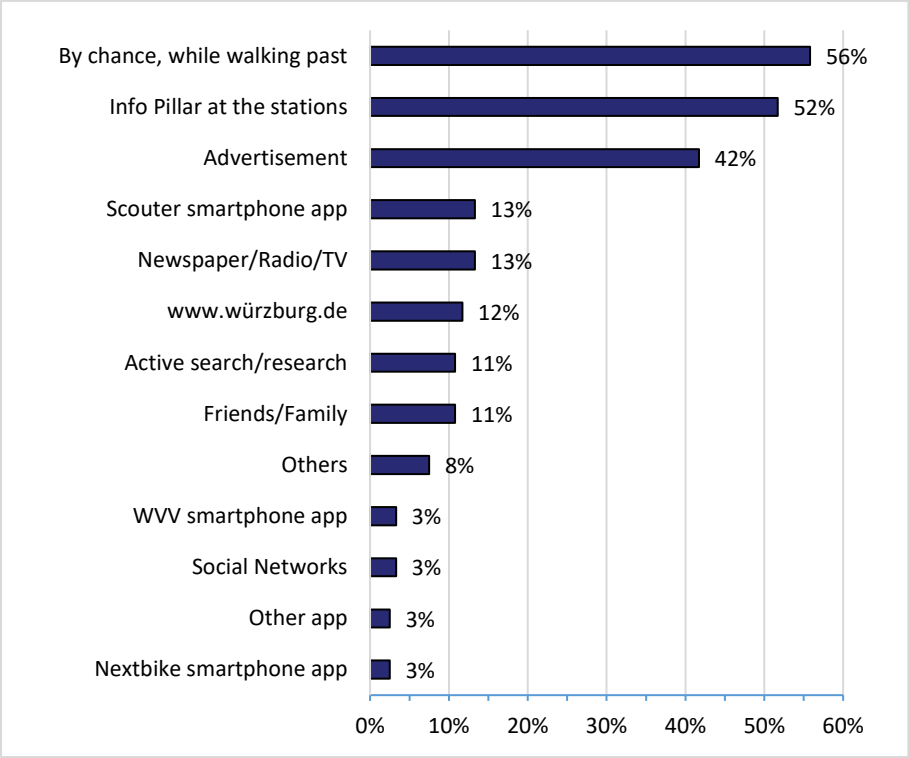

Figure 78: Source of awareness (n=120, multiple choice)

The most frequent way of recognizing the stations are by walking past (56%) and the information pillar at the station (52%). Both items highlight the importance of visibility in public space, which is the most important factor in attracting attention.

42% of users state that they were informed about the stations by advertisement, which includes marketing by the City, the public transport operator WVV, scouter and nextbike. Thus, marketing seems to be an efficient means of highlighting and promoting the stations.

Online media, apps and traditional media are of lower importance and hint at a potential for more engagement in this area. The same applies for recommendations by friends and family.

The need for visibility and attractiveness is also emphasized in Figure 79, where the majority of users states these properties are important:

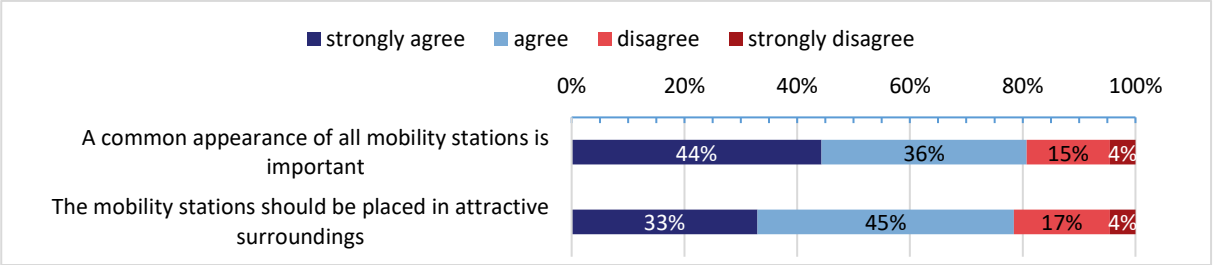

Figure 79: Surrounding and appearance of mobility stations (users, n=90)

Users' knowledge and use of the stations

Those users that know the stations in general were asked which of the nine stations they know and/or use. Figure 80 presents the summary of this question.

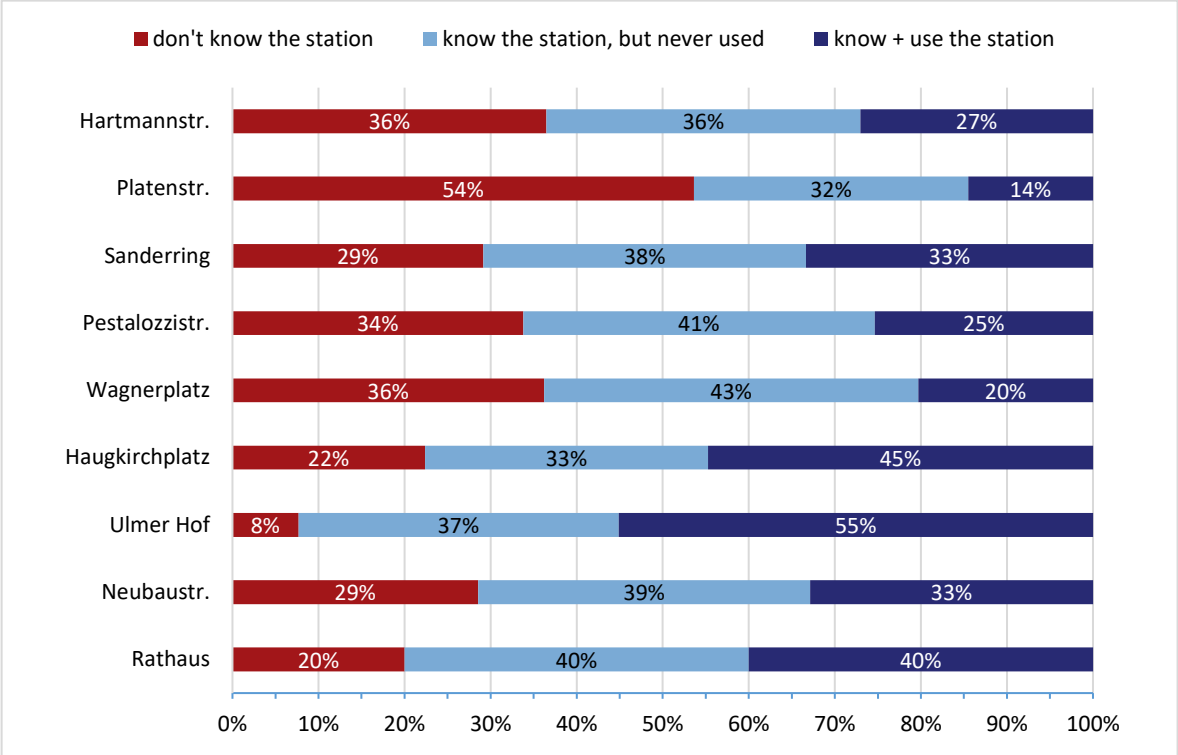

Figure 80: Knowledge and usage of stations (n=69-78, depending on station)

According to the figure, the stations that are known by the most people are Ulmer Hof (92% know about this station) and Rathaus (80%). Platenstraße is the least known (46%). Ulmer Hof is used by 55% of respondents, followed by Haugkirchplatz (45%) and Rathaus (40%).

Putting this in the context of the stations' urban environments (cf. Table 8), the most central stations are also the most known. The proximity to streetcar stops is also a decisive factor, as the station Ulmer Hof shows. Even though it is very central, in an area that is not typically residential, 55% of all users have used the station already. The good accessibility at this station (it is located directly at the streetcar stop) seems to have a positive influence on its use.

The integrated tariff option *WVVmobil*

Users and non-users were asked whether they know and use the integrated tariff offer *WVVmobil*. Figure 81 shows the result of this question for both groups.

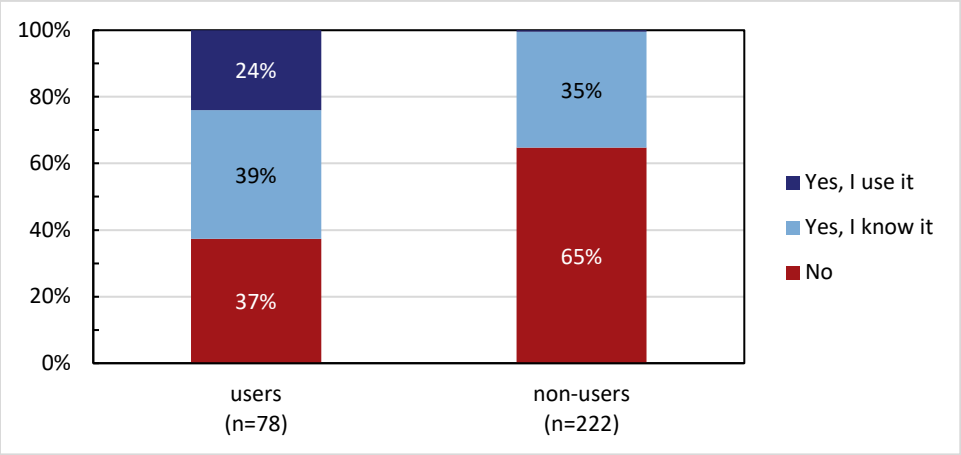

Figure 81: Do you know/use the integrated offer WVVmobil?

Obviously, more users than non-users know the service. While 65% of non-users do not know that *WVVmobil* exists, only 37% of users were not aware of the offer. 39% of users know *WVVmobil* but don't use it, and 24% say they make use of the offer.

Marketing efforts should target the 37% of users that do not know the offer to make sure *WVVmobil* attracts as many customers as possible. Among non-users, 35% of awareness show that the existing marketing measures reach some customers, but also among this group there is potential to attract more people.

Those who know or use *WVVmobil* were also asked how they became aware of the service. Figure 82 displays the result of this question.

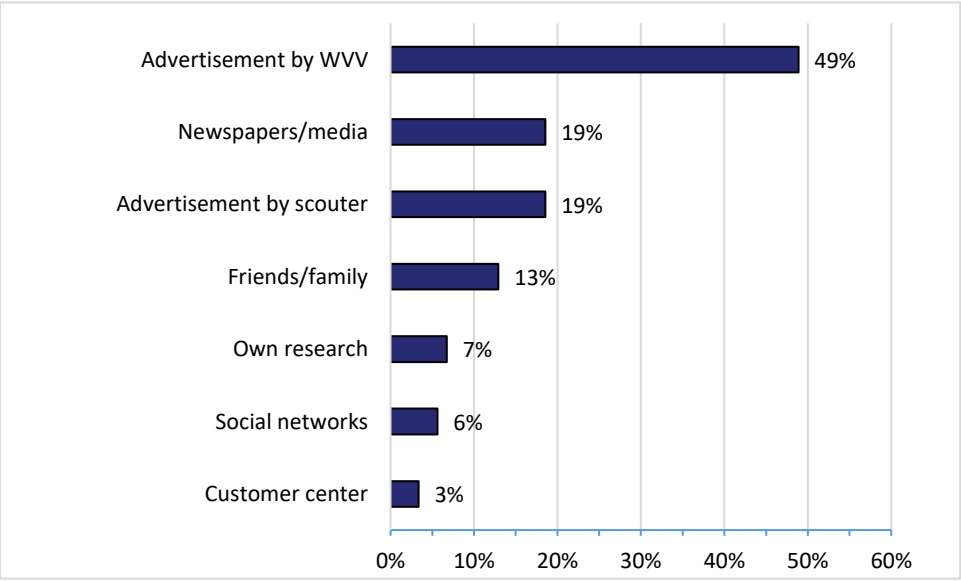

Figure 82: How did you become aware of *WVVmobil*? (n=178, multiple choice)

The most effective approach to reach out to customers was the advertisement of WVV (49% became aware because of this). It is to assume that subscribers of WVV are relatively well

aware of the offer. Media reports and scouter's campaign each reached 20% of people that know about the offer. Especially social networks show an unused potential to attract more attention for the topic of integrated mobility in Würzburg.

Components of the stations

Figure 83 presents the user's assessment of the importance of the mobility stations' components.

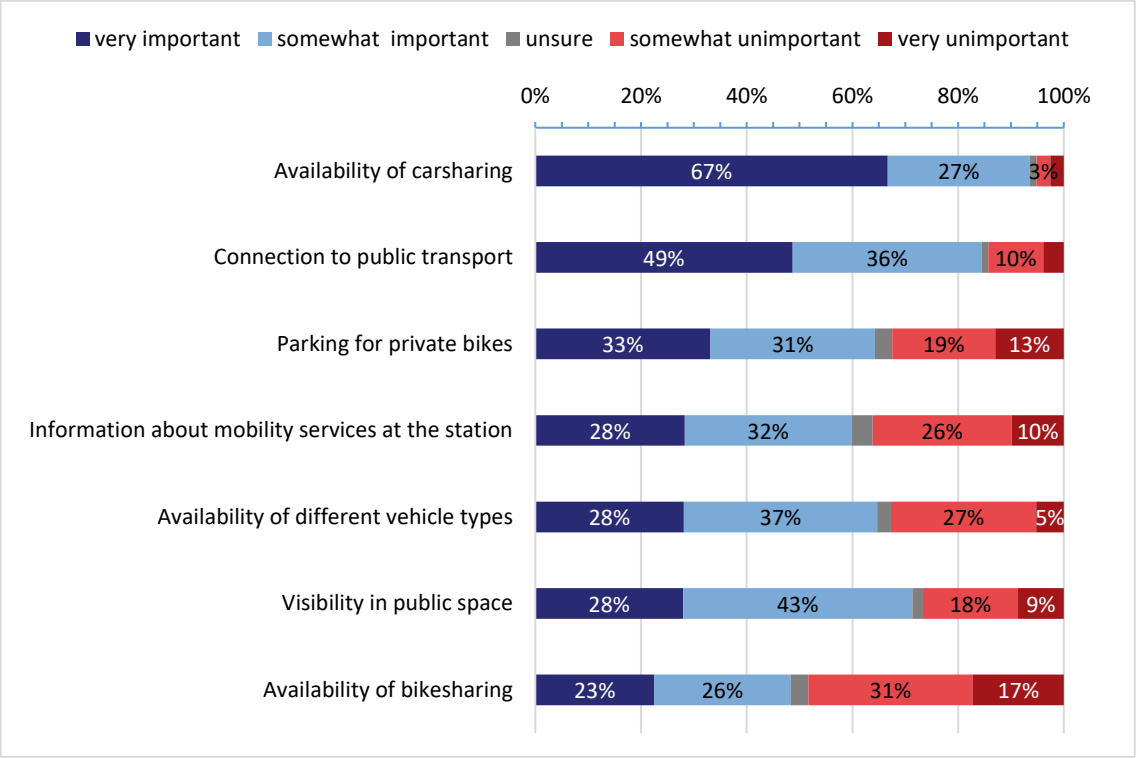

Figure 83: Importance of existing components of mobility stations (n=150-156)

The trend visible in backend data, where it was found that carsharing is used more frequently than bikesharing is also visible in the expression of importance for the components of the stations: while a total of 94% of the respondents state that the availability of carsharing is important, 49% think the same way about bikesharing.

However, not only carsharing is important at mobility stations, but also the connection to public transport: 85% say this is "very important" or "somewhat important".

Other components and characteristics such as different vehicle types, visibility in public space, private bike parking and information about mobility services all receive moderate approval rates, ranging around 60% - 75% of respondents who think these are important.

Mobility stations are not limited to these components. Ideas to extend the stations range from the inclusion of more modes (e.g. taxis) to extra services like luggage storage. Figure 84 shows the importance that users attribute to a list of additional components.

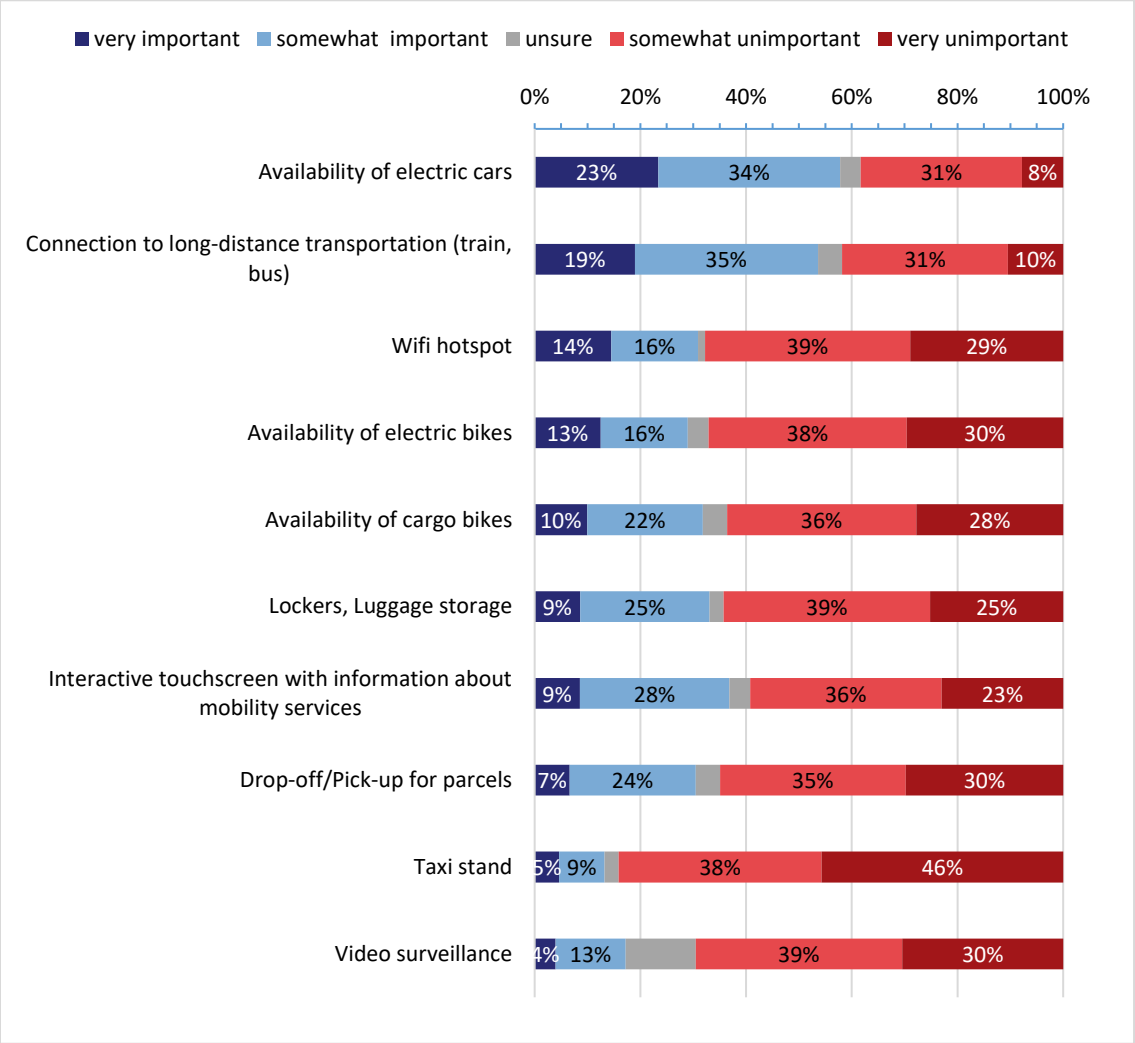

Figure 84: Importance of additional components of mobility stations (n=151-154)

Electric cars are considered as “important” by approximately 60% of all respondents, indicating that users would like to see these vehicles included in the scouter fleet. The second important idea is the connection to long-distance transportation such as trains and buses, which is considered important by 44% of the users.

Other possible additions to the stations experience less approval. Electric bikes and cargo bikes are important for 30% of users, lockers for luggage and touchscreen information panels for a few percent more.

Taxis and video surveillance are considered unimportant for the vast majority of responding users.

Ideas and expectations for the future of mobility stations

The majority of respondents (72%) wants more mobility stations in Würzburg (Figure 85).

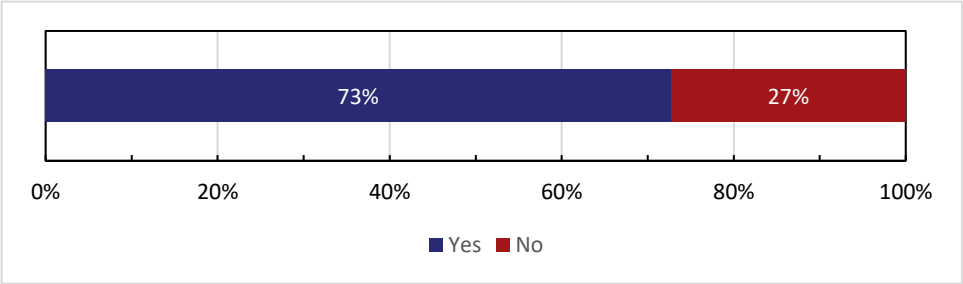

Figure 85: Do you want more mobility stations? (n=128)

This shows strong support for an extension of the mobility station network in Würzburg and a high level of satisfaction with the current system.

Users also have many ideas for new locations of mobility stations. These can be grouped into the following categories:

- Central places (central station)
- New urban developments such as the Hubland area
- Areas with a weak connection to the inner city (e.g. Frauenland)
- Upgrades of existing nextbike or scouter stations
- At public transport nodes (e.g. bus transfer station, central station)
- In residential areas
- In public places and venues (Swimming pools, concert halls, stadium, universities)

5.5 Changes in mobility behavior and car ownership

As described in chapter 3.3.2, mobility stations aim at influencing the user's mobility behavior towards less private car use and a lower car ownership rate while promoting multimodality. This chapter summarizes the findings on these effects.

Influence on membership with carsharing and bikesharing services

The influence of mobility stations regarding membership with carsharing and bikesharing companies is presented in Figure 86.

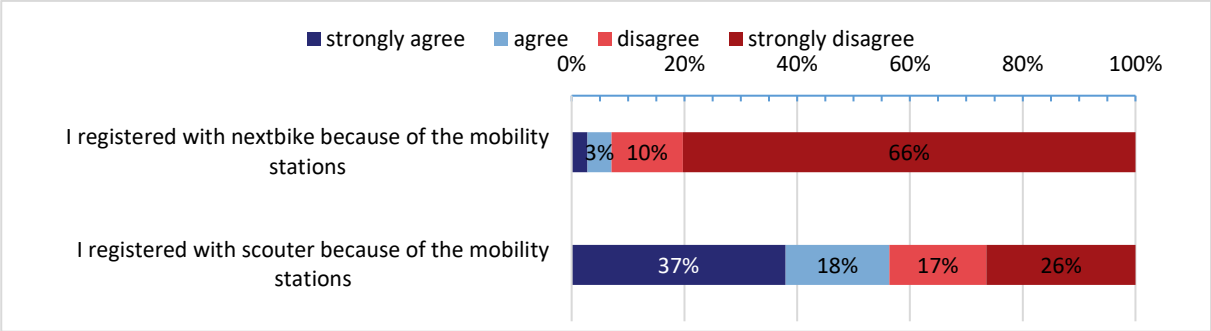

Figure 86: Registration with bikesharing/carsharing (users, n=90)

When mobility stations were implemented in Würzburg, they came along with a significant enlargement of the existing carsharing and bikesharing services in town. Thus, the fact that 55% of scouter users registered with the service because of the mobility stations is biased and the result has to be analyzed cautiously. However, also with this limitation, the power of mobility stations to attract new users is observable among carsharing users.

Only a small minority of nextbike users states that they registered with the service because of the stations. This can be explained by the fact that most nextbike users are visitors to the city.

Use of carsharing, bikesharing and public transport

The influence of mobility stations on the frequency of use of carsharing, bikesharing, and public transport is presented in Figure 87.

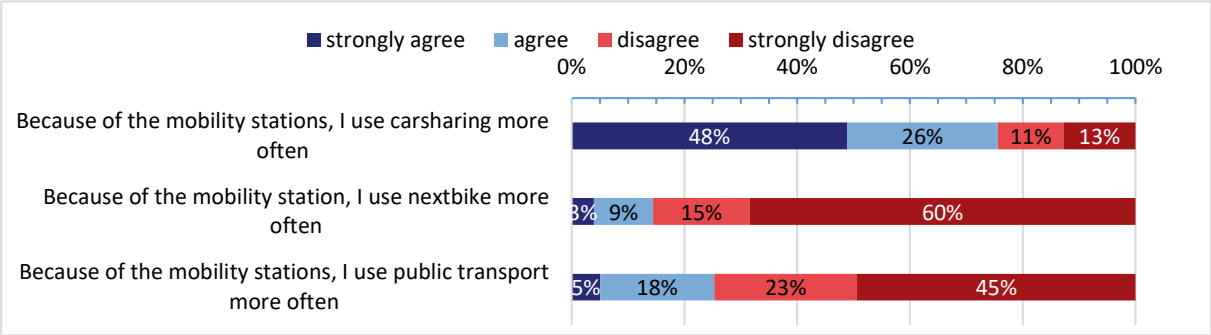

Figure 87: Changes in frequency of use (carsharing, bikesharing, public transport) (users, n=90)

Almost 75% of carsharing users state that they use scouter more often since there are mobility stations in Würzburg while only 12% of nextbike users agree to the statement that they use bikesharing more often. As mentioned earlier, this can possibly explained by the fact that carsharing users are residents who use the service quite regularly, while nextbike is used by visitors and spontaneous one-time users who do not change their mobility behavior because of the stations.

The amount of public transport users who have increased their frequency of use because of the stations is 23%, which indicates that mobility stations contribute to making the urban transport system more attractive.

It is to conclude that users perceive their frequency of carsharing use as higher, while backend data revealed that the trip rate per user is relatively stable. The consequence of this is that among those who say they use it more often, many have not used carsharing at all before the implementation of the stations. The effect that mobility stations strengthen the use of public transport is observable, but many users also strongly disagree to this statement.

Private cars: Ownership and usage

Users and non-users were asked whether the number of cars in their households has changed during the last year (Figure 88).

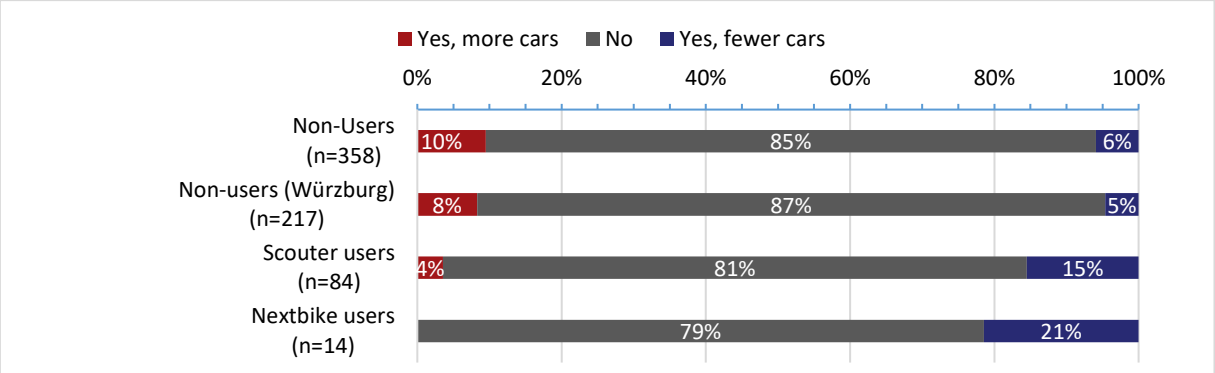

Figure 88: Changes in car ownership

Among non-users both in Würzburg and in the region, there is a trend observable towards more cars per household. 5% of non-users in Würzburg and 6% in the region reduced the number of cars in their household while 8% (10%) have now more cars than one year ago. This general trend is not seen in users of sharing services, where the opposite is true: Significantly more people have now fewer cars than one year before.

15% of scouter users got rid of a car while 4% added one to their household. Being asked how this is related to the use of carsharing, 46% of those selling a car state that carsharing had a “very large” or “large” influence on this decision. 45% of users in which the number of cars has been stable over the last year say that carsharing made them refrain from buying an (additional) car. Among the three scouter users who increased the number of cars in their household, two state that carsharing had only a “very small” influence on this decision and one person attributes a “very high” influence to the use of scouter.

Nextbike customers also tend to reduce the number of cars. 21% sold a car while no one got a new one.

Respondents who stated earlier that they have a car in their households were further asked whether their usage has changed over the past year (Figure 89).

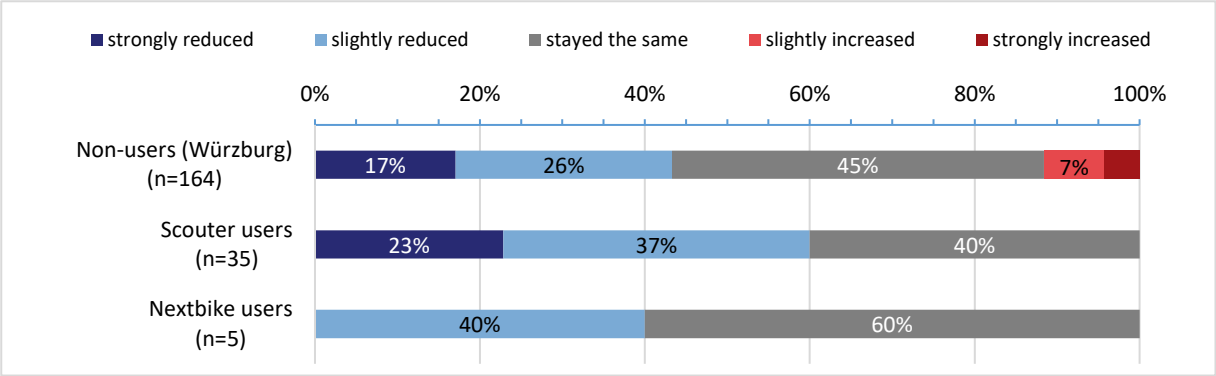

Figure 89: Changes in car use over the past year

Non-users from Würzburg can be seen as a reference group to test whether the use of carsharing and bikesharing reduces car use. Figure 89 suggests that there is an overall trend in Würzburg towards less car usage. 43% of non-users say they have reduced their car use “strongly” or “slightly” over the past years while 11% report increased vehicle usage.

Nextbike users show a similar ratio of 40% who reduced car use and 0% increasing. However the number of cases (n=5) is too low to interpret this as a valid result.

Scouter users, however, show a higher proportion of people who reduced their vehicle use (23% “strongly” and 37% “slightly”) and no one who increased car use. Thus it can be concluded that carsharing users reduce their frequency stronger than the average Würzburg resident.

These findings correspond to results obtained from the stated preferences part of the user survey (Figure 90).

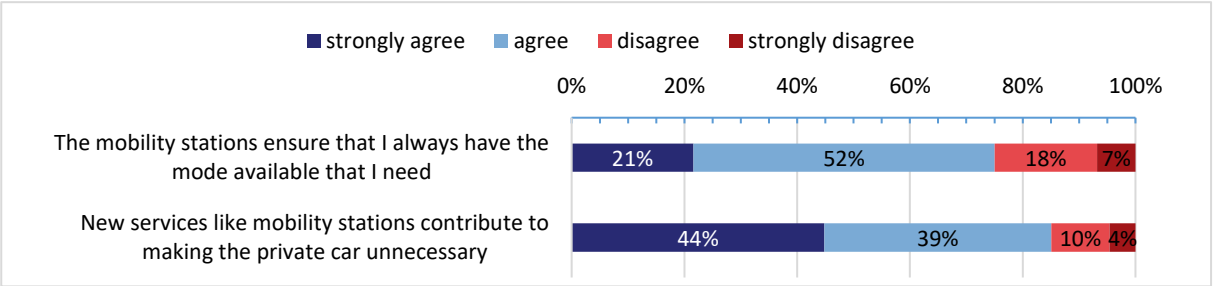

Figure 90: Stated preferences (users, n=90)

More than 80% of users “agree” or “strongly agree” that services like mobility stations contribute to making the private car unnecessary and more than 70% state that the stations always provide the modes of transport that the users need.

Summing up these findings it is to conclude that mobility stations contribute both to reducing the number of cars per household and also to lower the kilometers driven in private cars. Users of mobility stations oppose the trend to more cars found among non-users, which is a strong argument for the effectiveness of mobility stations to reduce the dependency on private vehicles in Würzburg. Of course, the absolute number of users is low, compared to the city's overall population – but as described by Chlond (2012), these initially small effects can accumulate and contribute to a transition towards a multimodal future.

5.6 Effects on CO_2 Emissions

Being part of the City's climate action plan, mobility stations are expected to contribute to lowering the CO_2 emissions produced by the transport sector. To evaluate the eligibility of mobility stations to reduce carbon dioxide emissions, this chapter estimates the amount of CO_2 saved per year. More details on the calculation methods are given in the *Methods* chapter (4.3).

Context

Transportation is responsible for 30% of all CO_2 emissions in Würzburg, and while the emissions of the other sectors have been decreasing over the last years, the amount of emissions produced by transportation is relatively constant (BAUM Consult GmbH, 2012).

In 2010, approximately 75,000 tons of CO_2 were caused by local person transportation in Würzburg. While 3,000 t are emitted by public transport vehicles, 72,000 t come from private vehicles (BAUM Consult GmbH, 2012).

As outlined in Chapter 4.3, the total amount of emissions reduced by mobility stations consists of

- lower CO_2 emissions per vehicle-kilometer due to smaller, more efficient vehicles in the carsharing fleet compared to the average private car
- reduced number of private vehicle-kilometers due to more attractive alternatives and a lower car dependency in general.

However, carsharing also adds additional emissions to the transport system when trips are shifted from public transport (and other low-emission modes) to carsharing.

Smaller and more efficient vehicles in the carsharing fleet

The fleet of private vehicles in Würzburg emits on average 172.9 g CO_2 per vehicle-kilometer while the average scouter car emits 100 g CO_2 for the same distance (c.f. Chapter 4.3.).

Approximately 30% of all scouter trips reported in the online survey replaced a private car trip (both as passenger and driver) and in total, approximately 439,000 km were driven with

scouter cars during the observation period of October 2015 to October 2016 (figure from backend data).

Combining these statistics with the formula presented in chapter 4.3, **9.6 tons of CO_2** are **saved** through the fact that scouter vehicles are more efficient than private cars in Würzburg.

New car trips shifted from other modes

Seventy percent of all scouter trips were done with other modes before. Thus, the shift towards carsharing creates more CO_2 emissions in these trips. Multiplying 70% of all carsharing trips (in the form of vehicle-km) by the emission factor for scouter leads to **30.7 additional tons of CO_2** per year created by the carsharing service.

Decline in emissions due to reductions in private car use

In the user survey, 60% of all carsharing users said they have reduced their private car mileage over the last year. On average, users drove 5,000 km less compared to the year before.

Thus, of approximately 1,200 active users in Würzburg (according to backend data), 730 reduced their kilometers driven by private cars. This results in 3.6 million private car-km less over a year, contributing to a **CO_2 emission reduction of 629 tons** over a year.

Balance

Summing up these three factors, the balance is shown in Table 23:

Table 23: Balance of CO_2 emissions

Factor	Influence [CO_2/year]
More efficient vehicles	-9.6 t
Additional car trips	+30.7 t
Reduction of private car use	-628.8 t
Total saved	**649.9 t**

It can be concluded that the implementation of mobility station and thereby the extension of the scouter carsharing system in Würzburg saved **650 tons of CO_2 emissions over one year.** This is roughly 1% of all local transportation emissions in the City of Würzburg.

6 Discussion

In this chapter, both the methods and the results are discussed in order to highlight strengths and weaknesses of the study and the mobility stations.

6.1 Strengths and limitations of the methodological approach

This thesis applied various methods in order to evaluate the mobility stations in Würzburg. This section will analyze the strengths and weaknesses of this approach.

6.1.1 Expert interview and site visits

The site inspection of all mobility stations was an essential instrument to generate a deeper understanding of mobility in Würzburg in general and each mobility station in particular. It is highly recommended that future studies of mobility stations and similar projects include at least one visit on-site.

The same applies for the interview with Adrien Cochet-Weinandt from the City of Würzburg, which supported this thesis with in-depth background information about the project.

6.1.2 Backend data

Thanks to the initiative of the City administration and the cooperation of the companies nextbike and Sharegroup (scouter), backend data for bikesharing and carsharing could be analyzed in this work. Both the observation period of more than one year and the quality of the data was very good and made a thorough analysis of the services possible.

The data provided meaningful insights into the development of rentals over time, the different user groups, rental characteristics like start- and end-time, durations and kilometers driven (scouter). The inclusions of non-mobility stations in both datasets allowed a comparison of mobility stations versus regular bikesharing and carsharing stations.

While the descriptive analysis in this study generated meaningful reports from the data, future analysis could integrate more statistical methods and models (e.g. regression models) in order to get a deeper understanding of single aspects.

6.1.3 Survey

The decision to combine the survey with a study designed by JMU turned out to be a good decision. The inclusions of non-users allows for a better understanding of users and would not have been possible in the scope of this thesis without this cooperation. Also, the joint

study attracted regional coverage in newspapers and websites thanks to marketing done by the City, WVV, nextbike, scouter and JMU.

Responses

The number of responses of scouter users was very good from the beginning, not only but also because of the direct invitation email sent by the provider. Thus, the results for carsharing users in Würzburg are based on a robust number of cases.

Not sufficient for results that go beyond trends and cautious statements was the number of nextbike users in Würzburg who took part in the study. After the analysis of backend data is became clear that there are simply not enough active nextbike users in Würzburg to generate reliable data. Further, an opt-in rule in nextbike's terms and conditions reduced the number of customers reached by email from the provider. Future studies should consider this issue and try to make more advertising e.g. directly at the bikes and stations.

Alternatively, a survey among cyclists in Würzburg could give insights into the general conditions for cycling that may influence the use of bikesharing, too. Further answers on why many people do not use bikesharing in Würzburg are also expected from the non-user part of the study conducted by JMU.

Design

Overall, the survey included the most important questions needed to evaluate mobility stations in Würzburg with a sufficient level of detail. The incentive is expected to have helped keep the respondents motivated until the end of the survey.

In retrospective, some details could have been improved:

- Due to privacy reasons, income classes and education were not asked. According to other studies (cf. Kuhnimhof et al., 2012), these factors both have an influence on mobility behaviour
- The question for how long users have been using the shared mobility services was not asked. This hinders the analysis of the influence of mobility stations on the uptake of multimodal behaviour
- The effectivity of the questions about general mobility behaviour is to question. Even though the two questions about general use of modes by frequency and purpose provided some insights into the daily mobility of users, this part of the survey is relatively long and 'boring' for respondents. Other forms such as questions about trips on one reporting day could be discussed in future studies

6.1.4 CO_2 calculation

The presented calculation is an approximation of the emissions reduced by the network of mobility stations in Würzburg and a very simplified model. It contains the following limitations:

- Bikesharing is used mainly by visitors, and only a small sample size could be achieved in the user's survey. Among those users participating in the study, no car trip was replaced by nextbike. However, nextbike contributes to the overall attractiveness of mobility stations and public transport in Würzburg, even if the direct influence on CO_2 emissions cannot be quantified.
- Regarding mode shift, only private cars are taken into account for replaced modes. While some other modes like walking and cycling do not emit any CO_2, public transport, taxi, motorbikes, and others do also emit CO_2.
- The numbers for reduced car utilization were obtained from an open question in the survey, and the data quality may not be very precise. From the user's perspective, exact figures about how many kilometers were driven less are not easy to determine.

These results are focused strongly on the effects of carsharing, which is closely linked to mobility stations but not limited to those. It is hard to attribute these effects only to mobility stations or only to the extension of the carsharing system in Würzburg – an integrated approach is the viable way.

Futures studies about the reduction of emissions through shared mobility services should go more into detail and include more data on general mobility behavior and vehicle milage per car in the study area. However, for the present study, the presented approach generates a sufficient level of detail.

6.2 Strengths and weaknesses of the mobility stations

This section summarizes the results to highlight strengths and weaknesses of mobility stations in Würzburg.

6.2.1 SWOT analysis

Taking into account the findings of this work, the SWOT analysis presented in Table 24 summarizes the current state of mobility stations in Würzburg.

Table 24: SWOT matrix of mobility stations in Würzburg

	helpful	harmful

internal	**Strengths**
	– large number of stations
	– very positive development of carsharing use
	– integration in nation-wide sharing systems (nextbike and Flinkster)
	– tariff integration of PT and carsharing
	– good visibility in public space (recognizable branding)
		Weaknesses
		– low usage of bikesharing:
		  – no tariff integration
		  – station-based system not optimal for many one-way trips
		– weak branding of “Mobilstation” on vehicles, service websites, etc.

external	**Opportunities** – sharing economy as a trend in society – need and political will to make the transport system more sustainable – new developments (Hubland) as a model for integrated mobility services – state-wide attention at the 2018 horticultural show – potential for more integration in the WVV corporation	**Threats** – currently no legal foundation for mobility stations – lack of high-quality cycling infrastructure in the city center – fear of the public that carsharing ‘cannibalizes’ public transport – ‘private car culture’ – the feeling that people need a private car

Internal factors describe the properties of the mobility station system. Thus, helpful items represent the strengths of the system. These include:

- the size of the system: Nine stations is a respectable size for a city with about 130,000 inhabitants that ensures visibility in the urban area as well as a large area coverage of the services.
- the strong growth of carsharing since the implementation of mobility stations. This contributes to making people aware of the service and to dissemination.
- the embedding into the nation-wide *Flinkster*-network (carsharing) and the worldwide-operating nextbike system make it easy to use the system for visitors but also increase attractiveness for locals.
- *WVVmobil,* the tariff combination of WVV and scouter, makes it easy and cheaper for public transport customers to use carsharing
- the information pillars with the green brand color make the stations easy to find and eye-catching in public space.

Harmful internal items in the matrix reveal weaknesses of the system. These are in particular:

- the low usage of nextbike, which is supposedly linked to
  - the lack of a tariff integration (like *WVVmobil* for carsharing) that encourages people to try the service
  - the fact that a station-based system guarantees the availability of bikes at the stations, but it is not optimal for short, utilitarian one-way trips. This reduces the potential number of use cases for residents in Würzburg
- the branding “Mobilstation” is visible at the stations and on the City’s project website, but it is not part of the marketing of the carsharing and bikesharing companies. There is no branded website/smartcard/mobile app that focuses integrates all services (except from the City’s mobility station website that offers basic information).

External factors are influencing the project, but are not easy to change from the project’s perspective. Thus, helpful external factors can be classified as opportunities, which contribute to the project’s success from the outside:

- the sharing economy is a trend in society (cf. Cohen and Kietzmann, 2014) and thus there is an overall trend towards sharing services which helps to attract new users of carsharing and bikesharing
- in light of exceeded NO_x thresholds and the pursuit for the reduction of CO_2 emissions, there is political support for the implementation of new mobility services in general and mobility stations in particular
- the new urban development project at the Hubland area is a chance to integrate shared mobility services from the beginning
- the Hubland area will also be part of the horticultural show 2018, which will attract many visitors and media attention in 2018. Thus, the city has the chance to use this event to showcase its innovative approaches in urban mobility – an opportunity that can facilitate decision processes that would otherwise take a lot of time
- WVV provides not only public transport, but it also operates the city’s parking facilities for private cars as well as electricity, among others. This offers further opportunities for integration of various services and combined tariffs.

Harmful external effects can be considered as threats to the project. They are not within the control of the project partners and may have negative effects on its succeeding. The threats identified for mobility stations in Würzburg are:

- the absence of a legal framework that allows to reserve public space for the purpose of a mobility station. Currently, only workarounds with weak legal certainty allow the prioritization of carsharing on public ground.
- the lack of high-quality cycling infrastructure in Würzburg. This hampers the attractiveness of bikesharing and antagonizes a multimodal transport system.

- the fear of politicians and decision-makers that carsharing ‘cannibalizes’ public transport. People might thing that the promotion of carsharing produces more car trips in a city and harms public transport. However, these arguments disregard the effect that carsharing reduces the dependency of private cars and facilitates a lifestyle without a private vehicle
- the fact that many people still feel the need for a private car in Würzburg is a problem for to the acquisition of new customers.

6.2.2 Promotion of multimodality

In chapter 2.1.1, the factors *car availability* and *public transport access* were presented as key determinants to promote multimodal travel behavior, according to a study by Buehler and Hamre (2014). In the results of the present study, it could be shown that both of these key determinants are influenced by mobility stations in Würzburg.

Users of mobility stations have fewer cars available than non-users, and they are more likely to shed a private car than non-users. In addition to that, also the subjective opinions of users reveal that mobility stations reduce the need for a private car: 83% of users agree that services like mobility stations contribute to making the private car unnecessary. As Buehler and Hamre (2014) predict, at the same time users state that their use of shared mobility services and in part also of public transport has increased since they are using the stations.

The second determinant that is a trigger for more multimodality is the access to public transport. In this field, the mobility stations contribute mainly by providing bikesharing as a first mile and last mile complement to public transport. However, the results show that nextbike is used mainly by visitors and only few trips link directly to public transport. To be really effective in this area, the bikesharing system should be improved (cf. Chapter 7.1).

7 Recommendations

This chapter builds upon the results of this study and will give recommendations for improvements of the current system of mobility stations in Würzburg as well as for the future development of the concept.

7.1 Bikesharing

Bikesharing has a lot of unused potential in Würzburg, especially for the use by locals in utilitarian purposes. To increase the popularity and the frequency of use of bikesharing in Würzburg, the following measures are suggested in order to maximize the potential benefits that bikesharing brings to Würzburg:

- Improvements to the general bicycling infrastructure in the city. This includes more bike lanes and cycle tracks, a routing system that focuses on utilitarian trip destinations, and soft measures that contribute to a cycling culture in Würzburg.
- The bikesharing system should be expanded to reach a critical mass of stations that makes nextbike suitable for more one-way trips. Another approach that requires more operational efforts but is more flexible would be the introduction of a hybrid system that allows rentals and returns both at stations and in public space within a business area (cf. MVG Rad in Munich). This allows direct trips from origin to destination of a trip and is more attractive for residents. In this approach, incentives should be provided to make the return at a station more attractive.
- The university campuses and the hospitals should be better connected by bikesharing. Special tariffs for students (integration in semester ticket) and employees of big companies (such as the hospitals) make the service more attractive.
- The fact that nextbike is used mainly by tourists is also a strength that can be promoted mode: Bikesharing should be advertised in tourism brochures, tourist maps and the visitor information center.
- Bike racks at mobility stations are currently used by both nextbike and private bikes. To ensure optimal visibility in public space, the shared bicycles should have own docks where every potential user can see instantly whether that there is a bikesharing bicycle available.

7.2 Carsharing

Carsharing is working well in Würzburg, and the system is growing both regarding trips and customers. The current expansion of the system should be continued and the so-called *Bauherrenmodell*, where the integration of carsharing into new buildings reduces the number of mandatory car parking, should be further pursued and promoted.

The integration of free-floating carsharing in Würzburg is from this study's point of view not necessary as the station-based system provides a tight network of stations and the city's size seems to be more suitable for a station-based approach.

7.3 Mobility stations

Mobility stations are popular among users and known by both users and non-users. The recommendations are grouped by level of integration, analyzing the mobility stations not only as physical connection points in public space but also as an entire system of integrated mobility.

7.3.1 Physical integration

- The information pillars work quite well and attract the attention of passersby in public space. They practical value would be increased if they also included maps of the city's bike network and, in cases where public transport is not visible from the station, signage that points users towards the closest streetcar stop.
- The central station is the nextbike station with the highest usage, but it is not a mobility station. According to the city, current land-use plans do not permit carsharing in this area, and that is why there is no mobility station. However, mobility stations in Würzburg could also be modular, so that this nextbike station is a mobility station that combines public transport with bikesharing. This had the advantage that every visitor who arrives at the station is aware of the mobility station system and visibility is maximized. The map on the information pillar can then provide information about other stations that also provide access to carsharing.
- Users report problems with illegal parking blocking the reserved parking for scouter at the stations. Either users do not mount the bollard on purpose, they forget, or there is a technical problem with it. In all cases, this causes problems that could be easily avoided. More user information about the consequences is recommended, but also pavement markings that are more visible could help.

7.3.2 Information and virtual integration

- The multimodal online map and the project website hosted by the City are a valuable tool to inform users about the mobility stations. However, attraction can be increased if the system had its own website, along with integrated information and registration for nextbike and scouter and an online map that provides real-time information about car and bike availability.
- Symbols of mobility stations should be included in transit plans, tourist maps, signage in the central station, streetcars, and on carsharing cars as well as on bikesharing

bicycles. The distinctive green logo should be an eye-catcher that is seen in all parts of the city's mobility system.
- There should be one mobile app for Würzburg that offers information and booking of public transport, carsharing and bikesharing. This could be the WVV app or a new one that works under the mobility station brand. Another step could be integrated routing, which suggests intermodal combinations of public transport, carsharing and bikesharing in its route calculations.

7.3.3 Marketing

- As a brand is already created by the city ("Mobilstationen", green color, spinning top symbol), it should be promoted even more (cf. 7.3.2). The logo should be visible on all cars and bikes included in the system.
- Mobility stations should have their own marketing campaign that promotes the integration of public transport, carsharing, and bikesharing as a service that suits all needs for mobility in Würzburg.

7.3.4 Tariff

- Bikesharing has to have an integrated tariff (like *WVVmobil* for carsharing) to generate more local customers. There should be a certain amount of free nextbike use for season pass and semester ticket holders of WVV – this encourages people to try the new service.
- Integrated mobility packages (cf. switchh: Public transport flat rate + x minutes of carsharing use + x minutes of bikesharing per month) highlight multimodal behavior and present attractive and affordable alternatives to private cars

7.3.5 Billing and access

- Analogous to the tariff options, more integration is also recommended in billing and access to the shared mobility services in Würzburg.
- Users showed sympathy for the idea of one single bill for all mobility services used in Würzburg
- The same applies for a smartcard (or mobile application) that grants access to public transport, carsharing, and bikesharing.

8 Conclusions

This chapter concludes the thesis by summarizing the results and providing an outlook into the future.

8.1 Summary of results

The following subchapters emphasize the most important findings of this work.

8.1.1 Characteristics and demographics of users

Users are often (65%) males, aged between 20 and 55 with a median age of 36.5 (scouter) and 33 (nextbike). The majority lives in 2-person households, in around 65% of the cases without children. Backend data reveals that 80% of bikesharing users and 40% of carsharing users are visitors. However, an increase in the share of local users has been observed since the opening of mobility stations, indicating their benefit, especially for residents.

Compared to non-users from Würzburg and the region, users of carsharing and bikesharing have a very low availability of private cars while the share of public transport season pass holders is relatively equal to the non-user groups, ranging around 60%.

The users of shared mobility services in Würzburg endorse the promotion of public transport and the integration of carsharing and bikesharing with buses and streetcars. They are very open and interested in new technologies such as electro-mobility, and they care about the environment. Also, users presented themselves as pragmatic decision makers regarding their transportation choices with a lower willingness to pay more for individual transportation options than non-users.

Regarding their daily mobility behavior, users usually rely on biking, walking, and public transport for their daily trips and the frequency of private vehicle use is significantly lower than in non-users.

Compared to non-users, users are characterized as less car-dependent and more open towards the idea of the sharing economy. They make their choices in a pragmatic way and decided to use sharing services not only for environmental reasons but rather for their individual benefit. The biggest differences in attitudes towards mobility choices are found between Würzburg residents (users and non-users) and people from the region, showcasing the better alternative transport options in Würzburg compared to the hinterland.

8.1.2 Use of mobility stations

Scouter

Scouter rentals usually start between 8 am and 6 pm while returns peak in the early afternoon around 6 pm. The median rental duration is around 3 hours, but scouter rentals range from under one hour to multiple days (standard deviation: 19 hours).

The median distance driven per rental is 20.0 km, and 95% of all rentals are shorter than 241 km. It is also remarkable that local users drive significantly shorter distances than visitors, indicating that residents use scouter also for short trips while visitors use carsharing for longer rentals.

Carsharing trips serve mainly errands/shopping purposes (60% of all trips) and leisure activities (34%). Trips to work/education by carsharing are rare (5%).

Nextbike

Nextbike is used more frequently during the summer months May – August and twice the number of rentals per day is observed on weekends, compared to weekdays. This indicates the frequent use of nextbike for leisure trips. The start hour of rentals is normally distributed with more rentals around noon. Most rentals end in the afternoon around 6 pm. Night trips are also observable, hinting at a replacement for public transport, which is suspended at night.

The median rental duration is 49 minutes (SD: 23 h), and 75% of all trips are shorter than 4 hours. It was further observed that locals tend to make shorter trips (median 28 min), hinting at utilitarian purposes while visitors use nextbike for longer periods (median >1h). Also, local customers make more one-way trips (40%) than external customers (29%). This also shows that visitors tend to use nextbike for longer periods while locals use it for short trips.

The main trip purpose to rent a nextbike is leisure (>70%); utilitarian trips do only play a minor role. To promote multimodality in Würzburg and to reduce car dependency, measures should be taken to make nextbike more attractive for this kind of trips.

Mobility Stations

The most popular stations are Haugerkirchplatz and Ulmer Hof (Juliuspromenade) while Platenstraße is the least used station. Ulmer Hof is further the station that the most respondents (92%) know while Platenstraße is unknown for 54% of users. This is expected, as both Haugerkirchplatz and Juliuspromenade are located right in the city center. Residentially located stations like Platenstraße are more relevant for residents of their respective surroundings.

Most people walk to the stations to rent a car or a bike. An attractive urban environment and good accessibility on foot are crucial for the success of the stations. In contrast to regular scouter and nextbike stations, 15-20% arrive by public transport at mobility stations. This shows that the added value of a streetcar connection is embraced by the users. Especially scouter users do also arrive and leave the station by private bikes (15-30%). The same applies after the return of a bike or a car. Thus, carsharing has a larger catchment area than bikesharing, and a hybrid system of free-floating bikes plus stations could serve well as a feeder to carsharing cars.

Mobility stations have experienced an increase in usage since their opening. While carsharing use has been growing steadily and the number of rentals has doubled over the observation period of 20 months, bikesharing is more season-dependent. However, also in bikesharing use, a strong increase in the number of rentals per month is observable from 2015 to 2016. Mobility stations have thus increased the attractiveness and popularity of shared mobility in Würzburg.

8.1.3 Acceptance and assessment of the stations

More than 75% of users of the carsharing and bikesharing services in Würzburg and 58% of non-users know the mobility stations. To become aware of mobility stations, the visibility in public space seems to be decisive: More than 50% state in the survey that they have seen the stations by chance while walking past. Other important factors that attract attention are the information pillars at the stations and advertisement. This does also mean that 25% of users are not aware of the integrated system even though they have used it. More advertisement and integrated branding could improve awareness of users.

The most important components from the user's perspective are the availability of carsharing (94% think it is important) and the connection to public transport (85%). For 49%, bikesharing is important. Even though nextbike use is low in Würzburg, station users value the existence of the system, indicating that improvements of it will result in more usage.

Users are interested in electric vehicles at the stations and in the connection to long-distance transportation (trains, buses). Other ideas like cargo bikes, wifi hotspots or electric bikes, among others, are important for around 30% of all users. Seventy-three percent of the users think that the mobility stations ensure that the users always have the modes available that they need.

Only few users (9%) had problems using the mobility stations while 23% experienced problems with scouter and 36% with nextbike. The only recurring complaint about the stations are malfunctions of the collapsible bollard. Most problems at the stations were caused by illegally parked private cars, blocking the reserved parking for scouter. Problems

with the operation of carsharing and bikesharing range from availability issues to technical problems with the apps or locking and unlocking the bikes.

Regarding a possible extension of the system in the future, 73% of users want more mobility stations in Würzburg – a strong indicator that the users support and appreciate the existing stations and also more stations in the future.

8.1.4 Effects on mobility behavior, car ownership, and CO_2 emissions

Mobility stations change the users' mobility behavior and especially the use of carsharing is promoted: 74% of mobility station users say they use carsharing more often because of the stations. The effects on bikesharing and public transport are smaller, but also observable: 12% say they have increased their nextbike use and 23% use more public transport. This also reflects the fact that scouter is used mainly by residents while nextbike users are visitors whose general travel behavior is not influenced by a visit in Würzburg. It is worth mentioning that users are often already regular users of public transport – an increase in the use of this service is just not necessary in many cases.

The modes replaced when using sharing services are different in carsharing and bikesharing. Fifty percent of all carsharing trips at mobility stations replaced a public transport trip and 23% substituted a trip by private car. A third of all scouter trips was induced by the service. Nextbike replaces public transport in 46% of all cases, followed by walking (27% of all trips) and private bikes (18%).

While this could be interpreted as a 'cannibalization' of public transport, the overall conclusion of the user's responses towards mobility stations should rather be seen as added benefit for the multimodal transport system. As scouter is generally not used for trips to work or school, it does not work as a mobility option for daily trips. Only specific public transport trips, where a (shared) car is the most suitable transport options (e.g. because of heavy goods to transport), are replaced – possibly avoiding private car purchases.

According to the survey, there is a region-wide trend towards more cars per household observable among non-users: While 6% say, they have less cars than one year ago, 10% have more. Among mobility station users, the opposite trend has been found: 15% of scouter users reduced their number of cars in the household while 4% added one. A similar observation was made among nextbike customers. Similar statistics are found in the question whether respondents have changed their car use over the past year. While the trend to use the available private cars less is found in all groups, the effect is the strongest among users of mobility stations: 60% have reduced their private car usage. In addition to that, 83% of users agree that services like mobility stations contribute to making the private car unnecessary.

Analyzing these figures in context with the stated preferences it can be concluded that even though public transport trips are replaced by scouter and nextbike, these services contribute to making the overall system better, and thus they reduce car dependency and car use in Würzburg significantly.

This is also reflected in the calculation of saved CO_2 emissions. The main contributor to the total reduced amount of 650t per year is the reduction of private car use. Aside from these direct reductions of CO_2 emissions, the overall contribution to making the city's transport system emit less CO_2 is higher. The effects of mobility stations go beyond the occasional use by sending a strong signal to residents and visitors that there are viable alternatives to the private car in Würzburg. This will have sustainable effects on the mid-term mobility behavior as people become 'multimodals', as Chlond (2012) describes it:

> *"Nevertheless, these occasional changes of modes and behavior should not be underestimated in terms of their relevance. People 'learn' to use other modes and can assess their characteristics and utility. They are becoming 'multimodals' compared with the 'monomodals' or 'captives' (who are bound to one mode) as has been the typical situation in the past."*

8.2 Final remarks

The evaluation has shown that Würzburg's mobility stations increase the attractiveness of shared mobility services in Würzburg and contribute to a reduction of car ownership and the use of private vehicles. The calculation of reduced CO_2 emissions showed an overall reduction of emitted CO_2 per year, even though the absolute numbers are relatively small compared to the city's total emissions.

Users are satisfied with the stations, and both carsharing and bikesharing have gained popularity in Würzburg since the opening of the stations. While carsharing is frequently used and shows a good capacity utilization, the acceptance of bikesharing in Würzburg has not progressed equally. Key recommendations to strengthen the bikesharing concept include the introduction of integrated tariff offers (like WVVmobil for carsharing) and either an increase in the number of stations or the addition of free-floating bikes that complement the existing stations-based approach.

The extension of the system, e.g. in the Hubland area, is highly recommended to provide attractive integrated mobility solutions for the entire city. The established approach to reduce private parking facilities in exchange for the provision of shared mobility services is supported by this work as it could be shown that users embrace the new services and reduce their number of private vehicles.

8.3 Future outlook

Mobility as a Service in general, as well as mobility stations in particular have a huge potential to shape future sustainable mobility in cities. Especially cities with a good public transport quality can use mobility stations as an instrument to offer individual (motorized) transport options for residents just when they need it, making private cars unnecessary. By promoting multimodal mobility, this reduces car dependency and increases public transport ridership. Public space can be freed of parked cars and used better for pedestrians and cyclists.

After the decision to create mobility stations in Würzburg, many administrative and legal challenges made the process of putting the stations into practice difficult. A new carsharing law, which is currently under development in Germany, is expected to provide a way to reserve public space for carsharing. This will be a huge facilitation for other cities to follow the examples of Bremen, Hamburg, Leipzig, Munich, Offenburg, and Würzburg.

In a long-term vision, where autonomous cars could serve as on-demand driverless taxis, mobility stations could adapt their functions and serve as a physical connection between shared autonomous taxis and public transport.

One and a half years after the implementation of mobility stations, this evaluation certifies that mobility stations in Würzburg are on a good way to reaching their goals and making mobility in Würzburg more sustainable.

The scientific monitoring of the system should be continued in order to observe the effects over multiple years and make sure the stations keep their position in a rapidly changing market of Mobility as a Service.

Futures studies could take a closer look at the integration of shared mobility services into the new urban development in the Hubland area and build upon the suggestions made in this study to strengthen the role of bikesharing in Würzburg.

List of Figures

Figure 1: Multimodal travel behavior (translated from: Zukunftsnetz Mobilität NRW 2015) 4
Figure 2: Intermodal travel behavior (Zukunftsnetz Mobilität NRW 2015) 4
Figure 3: Development of Carsharing in Germany (translated from Bundesverband CarSharing, 2016a) 7
Figure 4: Spatial structure of mobility station network (adapted from Jansen et al., 2015) 10
Figure 5: mobil.punkt station in Bremen (Luginger, 2016) 15
Figure 6: Switchh station Berliner Tor (image: switchh.de) 16
Figure 7: Yélo, La Rochelle (image: yelo.agglo-larochelle.fr) 16
Figure 8: Location of Würzburg (map: Bundesamt für Kartographie und Geodäsie) 18
Figure 9: Modal Split Würzburg (2008) (BAUM Consult GmbH, 2012) 20
Figure 10: Streetcar network in Würzburg (image: WVV) 21
Figure 11: VVM area (VVM, 2016) 22
Figure 12: Constellation of public transport in Würzburg 22
Figure 13: Mobilstationen logo 27
Figure 14: Map of Würzburg and mobility stations (map: City of Würzburg) 28
Figure 15: Station Juliuspromenade (own picture) 28
Figure 16: Collapsible bollards at the station Juliuspromenade (own picture) 30
Figure 17: Information pillar (own image) 30
Figure 18: Map of the mobility station "Rathaus" (image: City of Würzburg) 31
Figure 19: Information sheet (image: City of Würzburg) 32
Figure 20: Multimodal map on the City's website (image: wuerzburg.de) 33
Figure 21: WVV logo on scouter car (own image) 33
Figure 22: Example of a box plot - Yearly rentals by station type 39
Figure 23: Gender of respondents 46
Figure 24: Age distribution scouter (left, n=84) and nextbike (right, n=13) 47
Figure 25: Household size scouter (left, n=84) and nextbike (right, n=13) 48
Figure 26: Households with children 49
Figure 27: Home and work locations (scouter, n=84) 49
Figure 28: Home and work locations (nextbike, n=14). Other options (cf. Figure 13) all 0%. 50
Figure 29: Car availability of users and non-users 51
Figure 30: Ownership of public transport season tickets 52
Figure 31: Membership with sharing services (n=196, multiple responses) 52
Figure 32: Sum of "totally agree" and "agree" for various statements (I) 53
Figure 33: Sum of "totally agree" and "agree" for various statements (II) 55
Figure 34: Frequency of use for different modes (non-users) 56
Figure 35: Frequency of use for different modes (users) 57
Figure 36: Use of modes for different purposes 59
Figure 37: Bikesharing in Würzburg 61
Figure 38: Active bikes and stations per month 62
Figure 39: Absolute number of nextbike rentals 10/2015-10/2016 62
Figure 40: Active customers per month and by origin 63

Figure 41: Nextbike rentals per month 64
Figure 42: Daily rentals by month (boxplot) 65
Figure 43: Rentals by weekday 65
Figure 44: Daily rentals by type of customer and type of day 66
Figure 45: Rentals/returns by hour of day (nextbike) 67
Figure 46: Logarithmic histogram of trip durations (nextbike) 68
Figure 47: Trip type by origin of customer 69
Figure 48: Correlation matrix of weather data 70
Figure 49: Max. temperature and rentals per day 71
Figure 50: Rentals in 2016 by station type 72
Figure 51: Carsharing in Würzburg 73
Figure 52: Active cars and stations over time (scouter) 74
Figure 53: Rentals by month (scouter) 74
Figure 54: Average rentals by month (scouter) 75
Figure 55: Absolute number of scouter rentals 10/2015-10/2016 76
Figure 56: Rentals by weekday (scouter) 76
Figure 57: Customer types by month (scouter) 77
Figure 58: Active users per month (scouter) 78
Figure 59: Rentals/returns by hour of day (scouter) 79
Figure 60: Logarithmic histogram of trip durations (scouter) 80
Figure 61: Distance driven per rental (scouter) 81
Figure 62: Rentals per station by month (scouter) 83
Figure 63: Access mode to mobility stations (left, n=80) and scouter stations (right, n=15). Scouter users. 85
Figure 64: Last trip results by mobility stations (n=81) 86
Figure 65: Trip purposes (n=81, multiple responses) (scouter users) 87
Figure 66: Egress mode from mobility stations (left, n=80) and scouter stations (right, n=15) 87
Figure 67: Substituted mode: mobility stations (left, n=80) and scouter stations (right, n=15). Multiple choice. 88
Figure 68: Access mode for nextbike (n=11) 89
Figure 69: Rental stations (nextbike, n=11) 90
Figure 70: Trip purposes (n=11, multiple responses) (nextbike) 90
Figure 71: Return stations (n=11) (nextbike) 91
Figure 72: Egress for nextbike (n=11) 91
Figure 73: Substituted mode (n=11, single choice) (nextbike) 92
Figure 74: Trip origins before renting a car/bike 93
Figure 75: Trip destination after returning a car/bike 94
Figure 76: Share of problems reported by the users 95
Figure 77: Awareness of mobility stations 97
Figure 78: Source of awareness (n=120, multiple choice) 98
Figure 79: Surrounding and appearance of mobility stations (users, n=90) 98
Figure 80: Knowledge and usage of stations (n=69-78, depending on station) 99
Figure 81: Do you know/use the integrated offer WVVmobil? 100
Figure 82: How did you become aware of *WVVmobil*? (n=178, multiple choice) 100

Figure 83: Importance of existing components of mobility stations (n=150-156) 101
Figure 84: Importance of additional components of mobility stations (n=151-154) 102
Figure 85: Do you want more mobility stations? (n=128) 103
Figure 86: Registration with bikesharing/carsharing (users, n=90) 104
Figure 87: Changes in frequency of use (carsharing, bikesharing, public transport) (users, n=90) ... 104
Figure 88: Changes in car ownership 105
Figure 89: Changes in car use over the past year 106
Figure 90: Stated preferences (users, n=90) 106

List of Tables

Table 1: Key determinants of multimodal car use (adapted from Buehler and Hamre, 2014) 5
Table 2: Statistics about Carsharing in Germany 2016 (Bundesverband CarSharing, 2016b) 8
Table 3: Possible components and services of mobility stations: Mobility (own summary on the basis of Zukunftsnetz Mobilität NRW 2015)..... 11
Table 4: Possible components and services of mobility stations: Additional services (own listing on the basis of Zukunftsnetz Mobilität NRW 2015) 12
Table 5: Levels of integration (adapted from Luginger, 2016) 13
Table 6: The yélo system (as described by Communauté d'Agglomération de La Rochelle (2017)) ... 17
Table 7: Scouter pricing structure (Scouter, 2017) 24
Table 8: List of mobility stations in Würzburg 29
Table 9: Classification of integration by Luginger (2016) 34
Table 10: Classification of Würzburg's mobility stations (template by Luginger (2016)) 35
Table 11: Comparison of integrated mobility services 36
Table 12: Overview of the questionnaire 41
Table 13: Number of of private vehicles by cubic capacity and fuel type 43
Table 14: Distribution of private vehicles by cubic capacity and fuel type 43
Table 15: Emission factors based on ProBas 44
Table 16: SWOT scheme 45
Table 17: Age structure of users 48
Table 18: Trip duration 67
Table 19: Trip duration: local vs. external customers 69
Table 20: Trip duration (scouter) 79
Table 21: Mean differences between user groups 80
Table 22: Kilometers driven per rental (scouter) 82
Table 23: Balance of CO_2 emissions 108
Table 24: SWOT matrix of mobility stations in Würzburg 112

List of References

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Appendix 1: Photos of the stations

Mobilstation Arndtstraße

Mobilstation Hartmannstraße

Mobilstation Haugerkirchplatz

Mobilstation Juliuspromenade


Mobilstation Neubaustraße


Mobilstation Pestalozzistraße


Mobilstation Rathaus (Glockengasse)

Mobilstation Sanderring

Mobilstation Wagnerplatz

Nextbike Station Barbarossaplatz

Appendix 2: Interview with Adrien Cochet-Weinandt (German)

1. Allgemein/Hintergrund

- **Bikesharing**
  - Call-a-bike war das erste Bikesharing System in Würzburg mit einer Station am Bahnhof
  - Die Ausweitung des Bikesharingangebots war länger in Vorbereitung, die Ausschreibung war Ende 2014/Anfang 2015 – unabhängig von den Mobilstationen

- **Carsharing**
  - Früher: 2-3 Autos von Kay-Bee und 2-3 Autos von DB Rent/Flinkster am Bahnhof. Systeme waren nicht miteinander vernetzt.
  - Vergrößerung des Carsharingangebotes angeregt durch Bauherrenmodelle, bei denen der Stellplatzschlüssel gesenkt wird und im Gegenzug durch städtebauliche Verträge verpflichtende Carsharingangebote eingeführt werden:
    - Durch Kooperation mit der Wohnungsbauwirtschaft im Rahmen des Bebauungsplanverfahrens (StadtBau, städtische Tochtergesellschaft am Anfang)
    - Zellerau/Brunostraße: 3 Carsharingstellplätze als Ersatz für 21 private Pkw-Stellplätze
  - Ziel des Modells: Teufelskreis zu durchbrechen: Schlechtes Angebot → Schlechte Nachfrage

    Für den Anbieter ist das Bereitstellen eines Fahrzeugs mit Fixkosten verbunden → finanzielles Risiko für Anbieter
  - Reduzierung des Stellplatzschlüssels bringt Einsparung der Baukosten für Wohnungsbaugesellschaft (1 CS-Fzg. für 7 private Parkplätze)
  - Wohnungsbaugesellschaft hat Verpflichtung gegenüber der Stadt, Carsharing zu garantieren (mit gewissen Qualitätskriterien) und beauftragt damit den Carsharinganbieter.
  - Carsharinganbieter erhält im Gegenzug einen Grundpreis/Auslastungsgarantie von Wohnungsbaugesellschaft
  - St. Bruno Werk, Studentenwerk, „Bada-Wohnungsbaugesellschaft“ als weitere Partner, die im Lauf der Zeit dazugekommen sind.

2. Mobilstationen

- **Planung/Entscheidungsfindung**
  - Hr. Cochet (als Mitarbeiter in der Bauleitplanung) war der Initiator der Mobilstationen, aufbauend auf dem erfolgreichen Bauherrenmodell. Konzept wurde 2012 geschrieben.
  - Zusammenarbeit zwischen Umweltreferat, FB Umwelt- und Klimaschutz, Stadtplanung
  - Plan schon länger in der Schublade, Klimaschutzkonzept 2012, „Innenstadtkonzept Mobilstationen“
  - Umsetzung 2015
  - **Ziele:** Flankierende Angebote zur tragenden Säule des nachhaltigen Verkehrs (=ÖPNV) zu bündeln, unter dem Dach der Stadt.
    - Optisch im öffentlichen Raum (Carsharing aus dem Hinterhof holen und der breiten Öffentlichkeit zugänglich machen)
    - Organisatorisch (Kooperation im Marketing und bei den Tarifen → WVVmobil)
    - ÖV-Verbindung garantiert schnellen Zugang zu Ausweichstationen, falls eine Station leer ist

- **Umsetzung**
  - Nach Stadtratsbeschluss: Stadt hat die Stationen geplant, das Design entwickelt und gebaut
  - UBA-Förderung kann „zufällig“ ins Spiel, stand am Anfang nicht in Aussicht
  - Förderung UBA 50%
  - Kosten 9 Stationen: ca. 70.000€
  - Auswahl der Standorte:
    - Hohe städtebaul. Dichte, gemischte Nutzung, hoher Parkdruck, einigermaßen vorhandene Nahversorgung, Straßenbahnverknüpfung
    - Am besten wäre es „jede zweite Straßenbahnhaltestelle eine Station“ zu haben
    - Sinnvolle Kombination der Einzugsbereiche
  - Stele wird schon länger in Würzburg verwendet, z.B. für Touristeninfos
  - Städtl. Dienstleister *Würzburger Stadtverkehrs-GmbH* (SVG, gehört zur WVV) wurde mit dem Betrieb der Stationen beauftragt (Bewirtschaftungsvertrag für Infrastruktur der Stationen): Wartung (z.B. Poller), Abwicklung mit Anbietern [Stadt legt Kriterien fest – Blauer Engel, Bandbreite von Fahrzeugen, etc.)
  - Die Verträge sind befristet gestaltet:
    - Umwidmung der Flächen: „Feststellung der Gründe des öffentlichen Wohls“ festgestellt, und von der Umwidmung abgesehen für eine Probelaufzeit von 5 Jahren

    - Rechtsgutachten vom BCS hat Umwidmung empfohlen. Problem: Flächen sind dann nicht mehr öffentlich, sondern private fiskalische Flächen der Stadt – Winterdienst, unterirdische Leitungen, Instandhaltung, Verkehrssicherungspflicht, andere Zuständigkeit (FB Immobilien)
    - Mietverträge entsprechend auch über 5 Jahre
  - Alles-oder-nichts-Entscheidung für Anbieter: Entweder 9 Stationen (+x eigene) oder keine
  - Carsharing-Gesetz sieht Sondernutzung vor (wie in Bremen), ändert die Voraussetzungen für die Zukunft

- **Betrieb**

  - Keine Handhabe bei Falschparkern im Moment
  - Stationen auf privatem Grund eröffnet/schließt scouter in Eigenregie
  - Nextbike im öffentl. Raum wird von Stadt geplant
  - An Mobilstationen mit geringer Auslastung darf scouter die Fahrzeugzahl auf 1 reduzieren

- **Hubland: niedrigerer Stellplatzschlüssel**

  - Hubland: Frühzeitig Flächen bevorratet als fiskalische Flächen im BPlan (Fläche mit besonderer Zweckbestimmung, Fläche für Versorgungsanlagen). Jetzt bei der Umsetzung Probleme: Gestattungsvertrag mit SVG notwendig, da bestehender Vertrag zw. Stadt und SVW nur für öffentliche Flächen gilt. Verkehrssicherungspflicht auch bei SVG? Oder FB Immobilien? Aktuell Überlegungen, die Flächen doch öffentlich zu widmen (CS Gesetz)

3. Probleme

- **Planung**
  - An allen Fronten Leute, die nicht auf ein Zusatzprojekt gewartet haben – überall Probleme, die von der Projektleitung gelöst werden müssen (Verwaltungs-intern)
  - Politik: Nie Probleme, „alles durchgerutscht“
  - Wichtig: Beschluss so geschrieben, dass man nicht „aufschreckt“, aber trotzdem auf alles hinweist.
  - In Wahlperiode Umsetzung auf Eis gelegt, Personalwechsel Dr. Dietrich/Dr. Frommer
  - Altstadt: Befreiung von Werbeanlagensatzung
  - Bahnhof: Stadt hat keine verfügbaren Flächen – verschiedenste Zukunftspläne – Gleis 1 5 Flinkster Fahrzeuge – Haugerkirchplatz als Ersatz in fußläufiger Erreichbarkeit, deckt auf Innenstadt ab
- **Betrieb**
  - Etwas Neues, das nicht in den Richtlinien/StVO vorgesehen ist macht immer Probleme.
  - Kleinigkeiten, wie z.B. Aufkleber im Auto für Poller-Hinweis – Anbieter kriegt Probleme mit Fuhrpark (Leasing-Fahrzeuge – Kleber-Rückstände)

- 15€ Strafgebühr für Poller-nicht-hoch wird nicht konsequent kassiert (Anbieter will Kunden nicht verschrecken)
- Kombitarif mit Nextbike scheitert bisher an Verhandlungen zwischen nextbike und WSB. Mischkalkulation bei Nextbike: Pro x Abo-kunden will ich einen Nextbike-Jahrestarif bezahlt bekommen (48€).
- Nextbike: Gründe für niedrige Nutzung
  - Frage der Größenordnung – kritische Masse nicht erreicht
  - Stationszwang bei Rückgabe → Hybridsystem interessant, auch für Anbieter. Notwendig dafür ist Anreizsystem für Rückgabe an Station und höherer Logistikaufwand um Räder umzuverteilen
  - Nutzung vorwiegend touristisch, Würzburger haben eigene Räder. Bei Ankunft am Bahnhof direkt verfügbar. Würzburg ist auch sehr touristisch.
  - Stationszwang → wenige A-B Verbindungen
  - Integration in ÖPNV Tarif notwendig (30 min kostenlos für Abokunden?) Gut für ÖPNV: Keine Kundenverlust, weil es Stammkunden sind und man kann Belastungsspitzen abbauen. Auch: Marketingaspekt, „alles aus einer Hand“.
  - Studentenwerk und Uni muss auch einbezogen werden. Keine Leihradanbindung am Campus

4. Sonstiges

- In Marktgarage/Rathaus „Dienst-Scouter“, die nach 17 Uhr auch für reguläre Kunden offenstehen. 1 Elektrofahrzeug ist auch vorhanden.
- Hartmannstraße: Nur ein Auto da, aber manchmal beide Poller aufgestellt – massive Anwohnerproteste – am Ende musste Bauhof extra Verschluss einbauen
- Heuchelhof – Satellitenstadtteil mit Straßenbahn – neue Station geplant – Kundenwunsch – mögliches Problem: keine Ausweichstation in der Nähe
- WVVmobil ist ein dauerhaftes Angebot, Marketingaktionen sind 50 Frei-Km ist zeitlich begrenzt
  Umstiegsmöglichkeiten-Ansage WVV - „Umstieg Mobilstation“ ? Sehr effektiv?

Appendix 3: Questionnaire (German)

1 Startseite_Einleitung_Nutzerfilter

Guten Tag!

In den letzten Jahren spielt das gemeinsame Nutzen und Teilen von Fahrzeugen eine wichtigere Rolle. Steigende Energiekosten oder die Verbreitung von Smartphones und des Internets verändern unser Verhalten auch im Verkehr. In Würzburg zum Beispiel stehen zudem Veränderungen wie die Erschließung des Stadtteils am Hubland und die Landesgartenschau vor der Tür, die verkehrliche Herausforderungen mit sich bringen. Um Ihre verkehrlichen Nutzungen und Ihre Mobilität besser zu verstehen, bitten wir Sie um Ihre Mithilfe bei unserer Befragung.
Sie leisten damit einen wertvollen Beitrag zur Erhebung von Mobilität in Mainfranken und Würzburg. Die Beantwortung der Fragen dauert etwa 15 Minuten.

Als kleines Dankeschön können Sie eine 1,5 stündige Fahrt im Schoppenexpress, eine von zehn Würzburger Bäderkarten im Wert von jeweils 50 € sowie zehn Carsharing Gutscheine über 25 €, anrechenbar auf Anmeldegebühr und Fahrtguthaben, gewinnen.

Der Fragebogen wurde in Kooperation von der Universität Würzburg und der Technischen Universität München entwickelt. Alle Ihre Antworten werden anonym erhoben und ausschließlich im Rahmen dieser Befragung verwendet.

Auftraggeber sind die Stadt Würzburg (TU München) sowie die IHK Würzburg Schweinfurt (Univ. Würzburg).

2 Verkehrsmittelwahl allgemein

Wo wohnen Sie?

Um Ihnen im Verlauf passende Fragen zu stellen, ist uns diese Information wichtig.

- ○ In Würzburg
- ○ In Schweinfurt
- ○ In Mainfranken außerhalb Würzburgs und Schweinfurts
- ○ Außerhalb Mainfrankens
- ○ Keine Angabe

Wie häufig nutzen Sie folgende Fortbewegungsmittel im Alltag?

	Täglich	Mehrmals pro Woche	Einige Male im Monat	Seltener als monatlich	Nie	Kenne ich nicht
Eigener PKW	○	○	○	○	○	○
PKW (in Fahrgemeinschaft oder mitfahrend)	○	○	○	○	○	○
Privates Carsharing (z.B. Drivy)	○	○	○	○	○	○
Carsharing (z.B. scouter, Flinkster)	○	○	○	○	○	○
Motorisiertes Zweirad	○	○	○	○	○	○
Bus (Nahverkehr)	○	○	○	○	○	○
Straßenbahn	○	○	○	○	○	○
Regionalbahn	○	○	○	○	○	○
Fernverkehr (Bahn, Fernbus)	○	○	○	○	○	○
Fahrrad	○	○	○	○	○	○
Elektrofahrrad	○	○	○	○	○	○
Leihfahrrad (z.B. nextbike)	○	○	○	○	○	○
Gehe zu Fuß	○	○	○	○	○	○
Sonstiges:	○	○	○	○	○	○

Besitzen Sie einen PKW Führerschein?

- ○ Ja
- ○ Nein

Was ist der genaue Name Ihrer nächstgelegenen Bus (oder Bahn) Haltestelle?

Bitte geben Sie an, welche Verkehrsmittel Sie normalerweise für folgende Tätigkeiten nutzen:

Weg zur Arbeit / Ausbildung
Mehrfachantworten möglich

- ☐ Eigener PKW
- ☐ PKW (in Fahrgemeinschaft oder mitfahrend)
- ☐ Privates Carsharing (z.B. Drivy)
- ☐ Carsharing (z.B. scouter, Flinkster)
- ☐ Motorisiertes Zweirad
- ☐ Regionalbahn
- ☐ Bus
- ☐ Straßenbahn
- ☐ Fernverkehr (Bahn/Fernbus)
- ☐ Fahrrad
- ☐ Leihfahrräder (z.B. nextbike)
- ☐ Elektrofahrrad
- ☐ Gehe zu Fuß
- ☐ Ich kombiniere mehrere Verkehrsmittel auf dem Weg (bitte angeben):
- ☐ Sonstiges

Dienstfahrten / berufliche Erledigungen
Mehrfachantworten möglich

- ☐ Eigener PKW
- ☐ PKW (in Fahrgemeinschaft oder mitfahrend)
- ☐ Privates Carsharing (z.B. Drivy)
- ☐ Carsharing (z.B. scouter, Flinkster)
- ☐ Motorisiertes Zweirad
- ☐ Regionalbahn
- ☐ Bus
- ☐ Straßenbahn
- ☐ Fernverkehr (Bahn/Fernbus)
- ☐ Fahrrad
- ☐ Leihfahrräder (z.B. nextbike)
- ☐ Elektrofahrrad
- ☐ Gehe zu Fuß
- ☐ Ich kombiniere mehrere Verkehrsmittel auf dem Weg (bitte angeben):
- ☐ Sonstiges

Private Erledigungen / Einkauf
Mehrfachantworten möglich

- ☐ Eigener PKW
- PKW (in Fahrgemeinschaft oder mitfahrend)
- ☐ Regionalbahn
- Bus
- ☐ Leihfahrräder (z.B. nextbike)
- Elektrofahrrad

☐ PKW (in Fahrgemeinschaft oder mitfahrend)	☐ Bus	☐ Elektrofahrrad
☐ Privates Carsharing (z.B. Drivy)	☐ Straßenbahn	☐ Gehe zu Fuß
☐ Carsharing (z.B. scouter, Flinkster)	☐ Fernverkehr (Bahn/Fernbus)	☐ Ich kombiniere mehrere Verkehrsmittel auf dem Weg (bitte angeben):
☐ Motorisiertes Zweirad	☐ Fahrrad	☐ Sonstiges

Freizeitwege

Mehrfachantworten möglich

☐ Eigener PKW	☐ Regionalbahn	☐ Leihfahrräder (z.B. nextbike)
☐ PKW (in Fahrgemeinschaft oder mitfahrend)	☐ Bus	☐ Elektrofahrrad
☐ Privates Carsharing (z.B. Drivy)	☐ Straßenbahn	☐ Gehe zu Fuß
☐ Carsharing (z.B. scouter, Flinkster)	☐ Fernverkehr (Bahn/Fernbus)	☐ Ich kombiniere mehrere Verkehrsmittel auf dem Weg (bitte angeben):
☐ Motorisiertes Zweirad	☐ Fahrrad	☐ Sonstiges

3.1 Anmeldung

Welche(n) Anbieter nutzen Sie für Car und/ oder Bikesharing?

Mehrfachantworten möglich

- ☐ scouter
- ☐ nextbike
- ☐ Flinkster
- ☐ tamyca
- ☐ Drivy
- ☐ app2drive
- ☐ Call a Bike
- ☐ Freirad
- ☐ Nachbarschaftsauto
- ☐ flinc
- ☐ Teilen von Fahrzeugen mit Freunden und Bekannten
- ☐ Teilen von Fahrrädern mit Freunden und Bekannten
- ☐ Sonstiges:

4 Kombi Sharing allgemein Freefl_stati

Finden Sie es besser, Leihfahrzeuge an vorgegebenen Stationen auszuleihen (z.B. Mobilstationen in Würzburg) oder ist Ihnen das ortsunabhängige Ausleihen (z.B. bei call a bike Fahrrädern der Deutschen Bahn oder drive now Autos der Stadt München) lieber?

- ○ Weiß nicht/kann ich nicht beurteilen.
- ○ Leihfahrzeuge an Stationen sind mir viel lieber.
- ○ Ich tendiere eher zu festen Stationen.
- ○ Teils teils
- ○ Ich tendiere eher zu ortsunabhängigen Ausleihen.
- ○ Ortsunabhängiges Ausleihen ist mir viel lieber.

Wie weit darf ein Leihfahrzeug/ eine Leihstation entfernt sein, damit Sie sie nutzen?

Meter ____ — Minuten ____ .

In einigen Gemeinden existieren Fahrzeuge, die den Bürgern bei Bedarf zu Verfügung stehen (z.B. Gemeindebus, auto). Können Sie sich vorstellen, solch ein Angebot zukünftig zu nutzen?

- ○ Ja, auf jeden Fall
- ○ Ja, wahrscheinlich
- ○ Eher nicht
- ○ Nein, auf gar keinen Fall

Wie sinnvoll finden Sie ein Verleihsystem von Fahrzeugen für Schweinfurt?

- ○ Sehr sinnvoll
- ○ Eher sinnvoll
- ○ Eher nicht sinnvoll
- ○ Überhaupt nicht sinnvoll
- ○ Weiß nicht

Wie häufig teilen Sie sich mit Freunden und Familien Fahrzeuge oder unternehmen gemeinsame Fahrten?

	Häufig	Gelegentlich	Selten	Nie
Fahrgemeinschaften zur Arbeit/Ausbildung	○	○	○	○
Gemeinsame Versorgungsfahrten	○	○	○	○
Einmalige weitere Fahrten	○	○	○	○
Sonstige gemeinsame Fahrten:	○	○	○	○

Welche Fahrzeugart wünschen Sie sich bei Verleihsystemen?

- ○ Vorwiegend Autos mit Verbrennungsmotor
- ○ Vorwiegend Elektroautos
- ○ Ich möchte beide Fahrzeugarten ausleihen können.

- Ich möchte beide Fahrzeugarten ausleihen können.
- Mir ist egal, welche Fahrzeugart ich ausleihe.
- Weiß nicht

Sind Sie bereit, für die Möglichkeit, Elektrofahrräder ausleihen zu können, einen Aufpreis zu bezahlen?

- Nein
- Ja
- Vielleicht/weiß nicht

4.1.1 SW Sharing

Finden Sie es besser, Leihfahrzeuge an Stationen auszuleihen oder ist Ihnen das ortsunabhängige Ausleihen lieber?

- Leihfahrzeuge an Stationen sind mir lieber.
- Ich tendiere zu festen Stationen.
- Teils teils/weiß nicht.
- Ich tendiere zu ortsunabhängigen Ausleihen.
- Ortsunabhängiges Ausleihen ist mir lieber.

Wo wären geeignete Standorte für Leihfahrzeuge (PKW/ Fahrrad)?
(Bitte geben Sie Orte/Plätze möglichst genau an)

5.1 NichtSharer

Warum nutzen Sie kein Carsharing?

	Trifft voll zu	Trifft eher zu	Trifft eher nicht zu	Trifft überhaupt nicht zu	Weiß nicht/ keine Angabe
Es gibt kein Angebot in meiner Nähe.					
Der Preis ist verglichen zu eigenen Fahrzeugen zu hoch.					
Mir ist das Risiko zu hoch, kein Fahrzeug an der Station zu finden, wenn ich es benötige.					
Ich fahre nicht gerne fremde Fahrzeuge.					
Sharing passt nicht zu meinem Lebensstil.					
Ich benutze kein Smartphone/keine Apps.					
Ich weiß nicht genau, wie es funktioniert.					
Mir ist die Verknüpfung mit anderen öffentlichen Verkehrsmitteln zu schlecht.					
Das Reservieren von Fahrzeugen ist mir zu unflexibel.					
Ich brauche zu lange zur nächsten Station.					
Mir ist das Tarifystem zu kompliziert.					
Ich habe versicherungstechnische Bedenken.					

Können Sie sich vorstellen, zukünftig Carsharing zu nutzen?

- Ja, auf jeden Fall.
- Ja, wahrscheinlich
- Eher nicht
- Nein, auf gar keinen Fall.

Welche weiteren Gründe gibt es, dass Sie kein Carsharing nutzen?

Warum nutzen Sie kein Bikesharing?

	Trifft voll zu	Trifft eher zu	Trifft eher nicht zu	Trifft überhaupt nicht zu	Weiß nicht/ keine Angabe
Es gibt kein Angebot in meiner Nähe.					
Preis ist verglichen zu eigenen Fahrrädern zu hoch.					
Mir ist das Risiko zu hoch, kein Fahrzeug an der Station zu finden, wenn ich es benötige.					
Ich mag keine fremden Fahrzeuge fahren.					
Sharing passt nicht zu meinem Lebensstil.					
Ich benutze kein Smartphone/keine Apps.					
Ich weiß nicht genau, wie es funktioniert.					
Mir ist die Verknüpfung mit anderen öffentlichen Verkehrsmitteln zu schlecht.					
Das Reservieren von Fahrzeugen ist mir zu unflexibel.					
Ich brauche zu lange zur nächsten Station.					
Mir ist das Tarifystem zu kompliziert.					

Mir ist das Tarifystem zu kompliziert.	○	○	○	○	○
Ich habe versicherungstechnische Bedenken.	○	○	○	○	○

Können Sie sich vorstellen, zukünftig Bikesharing zu nutzen?

- ○ Ja, auf jeden Fall!
- ○ Ja, wahrscheinlich
- ○ Eher nicht
- ○ Nein, auf gar keinen Fall!

Welche weiteren Gründe gibt es, dass Sie kein Bikesharing nutzen?

6 Mobilstationen_Kenntnis

Ist Ihnen die Idee von Mobilstationen, die verschiedene Verkehrmittel (z.B. Bahn, Bus, Leihfahrrad, PKW) verknüpfen, bekannt?

- ○ Ja
- ○ Nein

Wussten Sie, dass es in Würzburg *Mobilstationen* gibt?

Die Stationen sind an diesem Logo zu erkennen.

- ○ Ja
- ○ Nein

7.1 Mobilstationen_Ja

Wie sind Sie auf die Mobilstationen aufmerksam geworden?

Mehrfachantworten möglich

- ☐ Werbung der Anbieter (Stadt, Verkehrsbetriebe, Carharing /Bikesharinganbieter)
- ☐ Infosäulen an den Stationen
- ☐ Ich habe die Stationen zufällig im Vorbeigehen entdeckt.
- ☐ Zeitungsartikel/Radiobeitrag/TV
- ☐ Freunde/Bekannte/Familie
- ☐ Aktive Suche/eigene Recherche
- ☐ Soziale Netzwerke
- ☐ Homepage der Stadt Würzburg
- ☐ Smartphone App von scouter
- ☐ Smartphone App von nextbike
- ☐ Smartphone App der WVV
- ☐ App anderer Anbieter:
- ☐ Sonstiges

Haben Sie schon einmal ein Bikesharing Fahrrad an einer der Mobilstationen in Würzburg ausgeliehen oder zurückgegeben?

- ○ Ja
- ○ Nein

Haben Sie schon einmal ein Carsharing Auto an einer der Mobilstationen in Würzburg ausgeliehen?

- ○ Ja
- ○ Nein

7.2.1 Mobilstationen_Ja II

Bitte geben Sie an, an welchen der neun Mobilstationen Sie Carsharing oder Bikesharing schon einmal genutzt haben.

Mit "nutzen" ist hier gemeint, Fahrräder oder Autos auszuleihen oder zurückzugeben.

	Ich kenne die Station nicht	Ich kenne die Station, habe aber noch nie Bikesharing/ Carsharing dort genutzt	Ich leihe dort öfters ein Rad	Ich leihe dort öfters ein Auto	Ich leihe dort manchmal ein Rad	Ich leihe dort manchmal ein Auto
Rathaus (in der Glockengasse)	☐	☐	☐	☐	☐	☐
Neubaustraße (in der Gotengasse)	☐	☐	☐	☐	☐	☐
Ulmer Hof (in der unteren Juliuspromenade)	☐	☐	☐	☐	☐	☐
Haugerkirchplatz	☐	☐	☐	☐	☐	☐
Wagnerplatz	☐	☐	☐	☐	☐	☐
Pestalozzistraße	☐	☐	☐	☐	☐	☐

Pestalozzistraße	☐	☐	☐	☐	☐	☐
Sanderring	☐	☐	☐	☐	☐	☐
Platenstraße	☐	☐	☐	☐	☐	☐
Hartmannstraße (in der Sedanstraße)	☐	☐	☐	☐	☐	☐

Im nun folgenden Block würden wir gerne wissen, wie die letzte Fahrt, bei der Sie eine der Mobilstationen genutzt haben, abgelaufen ist. Dies ist wichtig um zu verstehen, wie die Stationen von Ihnen als BürgerInnen genutzt werden und wie man diese Nutzererfahrung möglicherweise noch verbessern kann.

Können Sie sich an Ihre letzte Fahrt erinnern, bei der Sie ein Fahrrad von nextbike an einer der Mobilstationen ausgeliehen haben?

- ○ Ja
- ○ Nein

Können Sie sich an Ihre letzte Fahrt erinnern, bei der Sie ein Carsharing Auto von scouter an einer der Mobilstationen ausgeliehen haben?

- ○ Ja
- ○ Nein

8.1 Erinnerung_Letzte Fahrt_nicht Mobilstation

Können Sie sich an Ihre letzte Fahrt erinnern, bei der Sie ein Fahrrad von nextbike in Würzburg ausgeliehen haben?

- ○ Ja
- ○ Nein

Können Sie sich an Ihre letzte Fahrt erinnern, bei der Sie ein Carsharing Auto von scouter in Würzburg ausgeliehen haben?

- ○ Ja
- ○ Nein

8.2.1 Letzte Fahrt Bikesharing nMS

Im folgenden Fragenblock geht es um die letzte Fahrt, bei der Sie ein Leihrad von nextbike in Würzburg ausgeliehen oder zurückgegeben haben.

Haben Sie das nextbike Fahrrad an derselben Station ausgeliehen und zurückgegeben?

- ○ Ja
- ○ Nein

8.2.2 Letzte Fahrt Bikesharing II nMS

An welcher nextbike Station haben Sie das Fahrrad ausgeliehen und zurückgegeben?

Mobilstationen

- ○ Hartmannstraße (in der Sedanstraße)
- ○ Haugerkirchplatz
- ○ Ulmer Hof (in der unteren Juliuspromenade)
- ○ Neubaustraße (in der Gotengasse)
- ○ Pestalozzistraße
- ○ Platenstraße
- ○ Rathaus (in der Glockengasse)
- ○ Sanderring
- ○ Wagnerplatz

Nextbike Stationen

- ○ Hauptbahnhof / Bahnhofsvorplatz
- ○ Talavera / Luitpoldstr. / Zugang zum LGS 90
- ○ Barbarossaplatz / Theaterstraße
- ○ Alte Mainbrücke / Rathaus
- ○ Keine Angabe

An welcher nextbike Station haben Sie das Fahrrad ausgeliehen?

Mobilstationen

- ○ Hartmannstraße (in der Sedanstraße)
- ○ Haugerkirchplatz
- ○ Ulmer Hof (in der unteren Juliuspromenade)
- ○ Neubaustraße (in der Gotengasse)
- ○ Pestalozzistraße
- ○ Platenstraße
- ○ Rathaus (in der Glockengasse)
- ○ Sanderring
- ○ Wagnerplatz

Nextbike Stationen

- ○ Hauptbahnhof / Bahnhofsvorplatz
- ○ Talavera / Luitpoldstr. / Zugang zum LGS 90
- ○ Barbarossaplatz / Theaterstraße
- ○ Alte Mainbrücke / Rathaus
- ○ Keine Angabe

Bitte geben Sie grob an wo Sie gestartet sind, als Sie sich auf den Weg zur Ausleihe des Fahrrads gemacht haben.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wie haben Sie den Weg zur Ausleihe des Fahrrads zurückgelegt?
Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- zu Fuß
- mit einem privaten Fahrrad
- mit einem Leihrad (z.B. nextbike)
- mit dem öffentlichen Verkehr
- als Fahrer mit einem privaten Pkw
- als Mitfahrer in einem privaten Pkw
- mit dem Taxi
- Sonstiges

Was war der Hauptzweck dieser Fahrt?

- Wege zur Arbeit/Ausbildung
- berufliche Erledigungen / Dienstfahrten
- private Erledigungen / Einkauf
- Freizeitaktivitäten
- Begleitung von anderen Personen
- keine Angabe

An welcher nextbike Station haben Sie das Fahrrad zurückgegeben?
Mobilstationen

- Hartmannstraße (in der Sedanstraße)
- Haugerkirchplatz
- Ulmer Hof (in der unteren Juliuspromenade)
- Neubaustraße (in der Gotengasse)
- Pestalozzistraße
- Platenstraße
- Rathaus (in der Glockengasse)
- Sanderring
- Wagnerplatz

Nextbike Stationen

- Hauptbahnhof / Bahnhofsvorplatz
- Talavera / Luitpoldstr. / Zugang zum LGS 90
- Barbarossaplatz / Theaterstraße
- Alte Mainbrücke / Rathaus
- Keine Angabe

Wie haben Sie Ihren Weg nach der Rückgabe des Fahrrads fortgesetzt?
Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- zu Fuß
- mit einem privaten Fahrrad
- mit einem weiteren Leihrad (z.B. nextbike)
- mit einem Carsharing Fahrzeug (z.B. scouter)
- mit dem öffentlichen Verkehr
- als Fahrer mit einem privaten Pkw
- als Mitfahrer in einem privaten Pkw
- mit dem Taxi
- Sonstiges

Bitte geben Sie grob an, wo Sie nach der Rückgabe hingegangen sind.
nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wenn es das Bikesharing Angebot nicht gäbe, mit welchem Verkehrsmittel hätten Sie die während der Miete zurückgelegte Fahrt wahrscheinlich durchgeführt?

- als Fahrer mit einem privaten Pkw
- als Fahrer mit einem Mietwagen
- als Mitfahrer in einem privaten Pkw
- als Beifahrer mit einem Mietwagen
- mit dem öffentlichen Verkehr
- mit dem Taxi
- mit einem privaten Fahrrad
- mit einem Carsharing Fahrzeug (z.B. scouter)
- zu Fuß

- zu Fuß
- Ich hätte die Fahrt gar nicht zurückgelegt
- Sonstiges

8.3.1 Letzte Fahrt Carsharing nMS

Im folgenden Fragenblock geht es um die letzte Fahrt, bei der Sie ein Carsharing Auto von scouter in Würzburg ausgeliehen haben.

An welcher scouter Station haben Sie das Auto ausgeliehen?

bitte wählen
Arndtstraße Mobilstation
Hartmannstraße Mobilstation
Hauger Kirchplatz Mobilstation
Hauptbahnhof
Juliuspromenade
Marktgarage
Michelstraße/Brunostraße
Neubaustraße Mobilstation
Pestalozzistraße Mobilstation
Rathaus Mobilstation
Sanderring Mobilstation
Ulmer Hof Mobilstation
Ulrichstraße / Bf Süd
Veitshöchheimer Straße
Wagnerplatz Mobilstation
Zweiter Siedlungsweg
Keine Angabe

Bitte geben Sie grob an wo Sie gestartet sind, als Sie sich auf den Weg zur scouter Station gemacht haben.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wie haben Sie den Weg zur Station zurückgelegt?

Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- zu Fuß
- mit einem privaten Fahrrad
- mit einem Leihrad (z.B. nextbike)
- mit dem öffentlichen Verkehr
- als Fahrer mit einem privaten Pkw
- als Mitfahrer in einem privaten Pkw
- mit dem Taxi
- Sonstiges

Für welchen Zweck / welche Zwecke haben Sie das Fahrzeug während Ihrer Miete genutzt?

Mehrfachauswahl möglich.

- [ ] Wege zur Arbeit / Ausbildung
- [ ] berufliche Erledigungen / Dienstfahrten
- [ ] private Erledigungen / Einkauf
- [ ] Freizeitaktivitäten
- [ ] Begleitung von anderen Personen
- [ ] keine Angabe

Wie haben Sie Ihren Weg nach der Rückgabe des Autos fortgesetzt?

Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- zu Fuß
- mit einem privaten Fahrrad
- mit einem Leihrad (z.B. nextbike)
- mit dem öffentlichen Verkehr
- als Fahrer mit einem privaten Pkw
- als Mitfahrer in einem privaten Pkw
- mit dem Taxi
- Sonstiges

Bitte geben Sie grob an, wo Sie nach der Rückgabe hingegangen sind.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wenn es das Carsharing Angebot nicht gäbe, mit welchen Verkehrsmitteln hätten Sie die während der Miete zurückgelegten Fahrten wahrscheinlich durchgeführt?

Mehrfachauswahl möglich.

- [ ] zu Fuß
- [ ] mit einem privaten Fahrrad
- [ ] mit einem Leihrad (z.B. nextbike)
- [ ] mit dem öffentlichen Verkehr
- [ ] als Fahrer mit einem privaten Pkw
- [ ] als Mitfahrer in einem privaten Pkw
- [ ] mit dem Taxi
- [ ] als Fahrer mit einem Mietwagen
- [ ] als Beifahrer mit einem Mietwagen

- [ ] Ich hätte die Fahrt gar nicht zurückgelegt
- [ ] Sonstiges

9.1 Letzte Fahrt Carsharing

Im folgenden Fragenblock geht es um die letzte Fahrt, bei der Sie ein Carsharing Auto von scouter an einer der Mobilstationen ausgeliehen haben.

An welcher der neun Mobilstationen haben Sie das Auto ausgeliehen?

bitte wählen
Hartmannstraße (in der Sedanstraße)
Haugerkirchplatz
Ulmer Hof (in der unteren Juliuspromenade)
Neubaustraße (in der Gotengasse)
Pestalozzistraße
Platenstraße
Rathaus (in der Glockengasse)
Sanderring
Wagnerplatz
Keine Angabe

Bitte geben Sie grob an wo Sie gestartet sind, als Sie sich auf den Weg zur Mobilstation gemacht haben.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wie haben Sie den Weg zur Mobilstation zurückgelegt?

Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- ○ zu Fuß
- ○ mit einem privaten Fahrrad
- ○ mit einem Leihrad (z.B. nextbike)
- ○ mit dem öffentlichen Verkehr
- ○ als Fahrer mit einem privaten Pkw
- ○ als Mitfahrer in einem privaten Pkw
- ○ mit dem Taxi
- ○ Sonstiges

Für welchen Zweck / welche Zwecke haben Sie das Fahrzeug während Ihrer Miete genutzt?

Mehrfachauswahl möglich.

- [ ] Wege zur Arbeit / Ausbildung
- [ ] berufliche Erledigungen / Dienstfahrten
- [ ] private Erledigungen / Einkauf
- [ ] Freizeitaktivitäten
- [ ] Begleitung von anderen Personen
- [ ] keine Angabe

Wie haben Sie Ihren Weg nach der Rückgabe des Autos fortgesetzt?

Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- ○ zu Fuß
- ○ mit einem privaten Fahrrad
- ○ mit einem Leihrad (z.B. nextbike)
- ○ mit dem öffentlichen Verkehr
- ○ als Fahrer mit einem privaten Pkw
- ○ als Mitfahrer in einem privaten Pkw
- ○ mit dem Taxi
- ○ Sonstiges

Bitte geben Sie grob an, wo Sie nach der Rückgabe hingegangen sind.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wenn es das Carsharing Angebot nicht gäbe, mit welchen Verkehrsmitteln hätten Sie die während der Miete zurückgelegten Fahrten wahrscheinlich durchgeführt?

Mehrfachauswahl möglich.

- [ ] zu Fuß
- [ ] mit einem privaten Fahrrad
- [ ] mit einem Leihrad (z.B. nextbike)
- [ ] mit dem öffentlichen Verkehr
- [ ] als Fahrer mit einem privaten Pkw
- [ ] als Mitfahrer in einem privaten Pkw
- [ ] mit dem Taxi
- [ ] als Fahrer mit einem Mietwagen
- [ ] als Beifahrer mit einem Mietwagen
- [ ] Ich hätte die Fahrt gar nicht zurückgelegt
- [ ] Sonstiges

Sonstiges

10.1 Letzte Fahrt Bikesharing

Im folgenden Fragenblock geht es um die letzte Fahrt, bei der Sie ein Leihrad von nextbike an einer der Mobilstationen ausgeliehen oder zurückgegeben haben.

Haben Sie das nextbike Fahrrad an derselben Station ausgeliehen und zurückgegeben?

- Ja
- Nein

10.2 Letzte Fahrt Bikesharing II

An welcher der neun Mobilstationen war das?

bitte wählen
Hartmannstraße (in der Sedanstraße)
Haugerkirchplatz
Ulmer Hof (in der unteren Juliuspromenade)
Neubaustraße (in der Gotengasse)
Pestalozzistraße
Platenstraße
Rathaus (in der Glockengasse)
Sanderring
Wagnerplatz
Keine Angabe

An welcher Mobilstation / nextbike Station haben Sie das Fahrrad ausgeliehen?

Mobilstationen

- Hartmannstraße (in der Sedanstraße)
- Haugerkirchplatz
- Ulmer Hof (in der unteren Juliuspromenade)
- Neubaustraße (in der Gotengasse)
- Pestalozzistraße
- Platenstraße
- Rathaus (in der Glockengasse)
- Sanderring
- Wagnerplatz

Nextbike Stationen

- Hauptbahnhof / Bahnhofsvorplatz
- Talavera / Luitpoldstr. / Zugang zum LGS 90
- Barbarossaplatz / Theaterstraße
- Alte Mainbrücke / Rathaus
- Keine Angabe

Bitte geben Sie grob an wo Sie gestartet sind, als Sie sich auf den Weg zur Ausleihe des Fahrrads gemacht haben.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wie haben Sie den Weg zur Ausleihe des Fahrrads zurückgelegt?

Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- zu Fuß
- mit einem privaten Fahrrad
- mit einem Leihrad (z.B. nextbike)
- mit dem öffentlichen Verkehr
- als Fahrer mit einem privaten Pkw
- als Mitfahrer in einem privaten Pkw
- mit dem Taxi
- Sonstiges

Was war der Hauptzweck dieser Fahrt?

- Wege zur Arbeit/Ausbildung
- berufliche Erledigungen / Dienstfahrten
- private Erledigungen / Einkauf
- Freizeitaktivitäten
- Begleitung von anderen Personen
- keine Angabe

An welcher Mobilstation / nextbike Station haben Sie das Fahrrad zurückgegeben?

Mobilstationen

- Hartmannstraße (in der Sedanstraße)
- Haugerkirchplatz
- Ulmer Hof (in der unteren Juliuspromenade)
- Neubaustraße (in der Gotengasse)
- Pestalozzistraße
- Platenstraße
- Rathaus (in der Glockengasse)
- Sanderring

- Sanderring
- Wagnerplatz

Nextbike Stationen

- Hauptbahnhof / Bahnhofsvorplatz
- Talavera / Luitpoldstr. / Zugang zum LGS 90
- Barbarossaplatz / Theaterstraße
- Alte Mainbrücke / Rathaus
- Keine Angabe

Wie haben Sie Ihren Weg nach der Rückgabe des Fahrrads fortgesetzt?

Falls Sie mehrere Verkehrsmittel genutzt haben, geben Sie bitte das mit der längsten zurückgelegten Strecke an.

- zu Fuß
- mit einem privaten Fahrrad
- mit einem weiteren Leihrad (z.B. nextbike)
- mit einem Carsharing Fahrzeug (z.B. scouter)
- mit dem öffentlichen Verkehr
- als Fahrer mit einem privaten Pkw
- als Mitfahrer in einem privaten Pkw
- mit dem Taxi
- Sonstiges

Bitte geben Sie grob an, wo Sie nach der Rückgabe hingegangen sind.

nächste Bus /Straßenbahnhaltestelle oder alternativ Ort (Straße/Kreuzung/...) oder PLZ

Wenn es das Bikesharing Angebot nicht gäbe, mit welchem Verkehrsmittel hätten Sie die während der Miete zurückgelegte Fahrt wahrscheinlich durchgeführt?

- als Fahrer mit einem privaten Pkw
- als Fahrer mit einem Mietwagen
- als Mitfahrer in einem privaten Pkw
- als Beifahrer mit einem Mietwagen
- mit dem öffentlichen Verkehr
- mit dem Taxi
- mit einem privaten Fahrrad
- mit einem Carsharing Fahrzeug (z.B. scouter)
- zu Fuß
- Ich hätte die Fahrt gar nicht zurückgelegt
- Sonstiges

11 Mobilstationen Einschätzung

Mobilstationen sind zentral gelegene Knotenpunkte, die das Straßenbahnnetz mit Carsharing und Bikesharing verbinden. Die Mobilstationen bieten auch Abstellmöglichkeiten für Ihr eigenes Fahrra sowie eine Übersicht der Mobilitätsangebote in der Nähe.

Wie wichtig sind Ihnen folgende Gesichtspunkte einer Mobilstation?

	Sehr wichtig	Eher wichtig	Eher unwichtig	Sehr unwichtig	Weiß nicht
Verfügbarkeit von Leihfahrrädern (Bikesharing, z.B. nextbike)	○	○	○	○	○
Verfügbarkeit von Leihfahrzeugen (Carsharing, z.B. scouter)	○	○	○	○	○
Ausleihbarkeit verschiedener Fahrzeugtypen	○	○	○	○	○
Verknüpfung mit öffentlichem Verkehr (Bus/Straßenbahn)	○	○	○	○	○
Sichtbarkeit der Station im öffentlichen Raum	○	○	○	○	○
Abstellplätze für private Fahrräder	○	○	○	○	○
Informationen zu den Mobilitätsangeboten an den Stationen (Infosäule, Karte, QR Code, etc.)	○	○	○	○	○
Taxistand	○	○	○	○	○
Interaktiver Touchscreen mit Informationen zu Mobilitätsangeboten	○	○	○	○	○
Verfügbarkeit elektrischer Autos	○	○	○	○	○
Verfügbarkeit elektrischer Fahrräder	○	○	○	○	○
Verfügbarkeit von Lastenfahrrädern	○	○	○	○	○
Anschluss an den Fernverkehr (Bahn / Fernbus)	○	○	○	○	○
Pack / Abholstation für Paketdienste	○	○	○	○	○
WLAN Hotspot	○	○	○	○	○
Schließfächer / Gepäckaufbewahrung	○	○	○	○	○
Videomonitoring der Station	○	○	○	○	○
Sonstiges	○	○	○	○	○

Bitte geben Sie zu folgenden Aussagen Ihre Einschätzung.

	stimme voll zu	stimme eher zu	stimme eher nicht zu	stimme gar nicht zu	keine Angabe
Wegen der Mobilstationen habe ich mich	○	○	○	○	○

Wegen der Mobilstationen habe ich mich bei nextbike angemeldet.	○	○	○	○	○	·
Durch die Mobilstationen miete ich mir häufiger ein Carsharing Auto.	○	○	○	○	○	
Durch die Mobilstationen bin ich Kunde von scouter geworden.	○	○	○	○	○	·
Durch die Mobilstationen fahre ich mehr mit nextbike Fahrrädern.	○	○	○	○	○	
Durch die Mobilstationen bin ich mir sicher, immer ein für mich passendes Verkehrsmittel zur Verfügung zu haben .	○	○	○	○	○	·
Durch die Mobilstationen fahre ich häufiger mit Bus und/oder Straßenbahn.	○	○	○	○	○	
Neue Mobilitätsangebote wie die Mobilstationen tragen dazu bei, dass das eigene Auto überflüssig wird.	○	○	○	○	○	·
Ein wiedererkennbares Erscheinungsbild aller Stationen ist wichtig.	○	○	○	○	○	·
Die Stationen sollten in einem attraktiven Umfeld stehen.	○	○	○	○	○	

12 Mobilstationen Einschätzung III

Gab es Probleme, die bei der Nutzung der folgenden Angebote aufgetreten sind?

Carsharing (z.B. scouter)

☐ Nein

☐ Ja, und zwar:

Bikesharing (z.B. nextbike)

☐ Nein

☐ Ja, und zwar:

Mobilstationen

☐ Nein

☐ Ja, und zwar:

Sehr interessieren wir uns für Ihre persönlichen Eindrücke! Hier haben Sie Raum für Kommentare, Ideen und Verbesserung, Lob und Kritik zu Carsharing, Bikesharing und Mobilstationen!

Wünschen Sie sich mehr Verleihstationen?

○ Ja

○ Nein

Wünschen Sie sich mehr Mobilstationen?

○ Ja

○ Nein

13.1 Mehr Mobilstationen

Wo wären geeignete Standorte für weitere Mobilstationen?

Bitte geben Sie Orte mittels PLZ/Stadtteil/Haltestelle/etc. an.

14.1 Mehr Mobilstationen

Haben Sie Verbesserungsvorschläge für die Mobilstationen?

Hier können Sie uns mitteilen, was Ihnen am Konzept der Mobilstationen nicht gefällt.

15 Leihsysteme Standorte Verbesserung

Wo wären geeignete Standorte für Verleihsysteme von Fahrrädern/PKWs?

Bitte geben Sie Orte/Plätze möglichst genau an.

Welche Verbesserungsvorschläge haben Sie für Verleihsysteme (PKW/Fahrrad)?

16 Einstellung

Wie sehr stimmen Sie folgenden Aussagen zu?

	Stimme voll zu	Stimme eher zu	Stimme eher nicht zu	Stimme gar nicht zu	Weiß nicht	
Ein Leben ohne eigenes Auto ist wünschenswert, aber unrealistisch.	○	○	○	○	○	
Die Kombination von Monatskarte für Bus						

Die Kombination von Monatskarte für Bus und Bahn mit Car /Bikesharing in Kombitarifen ist praktisch.	○	○	○	○	○	
Es stört mich, Gegenstände zu teilen.	○	○	○	○	○	
Im Umgang mit Smartphones kenne ich mich gut aus.	○	○	○	○	○	
Zu meinen täglichen Routinen passt das Auto ideal.	○	○	○	○	○	·
Es sollte eine Karte geben, mit der ich Bahn, Bus und Leihfahrzeuge nutzen kann.	○	○	○	○	○	·
Die Mobilität der Zukunft besteht weniger aus Besitzen und mehr aus Nutzen.	○	○	○	○	○	·
Für kurze spontane Wege in der Stadt sind Leihfahrräder perfekt.	○	○	○	○	○	
Ich befürworte einen starken Ausbau von Buslinien und Straßenbahn.	○	○	○	○	○	·
Umweltschutz ist mir egal.	○	○	○	○	○	·
Für Unabhängigkeit im Verkehr bin ich bereit, einen höheren Preis zu bezahlen.	○	○	○	○	○	·
Elektromobilität ist unsere Zukunft.	○	○	○	○	○	·
Die Idee, mein privates Auto zu teilen (z.B. drivy, tamyca), widerstrebt mir.	○	○	○	○	○	·
Es gibt zu wenig sichere und überwachte Parkmöglichkeiten für Fahrräder.	○	○	○	○	○	
Ich wünsche mir eine gemeinsame Rechnung am Monatsende für alle genutzten Verkehrsmittel.	○	○	○	○	○	·
Die Automarke spielt für meine Nutzung eine wichtige Rolle.	○	○	○	○	○	

17 Demografie

Sie sind...

○ Männlich

○ Weiblich

○ Keine Angabe

Wann sind Sie geboren?

Bitte auswählen
nach 1998
1998
1997

Wie viele Personen leben ständig in Ihrem Haushalt, Sie selbst eingeschlossen?

Wieviele Haushaltsmitglieder sind unter 18 Jahre?

Wieviele PKW gibt es in Ihrem Haushalt?

(Privat PKW sowie ständig verfügbare Geschäftswagen)

Hat sich die Zahl der PKW innerhalb des letzten Jahres in Ihrem Haushalt verändert?

○ Nein

○ Ja, es gibt mehr PKWs

○ Ja, es gibt weniger PKWs

Steht Ihnen persönlich ein PKW zur Verfügung?

○ Ja, immer

○ Ja, manchmal

○ Nein

18 Demografie II

Welchen Anteil an der Entscheidung, ein Auto abzuschaffen, hatte die Nutzung von Carsharing?

○ Sehr großer Anteil

○ Großer Anteil

○ War teilweise mitentscheidend

○ Eher geringer Anteil

○ Sehr geringer Anteil

Welchen Anteil an der Entscheidung, ein Auto anzuschaffen, hatte die Nutzung von Carsharing?

○ Sehr großer Anteil

○ Großer Anteil

○ War teilweise mitentscheidend

○ Eher geringer Anteil

○ Sehr geringer Anteil

Haben Sie wegen der Nutzung von Carsharing auf die Anschaffung eines (weiteren) PKW verzichtet?

- ○ Ja
- ○ Nein
- ○ Weiß nicht

Wie hat sich Ihre Nutzung des privaten PKW im letzten Jahr verändert?

- ○ Stark verringert
- ○ Etwas verringert
- ○ Etwa gleich geblieben
- ○ Etwas erhöht
- ○ Stark erhöht

19 Demografie III

Um wieviele Kilometer pro Jahr hat sich Ihre Nutzung des privaten PKW in etwa erhöht?

[ ]

Um wieviele Kilometer pro Jahr hat sich Ihre Nutzung des privaten PKW in etwa verringert?

[ ]

Wieviele fahrtüchtige Fahrräder gibt es in Ihrem Haushalt?

Fahrrad [ ]

Elektrofahrrad / Pedelec [ ]

Besitzen Sie eine Zeitkarte für den öffentlichen Nahverkehr?

Geben Sie bitte an, welche Zeitkarte Sie besitzen.

- ○ Nein
- ○ Jahreskarte
- ○ Monatskarte
- ○ Semesterticket
- ○ Firmen Abo
- ○ Sonstiges: [ ]

Wo wohnen Sie?

Nennen Sie uns bitte Ihre Postleitzahl

[ ]

Wo liegt Ihr Arbeits / Ausbildungsplatz?

- ○ In Würzburg
- ○ In Schweinfurt
- ○ In Mainfranken außerhalb Würzburgs und Schweinfurts (optional: Ortsangabe): [ ]
- ○ Außerhalb Mainfrankens
- ○ Keine Angabe

20 Endseite_Bogen

Herzlichen Dank für Ihre Teilnahme!

Bitte hier klicken für die Eintragung zu dem Gewinnspiel.
Unter allen Teilnehmern werden eine 1,5 stündige Fahrt im Schoppenexpress, zehn Würzburger Bäderkarten im Wert von jeweils 50 € sowie zehn Carsharing Gutscheine über je 25€ verlost.

Für die Würzburger Versorgungs und Verkehrsbetriebe sind noch weitere 5 Fragen, die nicht direkt im Zusammenhang mit der Untersuchung stehen, interessant. Daher freuen wir uns, wenn Sie diese noch kurz beantworten. Andernfalls können Sie die Umfrage nun schließen.

21 WVV mobil_Details

WVV = Würzburger Versorgungs und Verkehrsgesellschaft

Wie zufrieden sind Sie mit dem Mobilitätsangebot der WVV?

Antworten bitte in Schulnoten (1=sehr zufrieden; 6=überhaupt nicht zufrieden)

	1	2	3	4	5	6	Weiß nicht
Leistungsangebot der WVV insgesamt	○	○	○	○	○	○	○
Kundenservice	○	○	○	○	○	○	○
Freundlichkeit der Fahrer	○	○	○	○	○	○	○
Beratung und Auskunft	○	○	○	○	○	○	○
Einfachheit des Tarifystems	○	○	○	○	○	○	○
Angemessenheit der Preise	○	○	○	○	○	○	○

Wo erwerben Sie hauptsächlich Ihren Fahrschein?

Mehrfachantworten möglich

- ☐ Nutze keinen öffentlichen Verkehr der WVV
- ☐ Im Fahrzeug/bei dem Fahrer
- ☐ Am Automaten
- ☐ Im Kundenzentrum
- ☐ Ich nutze das Handyticket
- ☐ Abo Versand

Wenn Sie Informationen zum Nahverkehr der WVV benötigen, wo erkundigen Sie sich?

Mehrfachantworten möglich

- [ ] Homepage der WVV
- [ ] Homepage des VVM (Verkehrsverbund Mainfranken)
- [ ] WVV Kundenzentrum (Würzburg Domstraße)
- [ ] Servicehotline
- [ ] Mein Franken App (App der WVV)
- [ ] Newsletter
- [ ] Fahrplan
- [ ] Freunde und Bekannte
- [ ] Sonstiges:

Welche Kombinationsangebote der WVV würden Sie gerne nutzen?

- ○ Energie und Nahverkehr
- ○ Bäder und Nahverkehr
- ○ Bäder und Energie
- ○ Parken und Energie
- ○ Energie, Nahverkehr, Parken und Bäder
- ○ Andere Kombinationen:

Kennen und nutzen Sie die Mein Franken App der WVV?

- ○ Nein, kenne ich nicht.
- ○ Ja, kenne ich, nutze ich aber nicht.
- ○ Ja, kenne und nutze ich.

Kennen bzw. nutzen Sie das Angebot *WVVmobil: Carsharing plus Abo*?

- ○ Ja, kenne und nutze ich
- ○ Ja, kenne ich, nutze ich aber nicht
- ○ Nein, kenne ich nicht

Wie sind Sie auf *WVVmobil* aufmerksam geworden?

- [ ] Werbung der WVV
- [ ] Werbung von scouter
- [ ] Beratung im Kundencenter
- [ ] Zeitungsartikel/Radiobeitrag
- [ ] Freunde/Bekannte/Familie
- [ ] Aktive Suche/eigene Recherche
- [ ] Soziale Netzwerke
- [ ] Sonstiges:

22 Endseite

Herzlichen Dank für Ihre Teilnahme!

Sie können die Befragung nun schließen.

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, May 16, 2017

_____

Maximilian Pfertner