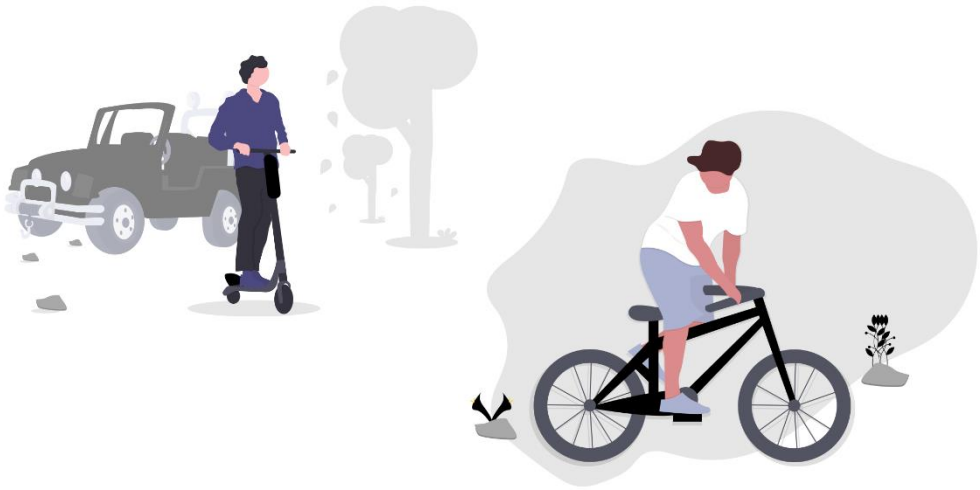
Master's Thesis
Master Sustainable Business and Innovation

The future of shared micro-mobility

The role of shared micro-mobility in urban transport visions for Berlin



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Summary

Shared micro-mobility - the short-term rent of micro-mobility vehicles such as bicycles and (e-)scooters - is suggested as a mobility (sub) system that could have the potential to change the current transport system based on cars. It quickly emerges in many urban areas such as Berlin. Research shows ambiguous results on the sustainability and desirability of the current use of these sharing systems. To decide whether and how shared micro-mobility should play a role in the urban transport future, it is important to first know what this role could be, which can be done by exploring the existing visions on the urban transport future of the actors involved. The main research question of this thesis reads: *'How does shared micro-mobility play a role in visions of the urban transport future in Berlin?'*. To identify these visions, interviews were conducted, supported by a document research.

The results show three distinct visions, however with many similarities. These are: 1) a green, low-carbon and liveable city with a large role for innovation, and a stimulating role for shared micro-mobility, 2) a green, low-carbon and liveable city, with a focus on behavioural change, and a stimulating role for shared micro-mobility and 3) a green, low-carbon and liveable city, with a focus on behavioural change, and a niche role for shared micro-mobility. The biggest difference is seen in the routes used to achieve the visions, where one groups focusses on innovation and the other on changing behaviour. Furthermore, shared micro-mobility either plays a stimulating role, where it supports low-carbon transport in the city, since it is an addition to other modes of transport when needed, or a niche role, were only a select group uses the shared micro-mobility offerings, with limited shared bikes available and even less to none e-scooters.

In all visions, several suggestions for shared micro-mobility were made. Most important were: including the suburbs in the shared micro-mobility schemes, using shared micro-mobility to create a better ecosystem for transport in the city and creating docking stations for the vehicles. Also, all visions state more involvement from the government as important. They should regulate the current negative externalities of shared micro-mobility with regulations and they should adopt a supporting role for the aforementioned new implementations. To conclude, shared micro-mobility is envisioned to support change towards a green, liveable, low-carbon city, with less cars and easily accessible intermodal traveling, if conducted the right way.

Keywords: Shared micro-mobility, urban future, visions, urban transport, Berlin

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1. Introduction

There is much debate on possible new personal transport systems, since the current system based on cars is seen as unsustainable (Bergman, 2017). A new suggested (sub) system with potential, is shared micro-mobility, which is emerging in many urban areas (McKenzie, 2020). Shared micro-mobility is the short-term rent of micro-mobility vehicles, for example bicycles and (e-)scooters, which are in general dockless (McKenzie, 2019). Micro-mobility vehicles are small (wheeled) and therefore exclude larger vehicles such as cars, hence car sharing is excluded from this definition (Duke et al., 2019). The sharing aspect of the micro-mobility concerns the possibility for users to use a transport vehicle without owning it, whenever needed. It can supposedly improve the environment as well as the quality of life of residents (Turoń, Czech & Tóth, 2019) and is at the same time the most efficient and fast form of individual transport in cities, after public transport systems (Brunner et al., 2018; McKenzie, 2020). Furthermore, it has the potential to solve the last-mile problem (Brunner et al., 2018).

The current transport landscape is mainly dominated by car use (Morton et al., 2017). In cities, this means most personal transport takes the form of individual car use (Nitschke, 2015). Especially in urban areas this creates problems with congestion and air pollution (Dora et al., 2011; Stradling, Meadows & Beatty, 2000). Although the automobile is dominant, multiple other regimes, called subaltern regimes, exist within the transport sector. Outside the automotive regime, trains, trams, busses and cycling have their own subaltern regime (Geels, 2012). Technological innovations are proposed as solutions to promote more sustainable personal transport, but even though improvements can be created by system optimization, deep structural change is only reached by system innovation and technological transitions (Elzen, Geels & Hofman, 2002; Geels, 2012). Research into such large transport transitions in cities is often referred to by scholars to as urban mobility transitions (Mäkinen, Kivimaa & Helminen, 2015).

The earliest forms of micro-mobility sharing date back to 1965, although they are different from the current form. In Amsterdam, ‘white bikes’ were left unlocked on the streets to be used by residents or visitors (DeMaio, 2009). This system failed, due to regulation issues and abuse of the bikes (DeMaio, 2003). The digital possibilities of the current age, such as real-time smartphone applications (Parkes et al., 2013), present possible solutions to those problems. Nowadays, new shared micro-mobility services are rapidly appearing all over the world (McKenzie, 2019).

Research has not stayed behind, where the rapidly rising volume of research into shared micro-mobility mostly concerns potential safety issues (Turoń et al., 2019), spatial and temporal implications of the services (McKenzie, 2020) and commuting patterns (Duke et al., 2019). Although not much research has been done on the potential of (e-)scooter sharing to be a solution to current transport problems, the impact and potential of bike sharing attracted the attention of researchers already (McKenzie, 2020). In fact, there is still ambiguity about the actual positive impact of these bike sharing systems (e.g. de Chardon, 2019; Fishman, Washington & Haworth, 2013; Nikitas, Wallgren & Rexfelt, 2015; Ricci, 2015), partly due to shifting behaviour towards these systems not coming from car drivers but from passengers on foot and users of public transport (McKenzie, 2020). Furthermore, side effects of these systems are becoming clear, such as an overflow of shared bicycles on the streets causing hinder (Van Waes et al., 2018). Fortunately, there are still opportunities left to reduce car use with bicycle sharing systems (Fishman et al., 2013) and research indicates the potential for car substitution by scooter-sharing (Hardt & Bodenberger, 2019).

These ambiguous results show the need for more research into this new and consistently growing phenomenon of shared micro-mobility and its desirability for the (sustainable) future of transport in cities. Especially since new technologies that become dominant might, in the end, turn out to be sub-optimal (Berkhout, 2002). To decide whether and how shared micro-mobility should play a role in the urban transport future, it is important to first know what this role could be, where the term 'role' is of a qualitative and quantitative nature. To be able to do so, exploring possible urban transport futures is important (Bai et al., 2016). The first step in this process is to map the possible future roles for shared micro-mobility, which can be done by researching existing visions of actors in the transport sector and others involved. Visions are "collectively held and communicable schemata that represent future objectives and express the means by which these objectives will be realized" (Berkhout, 2006, p. 302). These visions function as a basis for discussion and they allow for thinking about the implications of these visions, as well as investigating their desirability (Tight et al., 2011). And this is exactly the aim of this study; to lay a foundation for further research into the desirability of certain roles micro-mobility can have in the future, for example by researching the impact, and into the desirability of potential implementations to reach these particular transport futures.

So far, most research on urban transport concerns the role of walking and cycling, public transport and low-carbon cities. Although shared micro-mobility could be an imaginable and maybe even attractive part of visions, seen the potential positive impact it may have, it is currently not included in most research. Some researchers do speak of the importance of sharing transport in these future cities (Franckx & Mayeres, 2016), for example to optimize the use of parking spaces (Creutzig et al., 2019). Still, the role of shared micro-mobility is lacking in visions as described in recent research, which can partly be allocated to the novelty of the concept.

In Germany, the transport sector is a significant barrier in reaching the set climate goals. Although German cities are supposedly discouraging car use and improving transport alternatives, there is no integrated, comprehensive strategy to reach this goal and no significant car use reduction is apparent (Gössling & Metzler, 2017). Simultaneously, Berlin is one of the cities facing the most rapid increase of their shared micro-mobility sector (Zagorskas & Burinskien, 2019). The city-state wants the modal share of pedestrians, (e-)bike and e-scooter riders, and local public transport users to increase to 75 percent (and 80 percent in the inner city) by 2025 (Senate Department for Urban Development and the Environment of the State of Berlin, 2014). At the same time, the share of motorized individual traffic is wished to decrease to 20 percent. To do so, the city-state adopted a new mobility law in 2018 providing special rights to cyclists, pedestrians and public transport (Bartsch et al., 2019). Furthermore, a new (e-)scooter regulation made their usage legal as of May 2019, creating new business opportunities for many companies. It even resulted in the Tier app, an e-scooter sharing company, being the most downloaded in the online app stores for some time, while the number of (e-)scooters in the city exploded (Dediu, 2019). The rapid growth of the shared micro-mobility sector is currently also widely discussed in the media, for example in the renowned weekly magazine Der Spiegel, where the rapid emergence of shared micro-mobility in the city was called a "revolution" (Barsch, 2019). All this makes Berlin an interesting case for research into visions on the urban transport future and the role of shared micro-mobility. It follows, the research question for this thesis reads:

'How does shared micro-mobility play a role in visions of the urban transport future in Berlin?'

The following sub questions will be addressed to answer the main research question:

1. What are the most prominent concepts discussed regarding the urban transport future in Berlin?
2. What are the existing visions among actors regarding the urban transport future in Berlin?
3. What potential roles exist for shared micro-mobility in Berlin in these visions?
4. What are the similarities and differences between the existing visions of the urban transport futures of Berlin, in particular on shared micro-mobility?
5. Which route(s) towards the envisioned future(s) are described by actors?

As for the social relevance, actors and society in general can benefit from the visions that will be described in this thesis. Coalitions of actors are crucial for the success of a transition to happen, to bring about, for example, a cleaner and more sustainable city (Bergman, 2017), which can be formed by describing the matching visions of several actor groups. Furthermore, even contrasting visions can be brought together, since they can still form coalitions of support by emphasizing the similarities (Smith, Stirling & Berkhout et al., 2005).

The scientific relevance can be scrutinized in twofold. First of all, so far, much research overlooked the broader transition context by solely focussing on niches and formative phases (Berkhout, 2004; Hansen & Coenen, 2015). The goal of this research is therefore to look at the role of shared micro-mobility in the broader context of the transition system it prevails in, namely the sustainable urban mobility transition. Secondly, there is currently no prevailing method to research the role of a relatively new (sub)system or technology in visions of a particular transition. In this thesis, such a method will be examined. This can be useful for replication to other cases, e.g. other cities for the same system, or even for studies on different transition phenomena in other sectors.

All in all, the aim of this Master thesis is to map the role of micro-mobility in the different future visions for urban transport in Berlin further. This research will be conducted for the Mercator Research Institute on Global Commons and Climate Change (MCC) in Berlin and more specifically of the working group Land Use, Infrastructure and Transport at this institute. This working group is already embedded in the urban transport sector of Berlin and will therefore give an entryway into the required network and will be a source of relevant knowledge on the topic. In the next section, relevant influential scientific theories will be discussed. The methodology design will be presented in the third section. The fourth section provides some background on the case study and the fifth will present the results. In the sixth section, a discussion on the results will be presented. The thesis will end with a conclusion.

2. Theoretical framework

2.1 Socio-technical (sustainability) transitions

The modal shift away from the car regime towards a regime with alternative transport modes can be seen as a socio-technical transition (Geels, 2012; Hodson & Marvin, 2010). A socio-technical transition is the transformation over time of a society in a fundamental way (Geels, 2012; Rotmans, Kemp & van Asselt, 2001). During this transformation, a collection of developments boost each other towards a new system (Rotmans et al., 2001). Such transitions are special, since they go beyond a technological or behavioural change alone, but are systemic in nature (Geels, 2012).

As the more specific goal of a transport transition is of a sustainable nature, it is also seen as a sustainable transition. This transition topic has gained ground in recent years (Markard, Raven & Truffer, 2012). Sustainable transition are again socio-technical transitions focused on a more sustainable form of production and consumption (Markard et al., 2012). What makes sustainable transitions special, is the unique character of guidance and governance (Smith et al., 2005) and the coalitions of actors that need to work together in a coordinated way to make the sustainability transition happen (Markard et al., 2012).

The sustainability transitions research field holds four prevailing conceptual frameworks; Transition Management (TM), strategic niche management (SNM), multi-level perspective (MLP) and technological innovation systems (TIS) (Markard et al., 2012). Common to all these conceptualisations is the socio-technological regime (Markard et al., 2012). These regimes are the dominant practices, beliefs, rules and shared assumptions (Berkhout, 2002). Transitions happen by changing this regime in a profound way, for example due to a new innovation, mostly with policy action (Berkhout, 2002).

It is important to notice the fact that 'sustainability' is not a clear-cut and neutral term. There is not one outcome being the sustainable outcome one should aim for. It is the outcome of negotiations with many social interests and contrasting power relations (Raven et al, 2017). Therefore, the level of sustainability of the visions will not be discussed in this research, merely as a possible future research.

2.2 Sustainable mobility transitions in urban areas

Because of the growing need for sustainable transport, the research field 'sustainable mobility transitions' came about. According to Nykvist and Whitmarsh (2008), there are three routes to get to a sustainable transport future. The first and most researched is technological change, with much focus on automobility and the possibility of for example alternative fuels to decarbonize this sector (Mäkinen, et al., 2015; Nykvist & Whitmarsh, 2008). The other two, less researched, are a modal shift and decreasing travel demand. Decreasing the travel demand is typically carried out with the means of mobility management (Nykvist & Whitmarsh, 2008). The modal shift regards the attempt to reduce motorized vehicles use. Research on this topic primarily focuses on walking and bicycling (Gössling, 2013) and public transport (Potter, 2007).

An example of an urban mobility transition with a modal shift is the concept of ‘Copenhagenize’, where Copenhagen transformed into the best cycling city in the world (Colville-Andersen, 2018). The city worked deliberately and determined on their goal, which is uncommon for a city since most measures to foster cycling are without focus and strategy and are done mainly ad hoc

(Gössling, 2013). The example of Copenhagen is appealing, since it is acknowledged that without defining possible futures, there will probably only be incremental change. Desired objectives can only be reached with effort and investments that result from a plan for the future (Tight et al., 2009). For shared micro-mobility, several examples such as hinder and oversupply of shared bicycles (Van Waes et al., 2018) show that without a defined plan for the desired future, goals are not reached, or the proposed solutions create negative side-effects. To define such a plan, it can be helpful to not just know the desired future, but also the possible deployment of routes towards these futures.

2.3 Visions

The future is uncertain and complex (Bai et al., 2016) and hard to predict (Miller, 2011). One method used to discuss or reflect on the possible future, is the creation or analysis of visions for the future (Bai et al., 2016; Berkhout, 2006). In the transition literature, two prominent types of research on visions occur. The first focuses on the creation of visions, for example with workshops for stakeholders, and the other on the analysis of existing visions since they are already produced (McDowall & Eames, 2006). For the current research the focus will be on existing visions, as, among others, explained by Berkhout (2006).

As stated before, visions are "collectively held and communicable schemata that represent future objectives and express the means by which these objectives will be realized" (Berkhout, 2006, p. 302). In this method, such visions function as a 'possibility space', where possible futures are outlined (Smith et al., 2005). These visions differ from private expectations, which do exist but might not be communicated. Collective visions do not stay private, but at the same time do not assure action. Due to the nature of these visions, e.g. being permeated with political and ethical values, such visions for the future are frequently intertwined with a positive or negative utopian or dystopian polarity. This often paves the way for visions to have a moral charge which is linked to progress or hope (ibid). Additionally, these visions can then become almost a common good where it functions as a 'sociotechnical imaginary' and it becomes an institutional stabilized desired future. They can influence innovation and innovation pathways, shape actions in the present (Metzler, Humpe & Gössling, 2019), but at the same time change over time. These socio-technical imaginaries are not standing alone, there can be several which might compete (Bergman, Schwanen & Sovacool, 2017).

Visions consist of three important characteristics: objectives, technologies and orders (Berkhout, 2006). The objectives express the future outcomes, and the technologies are the mechanisms applied or used to achieve these objectives. And lastly, the orders are the institutional and social relationships that shape how these objectives can be achieved. When investigating existing visions, it is important that these elements are identifiable in the vision (Berkhout, 2006). To give an example: A vision of the transport sector could be to have streets that are only filled with low-carbon transport (a modal shift as stated by Bongardt, Breithaupt & Creutzig, 2010). The objective would then be low-carbon and low-impact transport, which is further specified in the technologies (what technologies are these low-carbon transport forms?) and in the orders (what actors and institutions are linked in this vision?). An example of such a technology is electric vehicles. The orders could be incentives of institutions given to the industry to increase the modal share of electric transport and to the public to use the electrical vehicles (policy packages).

Researching these existing visions renders several problems. The first being visions are not always explicit but might be of rather tacit form. Second, they can vary from narrow to complete alternative worlds, from visualized to entirely private. This means the dictation of these visions also

proliferates in different forms (Berkhout, 2006). Third, when a vision spreads wide among the public and the media, like a sociotechnical imaginary, it can develop into a hype that may disappear again. This generates an expectation peak, mostly created by beneficiaries of the innovations (Bergman et al., 2017). The final hurdle regarding visions concerns the many actors and institutions involved on different scales, which makes the explication of visions messy (Hodson & Marvin, 2010). Furthermore, especially the incumbent, dominant actors will have the best resources of voicing their future visions. Alternatively, distributed visions can use support in the development of their visions (Berkhout, 2006). The challenge is to analyse the different and even contradicting ideas of actors and how contrasting visions can still create coalitions of support (Smith et al., 2005). To overcome this hurdle, some flexibility in the interpretation of a vision can help, although too much can lead to instability of the vision (Berggren, Magnusson & Sushandoyo, 2015).

Despite these difficulties, visions are still important for future change as they are essential to get a common perception of the wide spectrum of social interests in territorial areas and the regimes surrounding them (Hodson & Marvin, 2010). Furthermore, describing these visions lays down the foundations for possible socio-technical transitions (Weber, 2003) and therefore anticipating actual success (Berkhout, Smith & Stirling, 2004). They can bring an understanding of the changes needed in the existing regimes (Hudson & Marvin, 2010) and can align the support of several actors towards this new technological regime (Weber, 2003; Bergman, 2017), which is valuable for the actors involved in a possible transition. The future of sustainable urban mobility depends on the competition between the coalitions of actors that want change in the current transport system (Marletto, 2014). Despite this, it is important to keep in mind that this research is not focused on a transition (with micro-mobility) to happen, but merely investigates what the visions for a possible transition are, according to the actors involved.

2.4 Visions for urban areas

Research on visions in urban transport is not new, although micro-mobility is often not included in these studies. Two well-known researchers involved in developing such general visions for the future of urban mobility are Miles Tight, mostly focussing on the United Kingdom, and David Banister, mostly focusing on the European Union. Tight's research includes the role of walking and cycling in visions for the future (Tight, 2016; Tight, 2017), visions for the year 2030 (Tight et al., 2011) and car-free zones (Tight, Rajé & Timms, 2016). Another emerging vision in urban mobility transitions concerns 'low carbon cities' or 'low carbon transport futures' (Banister, 2011; Bongardt et al., 2010; Mäkinen et al., 2015), resulting from the sustainability paradigm proposed by Banister (2011). In his view, cities will be designed in a way that people do not need individually owned cars. This requires more than a sole technological fix, as this will not generate enough carbon reduction to reach the set climate goals. A combined solution which involves planning and economic and technological innovations probably will.

Based upon the above, this research intends to describe a collection of visions on the urban mobility future in Berlin, with special attention to the role of micro-mobility in these visions. The current transport challenges and pressures urban areas face are not generic, since there is much variation across cities (Hodson & Marvin, 2010). Each city will have different goals and visions for their sustainable transport policies (Bongardt et al., 2010) and this also applies for micro-mobility sharing systems and their usage (McKenzie, 2019; McKenzie, 2020). Furthermore, visions for urban areas differ from general visions, since they are bound to a territorial property (Hodson & Marvin, 2010). Also, visions in a city can be limited due to the particular, static design of these cities (Mäkinen, et al., 2015). Although visions can be rather utopian and out-of-the-box, they still must be plausible (Smith et al.,

2005). This means that visions for urban areas should consider the current and potential future state of the city and its limits.

Even when researching the specific role of micro-mobility in urban transport visions, these visions are still embedded in the broader context of a future city. As explained before, there is not one (technological) fix, a combined solution is needed. There are many urban visions concerned with 'low-carbon' transport where inhabitants do not need a car (Banister, 2011). This shows the need for placing micro-mobility in the context of (visions on) over all city design. Since there are, outside the automotive regime, other subaltern regimes and since micro-mobility is inseparable from other forms of mobility - e.g. the last-mile problem - (visions on) general urban mobility will also be considered. Therefore, three levels within the visions on the urban transport future will be researched; City design, urban mobility and shared micro-mobility, see figure 1.

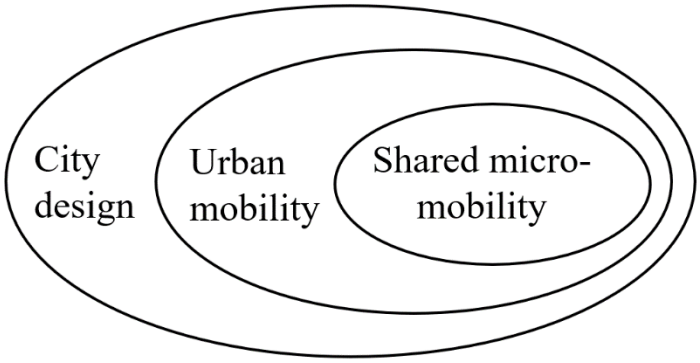

Figure 1. Levels for visions in urban transport

3. Methodology

In this section the methodological approach applied during this research will be described. First, the qualitative, inductive research method will be clarified, followed by the process of data gathering and analysis. Lastly, the taken steps during the research will be enumerated.

3.1 Research methods

This research aims to map the role of shared micro-mobility in visions for the future in Berlin and uses an iterative inductive approach, where theoretical reflection is part of the research. The research started with some interpretation of theory and known concepts supported the research process, such as the characteristics for visions. Furthermore, the research has a qualitative nature, where a describing approach is applied, since the goal is to give an overview of the existing visions (Oost, 2006). During this process, several visions will be extracted from interviews and documents, with the goal to cluster them where possible and to describe the similarities and differences. Additionally, the possible routes to achieve these visions according to interviews and documents will be described. How this data will be collected is described in the data collection and analysis section (3.2).

3.1.1 The case Berlin

The city-state Berlin is chosen as a case study for several reasons. Most importantly, there has been a rapid increase of shared micro-mobility offers in the city, both for (e-)bikes and, although more recently, for e-scooters (see section 4.3.3 for an overview of all shared micro-mobility vehicles available in Berlin). This rapid increase is even described as a "revolution" by the German magazine Der Spiegel. At the same time the city wants to decrease motorized travel and increase trips done with walking, cycling and public transport. The city is therefore an interesting case to see if, and how, shared micro-mobility plays a role in visions for the urban transport future.

A case study can be used in an explorative, descriptive or explanatory research where there is a need for an in-depth understanding of a complex, contemporary phenomenon in a real-life context (Yin, 1981; Yin, 2018). Choosing such a case is useful when the case in question has special circumstances (Yin, 2018), as is the case for Berlin as explained above. Furthermore, in this research detail and depth are important, which is best reached when only researching one case in this short time period.

3.1.2 Events attended in Berlin

To understand the background of the case study Berlin, events about transport in the city have been visited. These events are not used as data in the research but functioned as input for finding useful sources for the research. To see the attended events, see Appendix B.

3.2 Data collection and analysis

The data collection of this research is two-fold. Firstly, a document research process was carried out to get a better understanding of the case of sustainable transport in Berlin and to get a first view of the visions currently occurring in Berlin. The main data gathering came from interviewers in the mobility sector in Berlin.

3.2.1 Document research

A document analysis is a systematic procedure for reviewing important documents, which can serve several purposes. In this case it provided context on the research case, as a way to generate possible important questions during interviews in a later stadium and as supplementary data to support the information found during the interviews (Bowen, 2009). The analysis is done in three steps as explained by Bowen (2009). First, the documents with potential were superficially examined. If the document was deemed relevant and adhered to the selection criteria (see the list below), the document was read and coded. The procedure of the skimmed documents is summarized in Appendix C.

Only publicly available documents were analysed, including reports, peer reviewed research and grey literature. The documents could either be written in English or in German. As a search strategy, Google as well as Google Scholar were used (incognito mode is used to avoid search history to influence the outcomes), whereby all search terms and dates will be logged to improve transparency. Examples of search strings are "visions for future transport Berlin", "urban transport future Berlin" and "*Stadtentwicklungsplan Verkehr Berlin*" (translation: urban development plan transport berlin). Since these search terms did not provide many relevant documents, actors in the mobility field were also asked for other relevant documents. Again, see figure 11 in Appendix C for the procedure. The following criteria are taken into account when selecting documents:

1. the documents consider a future for urban mobility in Berlin,
2. the projections or visions are for the future between 2025 - 2050, since this is long enough for a socio-technical transition in the transport sector to come about (Geels, 2012)
3. they were published between 2016 and 2020, since this was the year before shared systems increased a lot (a growth of 75% for shared bicycles in Berlin in the year 2017 (Dobush, 2018)).

All documents coded can be found in table 1. For a more detailed description of the documents, see Appendix B.

Table 1. Documents on urban transport futures used for coding

Name of the document	Author	Year	Found through
The Evolution of Mobility	ADAC[1] ZukunfstInstitut	2017	On their website after several recommendations by interviewees
Abgefahren! Infographic on transport	Agora Verkehrswende	2019	Recommended by Felix Creutzig
Berliner Mobilitätsgesetz *Translation: Berlin Mobility Law*	Gesetzgeber Berlin	2018	Incognito search on Google: 'visions for the future transport Berlin'
Urban mobility 2030: case study for Berlin	McKinsey & Company	2016	Incognito search on Google: 'urban transport future Berlin'
Transportation Urbanism	R. Herzberger, H. Wu & T. Zihlmann	2020	Recommended by Raoul Bunschoten

[1] The Allgemeiner Deutscher Automobil-Club (ADAC) is an automobile association in Germany, and is the largest automobile club in Europe.

3.2.2 Interviews

The goal to conduct 20 interviews (as suggested by Warren, 2002) was reached. The interviews took place in the period February 2020 until May 2020. All interviews were held with the use of a semi-structured interview guide, since this is an important aspect of qualitative research (Bryman, 2012, p. 471). This guide was based on relevant information coming from the document research and events, the characteristics of visions as described by Berkhout et al., (2004), and the levels for visions in urban transport (figure 1). For the full interview guide, both in English and German, see the Appendix A. A list of interviews held is visible in table 2. Besides finding interviewees in an arbitrary fashion, the snowball sampling method was also used, which involved asking the interviewee if they knew other important actors to speak to (Biernacki & Waldorf, 1981). During the interviews, most respondents pointed out sensing resistance from the car industry and car users when working towards their visions. Therefore, and to avoid bias, these groups were actively approached to partake in the research, resulting in three car users being included as respondents and one report from the car industry being included in the document sources.

Table 2. Interview list

#	Function or company	#	Function or company
1	Car user	11	Politician in parliament
2	Car user	12	Public transport company
3	Car user	13	Researcher SRM and transport
4	Citizen initiator for neighbourhood change Berlin	14	Researcher transport and micro-mobility
5	Climate activist	15	Researcher transport transitions
6	District official	16	Researcher urban planning and development
7	Electromobility agency	17	Ride sharing company
8	EV charging company	18	Shared micro-mobility company
9	Future mobility company	19	Shared micro-mobility company
10	Initiator transport transformation project Berlin	20	Transport economist

3.2.3 Coding

All interviews and selected documents were coded after transcription. During this process, the data was broken down into codes. Concepts were initiated from these found codes and categories were created (Bryman, 2012, p.560 and p.570). A concept is a group of codes which represents a certain theme, which does not necessarily mean they fall within the same category since they can be different

outlets within a certain theme. A category is a collective (more abstracted) name that represents affiliated codes. This process can be visualized as follows:

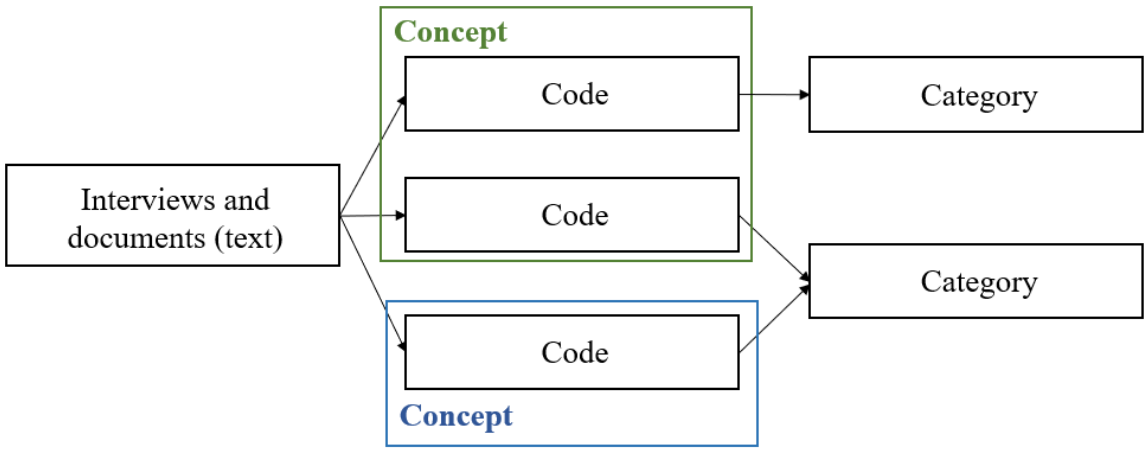

Figure 2. Abstract visualization of the coding process

To give an impression of the importance of the codes and concepts, they were labelled according to the percentile they belong to. Exact numbers were avoided, since the number of sources (meaning both respondents and documents) differs per vision (subgroups). The percentile indicates the share of sources mentioning a certain code and are indicated with P25, P50, P75 and P100. P25 means the mentioning of one code by a maximum of 25% sources. P50 means 25%-50% of the sources mentioned the code and so on. See figure 3 for a visualization of this ranking. Since a rank of P25 indicates the code does not prevail often, these codes are left out if they do not add up to a category with other codes. Important to note is that when someone has not stated a certain opinion, the person still might agree with the statement. The exact number of responses are collected in Appendix B.

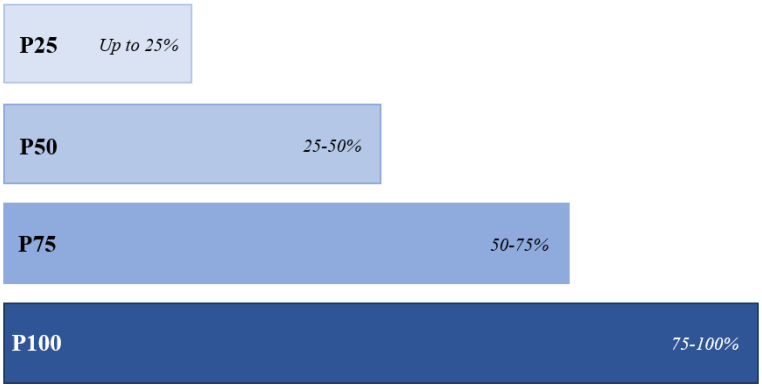

Figure 3. Visualization of the percentile labels

Before the coding of the documents and interviews, several concepts already appeared out of the interviews and the documents. These were used during the coding process and therefore a hybrid coding method is chosen. This method uses inductive (open or initial) coding, where new concepts emerge, and deductive coding, where concepts come from theory. The already found concepts are, firstly, the levels of visions in the transport sector, as described in section 2.4 Second, there are the characteristics of visions that are important to consider, since all visions must have objectives, orders and technologies. For more information see section 2.3. These concepts were not only used for the coding process, but also during the interviews and in the final phase when the visions were constructed. See table 3 for the combined levels and characteristics in this research.

Table 3. Levels and characteristics of urban transport visions

		Characteristic		
		Objectives	Technologies	Orders
Level	City design	The objectives for city design	The technologies in city design	The order of city design
	Urban mobility	The objectives for urban mobility	The urban mobility technologies	The orders of urban mobility
	Shared micro-mobility	The objectives for shared micro-mobility	The shared micro-mobility technologies	The shared micro-mobility orders

3.3 Research steps

Building upon the previously described method, the logic sequence in figure 4 was followed. The document analysis provided input for the interviews. The documents and interviews were coded and together exposed the existing visions through a process of flexible convergence. This, since a flexible interpretation of the specific visions is important for converging them, as stated in the theoretical section. Resulting from the visions, similarities and differences were demonstrated and explained routes were set out. Every step in the process will focus on one or more (sub)research questions, which are included in figure 4.

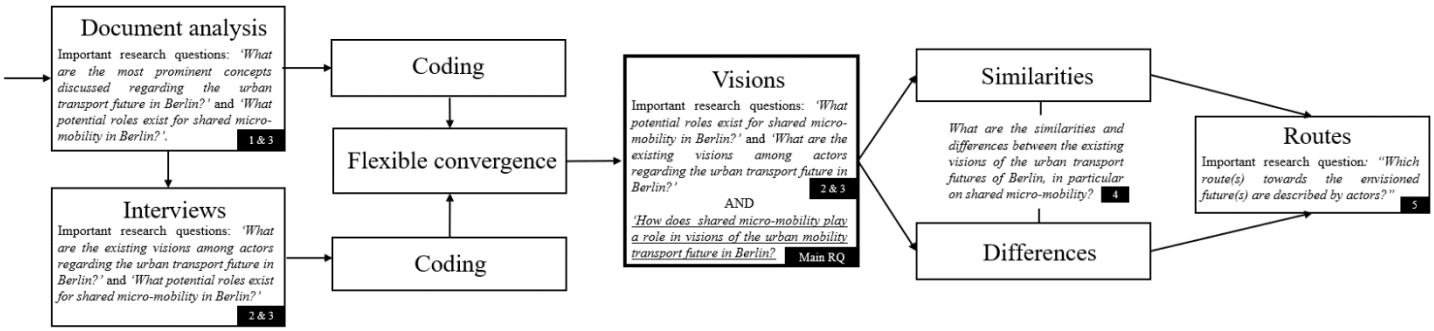

Figure 4. Research logic and (sub)questions

4. Background on case study Berlin

4.1 Berlin demographics and recent history

With a total population of 3.8 million people (Amt für Statistik Berlin-Brandenburg, 2020) and a surface of 891km², Berlin is Germany's largest city in population and in size (Berlin-Brandenburg, 2020; Friendmann et al., 2019). It is a decentralized city where neighbourhoods within the Ringbahn have their own centre, together forming the centre of the city (Population Density, 2019), but also has a busier inner-city centre like centralized cities (Rode & Hoffmann, 2016). The areas outside the Ringbahn are seen as the suburbs.

Berlin is a city with a unique history. After facing the two World Wars, Berlin went into another difficult era; Being divided by a wall from 1961 to 1989. This wall separated West Berlin from East Germany during the cold war. The wall fell on November 9th, 1989 (Berlin, 2020a).

4.2 The administration of Berlin

Berlin has a special jurisdictional form, since it is not just a city, but a city-state (Friendmann et al., 2019). This means that the city has a comparable power to a normal state in Germany. The parliament of Berlin is the House of Representatives. The executive body of the city is the Senate of Berlin, head of this Senate is the Governing Mayor of Berlin, who is elected by the parliament of Berlin. Every district is run by a council and a Mayor. In total there are 12 districts with limited power.

4.3 Transport in Berlin

4.3.1 Modal split

The modal split for transport in Berlin is quite distributed, as is shown in figure 5. When looking at the distance travelled per day per person per mode of transport, longer distances are travelled with car and public transport, see figure 6.

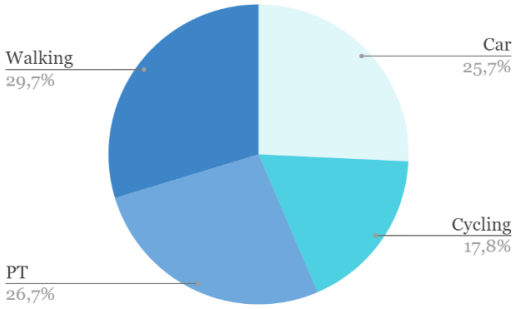

Figure 5. Distribution of trips per person per day. Adapted from Gerike et al., (2019)

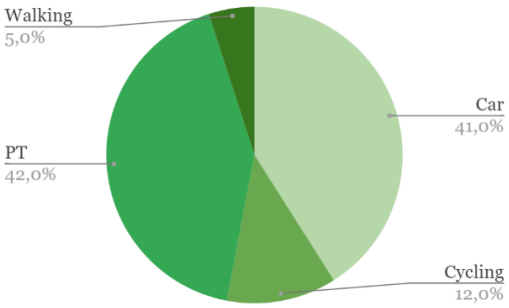

Figure 6. Distance distribution (km) per person per day. Adapted from Gerike et al., (2019)

4.3.2 Modes of transport

Berlin is a city with several public transport modes that were influenced by the division of the Wall. In the East, the S-Bahn (train) became the most important way of travel (Molnar, 2010). In the West, the railway (Molnar, 2010) and tramlines were almost not used anymore during this time (Halpern & Orlandi, 2017), but the U-Bahn (subway) was (Molnar, 2010). These developments in railways determined the course of Berlin, since its dependency on these systems stayed high (Peters, 2010). For a map of the public transport system, see Appendix C.

Although public transport in Berlin is well developed, and there is relatively low car ownership and use among inhabitants, the car still plays a central role in the city. This is mainly due to the influence it has on the streetscape, since this space is unfairly distributed (Creutzig at al., 2020) A recent development is ride and car sharing. There are two options to share a ride with other people, namely CleverShuttle and Berlkönig. For car sharing, many more options exist, some electric, some with a combustion engine, some free floating and some stationed.

Germany does not have a long tradition of cycling, but cycling is promoted more and more over time (Pucher & Buehler, 2007). For a visualization on the average usage of bicycles in Germany, see Appendix C. The city Berlin deems it important that pedestrians can walk through the city without obstacles (Berlin, 2020b) and many people do walk, see Appendix C. Still many people are concerned about safety, since many accidents happen (Marcus, 2020).

4.3.3 Micro-mobility sharing in Berlin

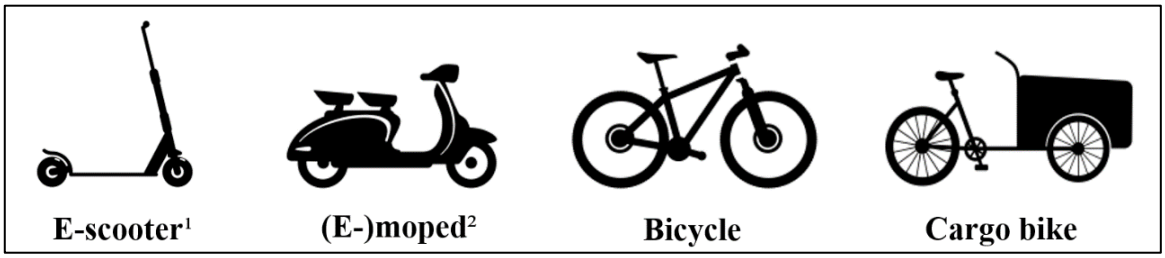

Figure 7. Shared micro-mobility vehicles

Shared micro-mobility has been on the rise in Berlin. Now, bicycles, e-scooters[2], (e-)mopeds[3] and cargo bikes are available. The systems really took off in 2017-2018 with an increase of 75% (Dobush, 2018). In 2019, a new law passed that made the use of e-scooters legal (Dediu, 2019). For all shared micro-mobility operators active in Berlin in the first half of 2020, see table 4. The rivalry in this sector is high and many companies already dropped out, among others these were Ofo and Obike, Coup (bought by Tier), Circ (taken over by Bird).

All shared micro-mobility vehicles are allowed to be free floating, although not all operators choose this. NextBike has several docks throughout the city and charges an extra fee for users who choose to park their bike somewhere else. FLotte works with pick-up locations where the key is handed to the renter and must be brought back to the exact same place.

Table 4. List of all shared micro-mobility companies in 2020

Company	Vehicles
Bird	E-scooters
Circ (now Bird)	E-scooters
Coup (now Tier)	E-scooters, e-mopeds
Donkey Republic	Bicycles
Emmy	E-mopeds
fLotte	Shared cargo bikes
Jump	E-bikes, e-scooters
LIDL bikes	Bicycles
Lime	E-scooters
Mobike	Bicycles
NextBike	Bicycles
Sacoora	Bicycles, e-scooters
Tier	E-scooters, e-mopeds
Voi	E-scooters

[2] E-scooters are sometimes also called kick scooters, or in German *Tretroller*

[3] Mopeds are often also called scooters, but in this research they were referred to as mopeds.

Due to the Corona lockdown restrictions imposed in Berlin starting in March 2020 (and in many other places all over the world), life in the city changed[4]. The transport sector was also severely affected; Many shared micro-mobility services shut down their operations in Berlin. For example, Bird and Lime paused their e-scooters sharing (Hawkins, 2020), but are back in business now (Hönicke, 2020). Tier was the only company still operational in Berlin and Jump had vehicles on the streets only available for certain groups such as the Clinic Heart Centre, free of charge.

[4] For a glimpse of life in Berlin during the lockdown, see for example this story: https://www.telegraph.co.uk/travel/destinations/europe/germany/berlin/articles/coronavirus-lockdown-berlin/ or these photos: https://www.businessinsider.nl/coronavirus-germany-berlin-landmarks-deserted-before-after-photos-2020-3?international=true&r=US

5. Results

The found visions for shared micro-mobility in Berlin are presented in this chapter. From the 20 interviews and 5 documents, three visions were abstracted. These will be presented for each level (city design, urban mobility, shared micro-mobility). First, a general outline of the found codes and concepts are presented per level, including the percentiles. Then the found vision(s) will be described per level. After all visions are clarified per level they are summarized, and the given routes towards the visions are set out. Lastly, an analysis on all visions will be provided.

The expectation was to find several distinctive visions, but this was not the case. Most visions showed overlap and only some characteristics set them apart. First of all, there is just one view on future city design, which is therefore the base in all visions. Similarly, on urban mobility, many views correspond with each other. Only the technologies differ between the visions. For shared micro-mobility, there were two distinctive views which separates two visions within this level.

5.1 Vision on city design

As stated above, just one vision on city design was found in this research. This, since almost every interview and document showed similar concepts and categories for overall city design in the future. All relevant codes are listed in the second column of table 5. The first column shows the concept these codes are part of, and the percentiles are listed in the third column. These codes are combined into categories, which is stated in the fourth column. For an explanation, see the methodology on coding. These codes can be subordinated in the characteristics of the vision on city design. See table 6.

Table 5. Codes, concepts, percentiles and categories for visions on city design

Concept	Codes on city design	Percentile	Category in vision
Climate impact	Less pollution in the future	P75	Liveable city
	Resilient cities for climate change	P50	Green city
General infrastructure	More pedestrian zones	P75	Reclaim streets
Social aspects	Create a liveable city	P75	Liveable city
	Children can play outside / Streets for children	P50	Liveable city
	Calmer city / Less noise	P50	Liveable city
	City (areas) as places where people can hang out	P50	Liveable city
	Connect with neighbours	P25	Liveable city
	More interaction on the streets	P25	Liveable city
	More life on the streets	P25	Liveable city
Responsibilities	Bigger role for the public / Involve locals	P50	Citizens
	Get rid of wrong regulations	P50	Government
	More courage from the government	P50	Government
	More urban planners / Use an urban planning method	P25	Urban planners
	Politics in Berlin are slow / Much bureaucracy in politics	P25	Government
Streetscape	Free up the car parking spaces and reassign for other things	P100	Infrastructure / Reclaim streets
	Green is important in the future city	P75	Green city
	Ecological city	P25	Green city
	Freiraum / Free or open spaces in the city	P25	Infrastructure / Reclaim streets

Table 6. General vision on city design for all respondents and documents

		Characteristic		
		Objectives	Technologies	Orders
Level	City design	➢ More green ➢ Liveable city	➢ Infrastructural change (streetscape) ➢ Reclaim streets	➢ Special role for urban planners and governing bodies ➢ Involve citizens and grassroot organizations

5.1.1 Objectives in the vision for city design

In almost every interview and document (sources), the concept of 'more green' was mentioned. Some sources see this as a way to become more climate resilient as a city. Most sources saw this as a way to have a nicer city, which overlaps with the statement of wanting a 'more liveable' city, which was the second objective clearly visible. This concept includes multiple codes and descriptions. The most common where: (social) life can be outside, interaction, a calmer city and children being able to play outside. One interviewee (7) explained this view as: *"I hope that they will use this space for better life quality in the cities, because now the quality is maybe not bad, it's not bad to live in Berlin, but still you can make it better. I mean, green gardens, parks, this should be something we could use the space for. And just to meet outside more often and to sit down somewhere."* Important to address here is the agreement of the car industry, ADAC (2017), on this topic: *"Tomorrow's cities will be more liveable, greener and quieter. Where cars shaped the cities in the past, today cities are shaping the cars."*

5.1.2 Technologies and orders in the vision for city design

For most sources, the liveability of the city is dependent on the streetscape, the visual elements of the paved area that create the character of a street (Rehan, 2013), of the city, which is why this was seen as the means to get to the liveable city (technology). More specifically, there needs to be change in the city where the streets are no longer focused on cars, which is seen in the concept of reclaiming the streets. *"If we have less cars around, we have place for more nicer things outside"* (6). By doing so, this creates a liveable street. One example of reclaiming the streets is the introduction of pedestrian zones in Berlin, since this is currently lacking according to the sources. *"What is most lacking, what I now think of, are pedestrian streets. I don't know any. That is a pity, since it is super nice for cafes and sitting outside"* (5).

Here, a special role was given to urban planners and the government since they can change the current infrastructure (order). *"It is definitely a thing of the State because, I mean, the State rules the street. So, the owner of the street is the State. So, they have to take care of the streets in Berlin"* (3). Right now, the government is often seen as slow and bureaucratic. The sources think the government should do more, as is seen in the codes: get rid of wrong regulations and more courage from the government.

Some sources worried about the lack of action taken by the government and therefore saw another role for citizens and grassroot organisations to create a bottom-up change. *"I think Berlin is a very good example to see how these roles are changing and how important the public can be. This mobility act for Fahrrad [translation: bikes]. This absolutely dramatically will change the whole idea of the city. So, for such a long time, these bike advocates here, mainly, they were fighting for more space, but they were not successful. And then, when it started, they really, in such a short time, it switched"* (14).

5.2 Urban mobility visions

Two visions for urban mobility became clear from the codes, although the objectives and orders in these visions are the same for both. The difference lays in the technologies used to reach the envisioned future. For all codes and concepts see table 7. The list of important codes is visible in the second column of the table and the percentiles in the third column. The category these codes are formed into are listed in the fourth column.

*Table 7. Concepts, codes, percentiles and categories for visions on urban mobility**

Concept	Most important codes	Percentile	Category in vision
Authorities	Better regulation for mobility / more regulations	P75	Regulations
	Parking is too cheap / will be more expensive	P50	Regulations
	Politics should get more involved with traffic	P25	Regulations
	Regulations are focused on cars	P25	Regulations
	Responsibility between governing bodies can be a problem	P25	Regulations
Behaviour	Mindset change / generation shift	P75	Behavioural change
	Let people experience alternatives	P50	Behavioural change
	Focus on behaviour, not technology	P50	Behavioural change
	Awareness campaigns	P50	Behavioural change
	Show people they do not need their car	P50	Behavioural change
Collaboration	Collaboration between actors / companies in the sector	P50	Strategic coll.
	Involve local companies / local authorities	P50	Local collaboration
Low-carbon transport	More / better / faster public transport	P100	Low-carbon
	Ban on polluting cars	P50	Regulations
	Existing transport (walking, cycling, public transport) will be most important	P50	Low-carbon
	Focus on the suburbs and transport after end stations	P50	Ecosystem
	Inclusiveness for all inhabitants / mobility for everyone	P50	Mobility for everyone
	Low carbon city due to low carbon transport	P50	Low-carbon
Less space for cars	Parked cars are a big problem	P100	Less space for cars
	Cars are a (big) problem (in general) / they own the streets	P50	Less space for cars
	Less (space) for cars (in general)	P50	Less space for cars
	Parts of the city will be car free	P50	Less space for cars
	The suburbs can be a problem if we want less cars	P50	Less space for cars

**For continuation of table see next page*

Continuation table 7. Concepts, codes, percentiles and categories for visions on urban mobility

Concept	Most important codes	Percentile	Category in vision
Infrastructure	More safety on the streets	P100	Invest in active modes
	Invest in infrastructure for active modes (walking, cycling)	P50	Invest in active modes
	More space for other mobility modes	P50	More space other mobility
Transport ecosystem	Intermodality / multimodality	P75	Platform
	Being able to choose from different mobility options	P50	More space other mobility / ecosystem
	Mobility hubs	P50	Intermodality
	Platform for mobility / one app	P50	Platform
	Multimodal tickets	P50	Ecosystem / intermodality
	Easy way to plan a trip / convenience	P50	Ecosystem / intermodality
	Better ecosystem for transport	P25	Ecosystem
Future technology	We do not know what the future technology will be / It is unpredictable	P100	Existing technologies / new offers
	Innovative mobility to give people what they want	P50	New offers
	Technology alone will not get us there	P50	Behavioural change
	Technology is only a tool	P25	Behavioural change
	Use existing technologies / We already have it	P25	Existing technologies
Pricing	Cars are too cheap / Increase costs for cars	P50	Monetary incentives
	Increase parking costs	P50	Monetary incentives
	Cheaper public transport	P25	Monetary incentives
	Wrong incentives for car use	P25	Monetary incentives
Sharing and MaaS	Car sharing and carpooling are important	P75	Sharing and MaaS
	More MaaS in the future	P75	Sharing and MaaS
	Car and ride sharing for special circumstances	P50	Sharing and MaaS
	Less privately-owned vehicles in the future	P50	Sharing and MaaS
	MaaS and sharing for people who still want a car	P50	Sharing and MaaS
	Sharing is the future	P50	Sharing and MaaS
	Ride sharing busses (as public transport)	P25	Sharing and MaaS

Since the only difference found in the visions on urban mobility lays in the role attributed to innovations in transport, this is separated from the overall vision held by all sources. Here, the

objectives, orders and one technology from both visions are stated in table 8. For the differentiation in technologies, see table 9.

Table 8. Urban mobility characteristics for both visions

	Characteristic		
	Objectives	Technologies	Orders
Level: Urban mobility	**Vehicles** ➢ Low-carbon transport ➢ Less space for cars ➢ More space for other mobility forms ➢ Mobility for everyone **Ecosystem** ➢ Ecosystem for all transport together ➢ Multimodality / intermodality ➢ Mobility hubs	➢ One platform for all mobility options	**Authorities** ➢ Regulations from the city Berlin ➢ Government should change monetary incentives for users **Collaboration** ➢ Strategic collaboration ➢ Local collaboration

5.2.1 Objectives for urban mobility visions

Vehicles envisioned in the urban mobility future

Part of the objectives for the future of urban transport appeared came all respondents and documents, namely the need for low-carbon transport. Several forms of low-carbon transport were mentioned, where walking, cycling, public transport and electrical vehicles where the main point of focus. All these modes will be discussed in the technologies section.

Another important topic was the space that cars take up in the city. Mainly the number of parked cars is seen as something that will be different in the future. The space that will be freed up due to this intervention, is seen as space that can be given to the public, to make the city more liveable (see 5.1.1).

Apart from this, there are also implications for other transport modes. Many speak of more space for pedestrians and cyclists, as one researcher said: *"I mean that's the biggest change, right, that Berlin has just so much space devoted to parking. And if you can get rid of even a 10th of that, you've opened up so much opportunity for bike lanes and greenery and outdoor cafes and small playgrounds"* (16). Important in this objective is the concept of fairness. All the space cars take up is only used by those car owners, which is a minority in Berlin, which is according to them unfair and is a waste of money.

Although many people see a fairer distribution of space in the future, some also state the importance of inclusiveness. Cars might take up too much space, some people will be excluded from traffic or even of a life outside their house, if cars are banned completely from parts of the city. Most mentioned are disabilities and age as a reason why some people need a car. *"I think a classical example is someone who's handicapped, with disabilities, or someone who's living in a neighbourhood [that is affected by parking restrictions], with a certain age and has no access to public transportation"* (13).

Also parking of other modes of transport is a heavily discussed topic. Since many people are disturbed by the way micro-mobility vehicles (shared and privately owned) are parked, they see some of the current parking spaces for cars to be freed up, so the sidewalk is not cluttered anymore.

Lastly, what is interesting about these objectives, is that car companies as well as car users also included this in their vision.

Optimisation of the urban transport ecosystem

A clear objective for the transport system as a whole, is the optimisation of the ecosystem where all transport modalities are integrated better with each other. Aspects of such an optimised transport ecosystem are: being able to use multiple modes in one trip (used terms: multimodality, intermodality and mobility chains), the option to choose from different modes, and the placement of mobility hubs where these mobility forms come together. Most people feel this need to make the transport system flexible and customizable for personal needs. For example, as ADAC (2017) states: *"We should no longer conceptualise mobility in terms of separate means of transport and organise and offer mobility accordingly, but rather along mobility chains."* This description is very similar to that of Mobility as a Service (MaaS)[5], although it seems as most sources see MaaS as a way to reach this optimisation of the transport ecosystem and not as an objective on its own. Therefore, MaaS is discussed in the technologies in urban mobility sections below.

Some people explicitly mentioned the need for mobility hubs and multimodality for the suburbs of Berlin. Since Berlin is a big city with many people living outside the centre (the Ringbahn) who need a car to get around, respondents said there is first a need to support these people before they suddenly cannot use their car anymore. One way would be to have mobility hubs at the Ring, where people can leave their car or a shared vehicle and use public transport or a shared vehicle. The exact forms of the optimisation of such a transport ecosystem are specified in the technology section and differ per vision.

5.2.2 Orders for urban mobility visions

Authorities in urban mobility visions

There are several changes in the relationship between actors in the visions for future. The first is the role the government should play in the transport field. It is clear that almost all respondents want the government to step up and take more control. There are several ways they are expected to change. Some speak of more 'courage' when it comes to restricting the use of cars. Others take a more moderate standpoint but still say they want regulations to help the transition away from cars in the city. The main points that are mentioned in this case: Car-free areas, imposing a speed limit, a ban on polluting cars and more parking regulations.

Besides this restrictive role, the government should also help along the transition by incentivizing other forms of transport. As a car user stated: *"Both, it should be more expensive to get by car into the city and I think the government should develop the public transportation more to get maybe a little bit cheaper or something, to get everyone to the public transportation"* (1).

[5] Mobility as a Service (MaaS) is a new innovative transport concept, aiming to change the current transport practices by tailoring different transport modes to particular needs. See for example: Jittrapirom, et al. (2020).

Collaboration in urban mobility visions

Roles and relationships need to change in terms of increased collaboration. The sources stated the need for collaboration, since this could help a transition along. Most mentioned was the 'strategic collaboration' between companies. With such a collaboration, the actors can achieve more together than they would have on their own. An example of a strategic collaboration already in place is between companies that provide shared micro-mobility vehicles for their employees[6]. Also, the collaboration between companies and local authorities was an important future order. Since this last order was mainly mentioned in relation to shared micro-mobility services, this will be explained in section 5.3.1.

5.2.3 Technologies for urban mobility visions

As stated before, the objectives and orders were congruent between sources but most technologies to get to this envisioned future differed. One technology was visible in all visions, which was a platform for mobility, see table 8, and will be explained in the next section. The differences between the technologies can be categorized in two separate visions. The first being a vision focusing on behavioural change and not so much on innovations, abbreviated to **BE**. The other being a vision with a focus on innovation as a means for change, abbreviated to **IN**. See table 9.

The term technologies in visions should not be confused with (digital) innovations. A technology in a vision is the means to get to the objectives in the visions and therefore a technology is in this case also something like an awareness campaign to change behaviour.

Table 9. Technology characteristics for urban mobility that separate visions BE and IN

		Characteristic: technologies
Level: Urban mobility	Transport vision 1: Behaviour-based **(BE)**	➢ Establish behavioural change ➢ Use existing technologies ➢ MaaS / sharing (car sharing only for people who really need it) ➢ Better infrastructure for active modes
	Transport vision 2: Innovation-based **(IN)**	➢ Create new, innovative offers ➢ React to demand ➢ MaaS / sharing (everyone with car switches to shared)

One platform for all mobility

All sources agreed on the need of a platform to facilitate the objective of an integrated transport system. Especially the hassle it now gives to switch or choose between several transport providers (public transport, shared systems, ride services) was the reason for this choice: *"You only need one app. It's horrible if you need 10 different apps"* (13).

[6] This example is about the BMW Groups facilitating e-scooters in collaboration with Lime Scooters for their employees in Munich. See: https://www.li.me/second-street/lime-partners-bmw-group-munich-campus-project

To get to a flexible, accessible system, a simple to use platform for all these services is seen as the best solution. In its most basic form, it should include offers from all transport facilitators. Also, the possibility to plan a trip where several modes from different providers was combined, was a needed functionality. "*But more like okay, I grab my electronic device[..] from my pocket and type in from where I want to go and where I want to go. So that must be most convenient. And that's just possible through aggregating and through collecting information"* (9). Additionally, such a platform would also give the option of buying tickets: "*And I think this must be also the solution for the future that you have this one app and you can use all the different mobility solutions, especially micro-mobility with this app. And then you can find it and you can pay with only one app, it's super easy"* (7). More advanced features mentioned were the integration of other data like the weather or booking a trip so that it unlocks when a person comes close to the vehicle.

So far there is no agreement on who should run the platform and not all sources stated an opinion about this. Some options are: the municipality themselves, the municipality who contracts it out, Google, BVG, the biggest player in the field of shared mobility or an unknown third party. What makes this topic difficult, is the willingness of operators to be in the same app and the data being controlled by a certain party. The solution is found in two ways. The first is the government playing a big role where they 'force' the operators to join the app, and second, to provide data security. The ADAC (2017): *"The above raises questions – of data protection and of who owns the information. The condition for acceptance by society is a maximum of data security. As a basic hygiene factor, data protection will be of immense importance in 2040: as a quality criterion it will be a minimum requirement for new players to enter the mobility market."*

Other technologies according to the behaviour-based vision

To reach the objective of a liveable, green city with less cars and more space, one source group saw the biggest need in changing the behaviour of people: *"The most important thing is not the technology. The most important is the behaviour and so I think we need to change our minds. And this is more important than to have new technologies"* (7).

The transition will not come when the focus is too much on new innovations. Although new technology and digitization are still a good addition when they are used with a clear purpose (for example the mobility platform), it will distract the focus from the real problem, which is the car culture that now exists in Berlin. This group agrees on the fact that *"In general in society, technological development is overestimated, and social change is underestimated"* (20). To change behaviour, current offers need to be pushed. This vision states, although new offers can be a good addition, that the current offers are good enough. Especially active modes like cycling are very important, since it is *"also the most green mode of transport"* (12). Cargo bikes are seen as a good substitute for cars, especially when goods need to be transported. When a situation really asks for a car, car sharing is a solution. Still, there is some hesitance on this topic. "*And I think it has to be mostly pooling because otherwise if there's one person sitting in the car, it doesn't make a big difference. I mean, of course, you don't have the parking space, but the driving so we say that those cars must always be pooled by as many people as possible, to make it more efficient"* (15).

Another often mentioned topic is the accessibility for everyone when it comes to transport. Some people might not be able to cycle, so there should be offers for them as well. The e-bike is mostly mentioned for longer distances or older age groups. To facilitate this behaviour-based change, infrastructure needs to be improved for low-carbon transport.

More hesitance goes towards innovative solutions like autonomous driving. There is a value there, but this will take a long time, and if it is not handled properly it will increase the number of vehicles on the road. For example, to create a mobility chain: *"It can help if these autonomous vehicles can bring people to public transport stations and when they are shared vehicles or when rides can be shared"* (14).

Ways to establish this change in behaviour are awareness campaigns and creating experiences that make people see they do not need their car. For example: *"We need to show people how the alternatives [to cars] are, to make them change their behaviour, make them experience the other forms of transport"* (10).

Most sources with this vision also saw the problems this attempt to focus on behavioural change can give. Especially the generation that grew up with a car as the symbol of freedom is seen as a problem. Therefore, some people say we maybe need to wait for a generational shift. *"The biggest changes come from generational shifts. You can also see that in large social movements. Then pressure is already used, but it is necessary that the group that can no longer make changes grows old"* (5).

Other technologies according to the innovation-based vision

The second group identified more with new innovations and technologies to comply with the demands of people. *"New developments such as the spread of electric and connected vehicles and changes in user behaviour now offer the opportunity to implement innovative mobility concepts. They have the potential to reduce congestions, noise, and pollution in urban spaces and improve the quality of life"* (McKinsey & Company, 2016). So instead of focussing (solely) on changing the behaviour of car users to make them switch to existing (low-carbon) transport offers, new offers can be introduced. These new offers should fit with the expectations of the users of personal transport and can at the same time support the objective of a low-carbon transition.

The sources see a bright future for MaaS and (car) sharing, which will create a big change in the city. The ADAC (2017): *"How we move from A to B is subject to radical change, since individual mobility will be based on the principle of access: people will buy access to, rather than acquire ownership of mobility products. 'Using not owning' will be the concept defining the logic of transport in the 21st century."* This new way of looking at transport supports the aforementioned need for an improved ecosystem for transport. Most sources also mentioned the stubborn group of car user, who mainly live in the suburbs of Berlin, and often do not have any alternative to their privately-owned car. For this group, sharing systems and MaaS are seen as important developments to also reduce car use in those areas. *"Even though we have really good public transport here in Berlin, especially in the centre, but for the more outside areas I think there are a lot of benefits to new mobility services to improve access to public transport for the outside areas here"* (15). The reason these car users could switch to sharing and MaaS, were among others for the transportation of goods or when the distance of a trip is too long.

An often-mentioned solution for the objectives in the vision, is the upcoming use of autonomous vehicles. When these vehicles are shared or function as a special form of public transport (for example pods or shuttles), they can reduce the number of vehicles on the road without ignoring the demand of people and saving costs. Furthermore, most people agree (especially from the innovation vision, but also from the behaviour vision), that we cannot know what the next thing (or innovation) in mobility will be.

5.3 Shared micro-mobility in the future city

Although so far most visions corresponded and the only real difference was found in the use of technology as described above, the opinions on the role of shared micro-mobility are more diverse. Two distinctive visions were abstracted from the results. The first sees a stimulating role for shared micro-mobility, where it can support the desired urban mobility visions (**S**). The other does not see much benefit of the services and only sees a niche role (**N**). Again, there is a list of relevant codes, the corresponding concepts, categories and percentiles, see table 10.

As stated above, the visions can be divided in two groups. The first group sees the shared micro-mobility systems as a way to stimulate the current low-carbon transition in the transport sector. This group consists both of sources that see an innovation driven future for transport as well as the behaviour-based sources. The sources from the niche vision, who have less belief in the positive influence of shared micro-mobility, all come from the behaviour-based vision. The first two groups are about the same size, the last is a very small group. See table 11.

Table 10. Concepts, codes, percentiles and categories for visions on shared micro-mobility

Concept	Most important codes	Percentile	Category
Changes in distribution compared to now	Shared micro-mobility will play a role in the future	P75	Addition
	New forms or vehicles for shared micro-mobility	P50	New forms
	Shared bicycles are important in the future	P50	Mainly bikes / addition
	Shared cargo bikes should play a role	P50	New forms
	Shared E-bikes are important in the future	P50	Mainly bikes / addition
	Systems do not work now but will in the future	P50	Addition
Collaboration	Collaboration between local authorities and companies	P50	Collaboration
	Contracts for multiple years	P25	Collaboration
	Political involvement to get shared mobility to suburbs	P25	Coll. and support
Integration	Addition to current system	P75	Addition
	Last-mile problem can be solved	P50	Addition
Parking and stations	Dock on every corner / Park at junctions	P50	Docks
	Station-based shared bikes and e-scooters are better	P50	Docks
	Car parking becomes parking for shared micro-mobility	P25	Docks
	Station-based shared bikes are better	P25	Docks
Solve problems	Digitization to support shared micro-mobility systems	P50	Digitization
Regulations	More regulations for shared micro-mobility	P75	More regulations
	Better parking policy for all shared micro-mobility	P50	More regulations / docks
	Regulate the amount	P25	More regulations
Usage in the future	E-scooters are for tourists	P75	Sceptical
	No need for e-scooters	P75	Sceptical
	E-scooters are for fun	P50	Sceptical
	People already have their own bike	P50	Sceptical
	Suburbs should be included	P50	Suburbs
	Competes with walking and cycling	P25	Sceptical
	Reliability is important, especially in the suburbs	P25	Suburbs

Table 11. The two roles of shared micro-mobility in visions for the future

	Characteristic		
	Objectives	Technologies	Orders
Stimulating	➢ Addition to current system ➢ Support the suburbs	➢ New forms ➢ Digitization ➢ Docks	➢ More regulation, collaboration and support
Niche	➢ Only for select minority ➢ Mainly bikes as addition ➢ Sceptical on e-scooters ➢ Special role in suburbs	➢ Docks	➢ More regulations and restrictions

Therefore, there are now three vision, and the division can be visualized as follows:

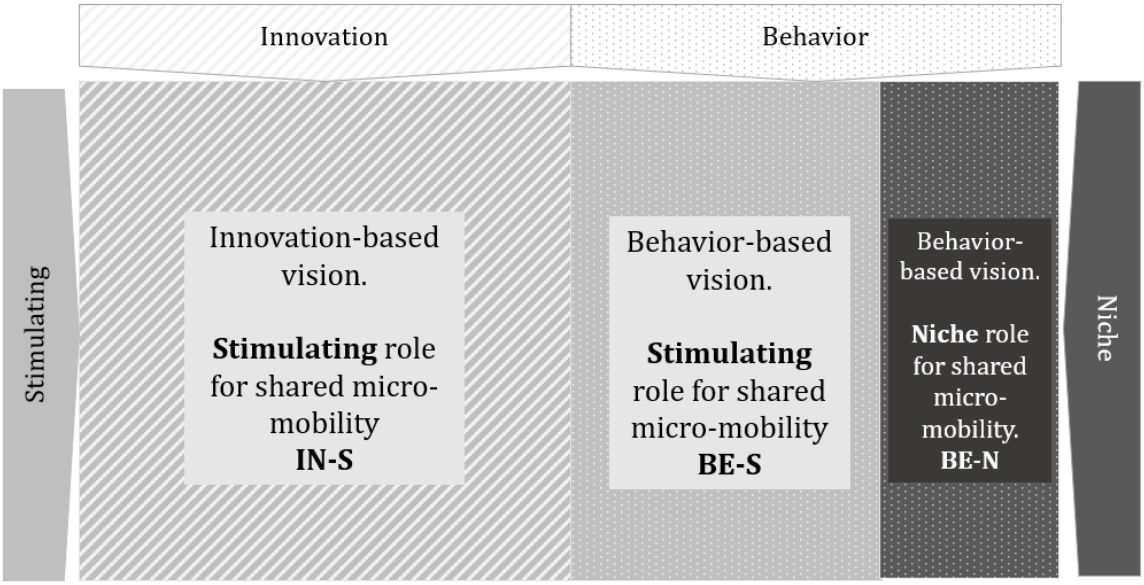

Figure 8. Basic visualization of the division towards three visions

5.3.1 Stimulating role for shared micro-mobility

Objectives for shared micro-mobility as a stimulator

Most sources see shared micro-mobility as a good and supporting addition to the current system. It is seen as something that can support the transition towards the city they see in their vision, with less cars. *"Bikes and public transport have been there for the last 20-30 years and it has not prevented people from buying more and more and more cars. So, bikes and public transport is not a solution. And I just want people to try out every way of transportation and just experience if it works for them or not"* (18). It also increases the flexibility, efficiency and reliability of public transport. *"I think it is very useful, especially for the last door-to-door parts. [..] I think it makes a huge difference if you can always grab a bike somewhere today. It makes you very flexible"* (5). And not just in the current system: *"micro mobility will be more important than now"* (7).

What is important in this vision, is that the sources see problems with the current implementation of shared micro-mobility but see a potential for the future. *"I think what most people don't see is that there's the short and the long term you need to differentiate. At first these offers will be an extra burden to the transport system. I think in many cases, in the long run, they might be a relief"* (20).

Another important objective in the future role of shared micro-mobility, is the inclusion of areas that are seen as suburbs (outside the Ringbahn). *"Also, where in the city because right now [the shared mobility offers] are all just within the Ringbahn, like in the centre. While outside areas are not really.. they don't have any scooters there. But they mostly need them for more access because in the centre, we already have a lot of everything I would say"* (15). Partly because of the last mile problem: *"I think they are a good fit into the whole picture. I think they should extend more. It's like right now they're centred in the middle of the city. [..] but for commuting, this is the last mile kind of thing [..]. So, to go back to your house, you would need it too and that is lacking right now"* (2). Here you see the importance of shared micro-mobility with the mentioned multimodality in the urban transport vision: "*This only works if [the shared micro-mobility company] would be available outside the Ringbahn. It is only in three or four places. In the inner city, [intermodality] is not what happens if you use [the shared micro-mobility company] inside the Ringbahn you can also cycle all the way. You do not need the train then"* (6).

Technologies in the stimulating vision for shared micro-mobility

The group with this vision sees several solutions to problems that now occur with shared micro-mobility in Berlin. By introducing new offers, by enhancing the digitization of the systems and by introducing docking and parking for the vehicles.

First of all, they see many options for shared micro-mobility forms. *"I see all of those. I see bikes because they are great. Also, some cargo bikes for rent. I see big scooters, you can go faster, people like that. And I see the electric kick scooters, people could live without them for quite some time, but I tried to look at people who use them and it is not only tourists"* (6). And there are many new solutions that could be introduced, to improve the experience using the vehicles, although most sources do not try to predict what kind since they see an uncertainty in what is to come. Furthermore, the type depends on the user, especially in the suburbs that currently have no access to these services. *"If I imagine this [for the suburbs]. Partly because of where it is but also what kind of person I imagine. I don't see them take a bicycle all the way to town. In any case, do not quickly grab a bicycle. I see a kick scooter maybe. For example, a scooter or a car to a station, to take the train instead of driving all the way"* (5).

Another important technology to get to the envisioned role for micro-mobility, is to implement parking policy, preferably with flexible docking stations. Most favourable is the placement of docks at every corner so the accessibility does not decrease for users. Most sources link this with the current parking of cars. For example, to park on junctions: *"Every crossroad, the law says, there has to be like five meters where you're not allowed to park a car. What the law says, I mean, it's disrespected in every single corner of the city. So just like making room there, five meters, giving it to bikes and shared mobility services, that would be so smart"* (18). Especially for e-scooters, docks are favourable since they need to be charged. *"Charging becomes substantially easier if you're station based, or private property based"* (16).

Orders in the stimulating vision for shared micro-mobility

Almost all sources, from all visions, spoke of the negative externalities of the current use of shared micro-mobility. The concerns are stated in table 12. For this reason, all sources see the need for better regulation when it comes to shared micro-mobility. For shared micro-mobility to be a good addition to the current system, better regulations are critical.

These regulations should go further than just solve the current problems but should be done looking at the future. *"I think what really makes the difference is not the offer or the tech company itself. But regulation setting the incentives or disincentives for certain behaviours or business models and regulation should actually look ahead and try to shape the market, which is not happening, at least in Germany, but it's always looking behind trying to improve things that go wrong a little bit"* (20).

Also, the aim of getting shared micro-mobility to the suburbs of Berlin should be enforced with regulations. There was some mention of also giving financial support, although most sources stated to have no clear opinion on this. One respondent who did see financial support from the government: *"Cities would need to find a way to regulate where those scooters have to be located and also maybe finances because then we are back to the business model. Of course, the companies need as many rides as possible. Which are mostly possible in the centre. And there needs to be any other financing mechanism, so they can be located on the outside"* (15).

Again, collaboration is seen as important. In this case collaboration between the government and the shared micro-mobility companies. *"What you need in a city government, I think, is sort of an openness to share the challenges that you're working on, and work with that, with companies as a collaborator. And not just as a regulator. And it's a tough balance to strike"* (16). Several mobility companies state the opposite is currently happening and say the government is making it harder for them instead of easier. *"They are already quite involved. The problem is that the government isn't doing anything completely thought through. It's also funny because as a new mobility provider, they give us all these rules and regulations and things we need to achieve to say this is how many people will stop using their private car but to be honest, the biggest change has to come from them"* (17).

Also, the slow bureaucracy is hard to work with: *"What I've heard from the start-up community is that they are frustrated with the speed at which policy decisions happen"* (16).

5.3.2 Niche role for shared micro-mobility

Objectives in the niche role for shared micro-mobility

The other group is less convinced of the added value shared micro-mobility has now and in the future, although this group is smaller compared to the first group. The most important objectives are that shared scooters are probably only for a select minority, such as tourists. *"I think 50 years from now, 30 years from now, I think this will be around, but they will be less used by a very select minority. And I hope they will be used by a select minority"* (13). Some of the sources in this group are even less fond of e-scooters, and preferably see them gone in the future *"I hope long term [they will be gone]. But shortly or the next couple of years, I think they will not"* (8).

One of the biggest issues of this group with shared micro-mobility, and mostly with e-scooters, is the externalities they give and the exclusiveness for some users. Also, the services are mainly used by people who normally walk, cycle or take the public transport. This means they do not see a big added

value for the services: *"I do think that it's a lot of resources for a service that is maybe not so useful in the end"* (8). Other reasons have to do with the electricity use and the space they take up on the streets.

The bikes on the other hand, might be a valuable addition to the current system when handled in the right way. Still this role is not too big, since *"I think that bicycles are also not quite as attractive to ordinary Berliners because you actually have your bike in the basement"* (11).

Here, again, there is a special role for the suburbs. There the shared (e-)bikes should be as reliable as a car, for example by being able to make a reservation. *"And the prerequisite there is, I think, that these bike racks or e-scooter racks, they need to be very close to where the people live. And they need to be sure that one bike is available when they need it in the morning, you absolutely cannot arrive at like these shared stations and not find the bike for yourself. You need to be able to reserve one regularly or needs to be so well stocked, that people never run into that situation where they're running late and there's just no bike for them"* (13).

Technologies for the niche role of shared micro-mobility

When looking at technologies, a lot less is needed since the services will not grow in the future. Externalities like parking are seen as important, and therefore this group also sees the need for docking stations.

Orders for the niche role of shared micro-mobility

For this group, more regulations are also important. These regulations are the same as the other group (see 5.2.2). They do not see the need for a more collaborative role for the government. This group does feel the need for more restrictions when it comes to shared micro-mobility. For example, prohibition of e-scooters and restrictions of parking, especially on the pedestrian lanes. *"If scooters can just be parked somewhere on the street because they are often in the middle of the path. So, people with wheelchairs or people with strollers or with two or three small children with luggage on hand simply cannot get through. It's really reckless"* (11).

5.3.3 Concerns about the current impacts of shared micro-mobility

As explained, many respondents do have concerns on the current impacts of shared micro-mobility in the city. Several different concerns were acknowledged, and the concerns mentioned more often are depicted in table 12. The three concerns that had up to half of the sources discussing them were: the place they take up on the streets, the economic problems for the operators and the fact that the vehicles are vandalized.

Table 12. Codes for current concerns of shared micro-mobility

Most important concerns	**Percentile**
Shared vehicles are vandalized / Users do not care for the vehicles	P50
Cluttering of the pedestrian lanes / take up too much space on the street	P50
Shared micro-mobility operators have economical or profit problems	P50
Charging infrastructure of electrified shared micro-mobility (extra cars in the city)	P25
General mention of concerns about the impact	P25
Difficult for older people / Older people will not use shared micro-mobility offers	P25
Shared micro-mobility competes with walking and cycling	P25
Shared micro-mobility services are too expensive	P25
Shared micro-mobility operators do not care about the vehicles	P25
There are now too many shared micro-mobility vehicles in the city	P25

5.4 The visions for all levels and characteristics combined

To further specify the visions and the differences and similarities between them, see figure 9. As explained before, the first is the **in**novation-based vision with a **s**timulating role for shared micro-mobility, indicated as **IN-S**. The second is the **be**haviour-based vision with a **s**timulating role for shared micro-mobility, indicated as **BE-S**. The last is the **be**haviour-based vision with a **n**iche role for shared micro-mobility, indicated as **BE-N**.

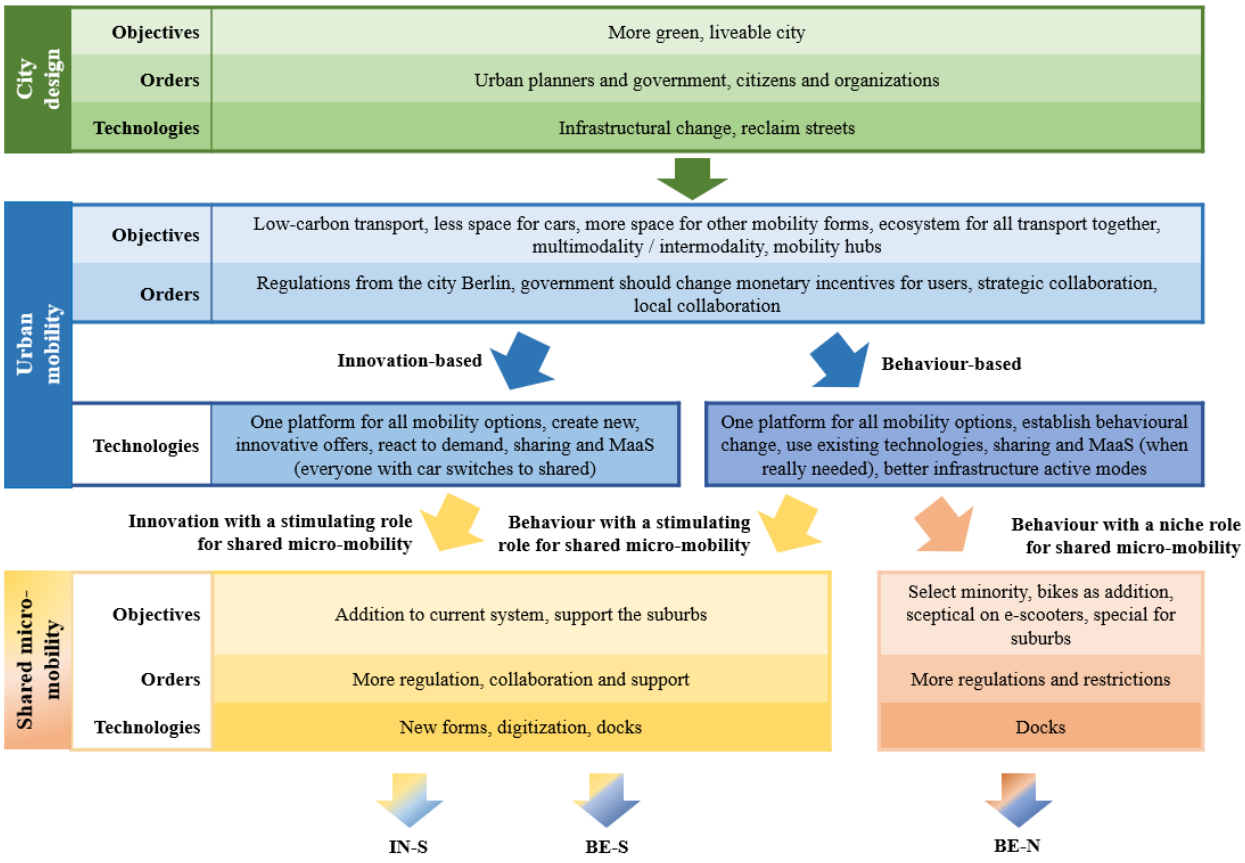

Figure 9. Complete visions visualized in a tree diagram

5.5 Analysis of the visions

5.5.1 Similarities and differences between the visions

The conformity on future city design is remarkable. All sources agree on a greener and more liveable city, the technologies used to reach this goal and how the orders need to change. There were no major differences between sources visible. For the future of urban mobility, there was also much conformity. All sources see a city with low-carbon transport. What makes this so interesting, is the fact that the end goal is the same for everyone, although the means to get there might be different. A city that is more liveable, with less cars and more low-carbon transport. A city where mobility works efficient (optimisation of the transport ecosystem, multimodality) without clogging the streets. During the interviews, respondents often stated the unwillingness of car users and the car industry to change, but during the interviews and document research with these groups, this appeared to be different. Their vision corresponded with the rest. This shows that there is more overlap between the respondents than they expected themselves, which could stimulate collaboration initiatives.

Another agreement in all visions was the need to create a transport ecosystem that offers a better integration of current and new low-carbon transport modes as well as several transport mode options in a flexible and customizable way. This way, personalized multimodal trips are possible and have the potential to decrease car use. To support such a transport ecosystem, a MaaS platform could help.

In all visions, there is a large role for the government. This governmental involvement can be seen in two-fold. First, a regulating role for current problems in the transport systems is requested (such as the regulation of car parking and shared micro-mobility externalities). Second, a supporting and collaborating role is desired, which would mean more involvement with mobility, working together with mobility companies and supporting the wanted improvement of the transport ecosystem. Most important would be the creation of the MaaS platform, where the government might play a guiding role.

5.5.2 Analysis on shared micro-mobility visions

The regulatory role for the government is more complex for shared micro-mobility than for urban mobility, since not all visions agree on this. The niche vision group does not see a collaborative role for the government, since they do not think money and resources should go to a service that is in their opinion not suited for extensive use. Since this is a small group, it is important to state that most sources do think the role of the government is twofold. First, a regulatory role and, second, a supporting and collaborating role.

Since the suburbs (outside the Ringbahn) are now often excluded from shared mobility offers, but at the same time have the highest car ownership and car use of the city, the visions state that the suburbs deserve more attention. This way, the transition to a city with less cars will get closer. Since this often does not come from companies themselves, the government should get involved with this more, in a collaborative manner. How this should be done exactly, is not yet clear from the visions.

Another interesting discovery in both visions on shared micro-mobility is the preference for docked vehicles instead of the existing dockless systems. Although many people mentioned this, it was never seen as a must have but more as a nice to have, since it solves many problems that shared micro-mobility now causes (cluttering of streets, charging issues, vandalism). It is however clear that the availability of the service should not decrease. The dockings are supposed to be close together (junctions and crossroads are mentioned most). Since this is in the hands of the municipality, again this is seen as a job they should do in collaboration with the shared micro-mobility companies and that potentially regulation is necessary.

5.5.3 Proposed routes towards the envisioned futures

Although focusing on behaviour versus innovation seem two very different routes, they do not necessarily exclude each other. The concern from sources that do not see technology and innovation as the solution (in vision BE-S and BE-N) is about the trust put into these new technologies, as if they would solve the current problems without the need for behavioural change. Most of them still prefer bikes over new innovations, but they do not think innovation is unquestionably a bad thing. Especially when zooming in on shared micro-mobility, this is often (by vision BE-S) seen as a positive addition to the current system. Correspondingly, sources that do see innovative new transport offers as important, do not say changing behaviour is not a possibility as well (vision IN-S). This would indicate that there is the possibility of using both routes and not see them as mutually excluding ones. By on the one hand working on new innovations in transport (C in figure 10) and on the other hand invest in behaviour campaigns (A), there might be a faster transition than just focusing on one of them, since the groups

work together. Also, change through more regulations and support from the government (B) overlaps between the two visions. This leads to the combination of routes as follows:

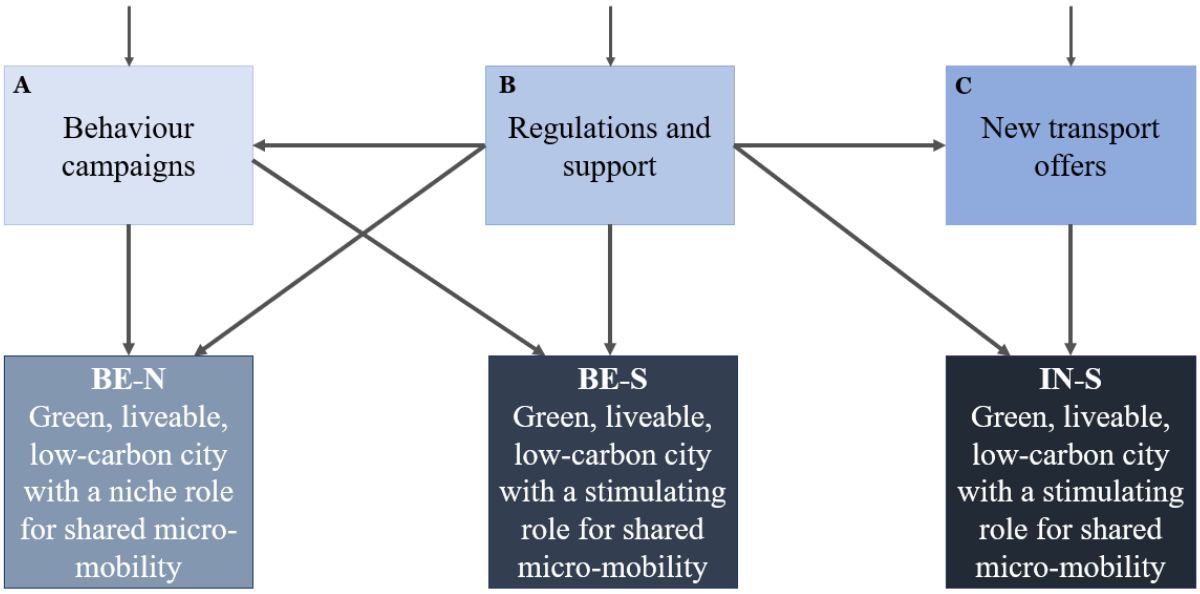

Figure 10. Proposed routes towards visions and the specific role of shared micro-mobility

6. Discussion

In this section, the theoretical implications stemming from the conclusions of this research will be discussed, together with a review of the limitations of this research.

6.1 Theoretical implications

This research is based on identifying visions. The found visions have several indications for the theory on visions for the future, being: collaboration and planning, and the existence of sociotechnical imaginaries. This will be discussed below.

6.1.1 Need for collaboration and (policy) planning

Coalitions of actors are crucial for the success of a transition (Bergman, 2017; Smith et al., 2005). The findings of this research show there is indeed potential for actors with different visions to simultaneously work on a transition, due to the resemblance between the visions. What set them aside for the most part, were the chosen measures and not the end goal. At the same time, the actors were not aware of the resemblance with disparate groups. This supports the argument that by identifying visions, actors with different visions can be brought together to create coalitions of support.

Not only collaboration is necessary to reach a transition, a coherent plan on how to get to the vision is crucial as well (Tight et al., 2009), which is supported by the findings of this research. Currently, there seems to be a lack of policies and planning regarding shared micro-mobility, which should change. Suggestions for policy plans are supporting better integration with the urban transport ecosystem (docks, include the suburbs) and regulations against the current negative externalities (mainly the cluttering of streets). When creating such a policy plan, the government should involve stakeholders, public agencies and mobility actors to support this cause together (Cohen & Shaheen, 2019). So, policy planning is indeed important when it comes to shared micro-mobility, either for cities such as Berlin where a plan is lacking, or in cities that do not yet have shared micro-mobility offers due to regulations or size, but plan to.

6.1.2 Indications for sociotechnical imaginaries

The visions identified through this research showed considerable overlap. Especially city design enclosed one consistent vision. This implies the vision is becoming a sociotechnical imaginary. As explained in the theoretical section, a socio-technical imaginary indicates a vision being institutionally stabilized and could already shape the actions taken right now. This seems to be the case for Berlin, as it is already on its way to become less car focused, by implementing new regulations such as the introduction of a low emission zone within the Ringbahn in the Federal Emission Protection Act (Fünfunddreißigste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes, 2015).

For urban mobility, the difference between the visions could mean there are already two competing socio-technical imaginaries but could also show a lack of socio-technical imaginary for the time being. The latter is more in line with the results, since the visions are ambiguous concerning the exact objectives of the future transport system in the city. Both visions comprise many possibilities, such as all different ways of embedding low-carbon vehicles in the future ecosystem for mobility. Even

the overlapping objectives, such as a better ecosystem for multimodal urban transport, showed diverse options on what such an ecosystem should be exactly.

There is not yet a socio-technical imaginary for shared micro-mobility, as the visions on this level are mainly focused on changing the current negative externalities, and less on a future image of the system. Most suggestions for the future of shared micro-mobility are solutions for these externalities, and not really a clear perception of the future. An explanation for this could be the uncertainties surrounding shared micro-mobility, which can impact the forming of visions (Costanza, 2000). These uncertainties for shared micro-mobility stem from the rapid emergence of the systems, corona impacts, economic problems within the mobility companies and changing regulations. As a result, these uncertainties seem to create a barrier to form a common vision for shared micro-mobility. Considering that socio-technical imaginaries are helpful for transitions, it is recommended to take away some of these uncertainties. For example, by clearly stating the role shared micro-mobility is aimed to have by the city itself. This is in line with the aforementioned need for a (policy) plan as stated in the subsection above.

6.1.3 Further research

There are several suggestions for further research to be made. These all concern the implementation or desirability of the visions. First several general implications for further research will be given. Lastly, further research specific for shared micro-mobility is suggested.

The aforementioned possibility of merging the two urban mobility visions by both focusing on behaviour campaigns as well as on new offers, does raise some questions. Firstly, combining both routes could result in a policy paradox (Stone, 2012). Such political choices could induce conflict over simple trade-offs, such as how to divide money between the deployed routes of the two visions. Further research into this potential trade-off can support the actual choices to be made. Secondly, it is important to first research the desirability of the visions and routes in terms of sustainability (or if it truly supports a green, liveable and low-carbon city) before choosing how to implement the routes. The discrepancy between the two visions seems to conform with tensions previously found between visions on, and the actual practices of, smart-cities (Martin, Evans & Karvonen, 2018), which are mainly tensions between consumerism/growth and sustainability. For suggestions on how to research this, see the work of Martin et al. (2018).

One important and much discussed objective for urban transport in the future is the need for a transport ecosystem that supports multimodal travel. The visions show the technology behind this to be a MaaS platform (like Jelbi[7]), although there was no decisive answer on the specifics. The hesitation occurred mainly on the grounds of privacy issues, (data) control and the acceptance of companies to work with such a platform. It is advised these issues are first tested in living labs, where citizens, organisations, knowledge institutes and the government co-create practical innovations for complex societal issues (Maas et al., 2017).

Further research on shared micro-mobility

Originating from the visions, several changes could be made in the role shared micro-mobility plays in cities. The most important were: including the suburbs in the shared micro-mobility schemes,

[7] Jelbi is a platform run by the BVG and aims to connect all types of mobility in the city. In 2020, a minority of the offers are available in the app.

using shared micro-mobility to create a better ecosystem for transport in the city and creating docking stations. All will be discussed below, first in general and then in the specific context of Berlin.

These topics are not new to the shared micro-mobility research field. The difference between urban and suburban areas has been acknowledged recently, together with the opportunities for including the suburbs (Shaheen, 2020). Furthermore, the integration of shared micro-mobility with other modes of transport, through MaaS models, has already been increasing over time (Lazarus, et al., 2017). As for docked versus dockless systems, the debate has been going on for some years. The dockless systems are in fact new compared to docked systems (Fishman, 2016), and are often low in costs and perceived as convenient to use (Gu, Kim & Curry, 2019). On the other hand, problems with these systems found in research are similar to what is found in this research; The financial sustainability can be a problem, as well as vandalism. From the current research, there were additional reasons to prefer docks. It can decrease the cluttering of streets and it can be combined with charging, since e-scooters, e-mopeds and e-bikes need to be charged. Actually, the fact that vehicles need to be charged contributes considerably to the costs of these vehicles (Zu et al., 2020). Given these points, research into the consideration between docked or dockless systems should be investigated further.

The exact reasoning and further implementation of these changes in the role of shared micro-mobility are also context specific. For example, the importance of docking stations in these visions could stem from the limited amount of micro-mobility parking space available right now in the city Berlin, although more parking facilities are being installed due to the new Mobility Law (Fahrrad-Parken: Sicher abstellen, 2020). Another example is the mention of placing docks at junctions, which could also be a specific vision for Berlin, since parked cars currently block (dangerous) junctions which can cause accidents (O'Sullivan, 2017). To understand how to exactly implement the new role for shared micro-mobility in Berlin, context specific research can be done to discover this further. For example, what wishes would exist in the suburbs of Berlin when it comes to shared micro-mobility, how exactly shared micro-mobility complements the current transport system in Berlin or in what way docks should be integrated in the city. One way to do this is to run a pilot in the suburbs.

6.2 Limitations

6.2.1 Selection bias

A first limitation to this study is a possible selection bias in the sample. Most actors involved with mobility were involved with a transition in this field which could have biased the outcomes. To overcome this bias, special attention was paid to also include car users and the car industry. Since the visions of these sources corresponded with the visions of the other actors, it is questionable if real car fanatics were not excluded and what impact this might have had on the results. On the other hand, the city Berlin has a relatively low car dependency amongst citizens compared to other cities in the world (von Behren et al., 2018) and 60% of the citizens were willing to accept a car-free city centre with the current infrastructure. This percentage rises to over 90% when bike infrastructure is improved and public transport fees are lowered (Gundlach et al., 2018). This shows a general acceptance of a future with less cars in the city.

6.2.2 Generalizability

The most important limitation of this study is the generalizability, since the findings from a single case study are not as powerful compared to those from a multiple-case design (Yin, 2018).

Furthermore, the city Berlin was chosen due to its interesting position when it comes to shared micro-mobility. Since all cities are different in their design and approach to shared micro-mobility, it is hard to generalize the results from this research to other cities. Still, several general findings can be useful for other cities. For example, when cities intend to allow shared micro-mobility for the first time. The Berlin case has shown the need for a policy plan when implementing the shared services in the transport sector.

6.2.3 Corona impacts on results

Another potential limitation to this study is the impact of the Corona pandemic[8] on the results of the study. Starting March 15, 2020, physical meetings where discouraged by the German government and many people worked from home. This resulted in over half of the interviews being held online and several respondents being occupied with the new and uncertain circumstances in their professional and private lives. Furthermore, the lockdown measures also impacted mobility in Berlin (and the whole of Germany) in general. During interviews several of these uncertainties and changes were discussed, which indicates a potential (temporary) change in the visions of the actors.

[8] On March 11th, 2020, the World Health Organisation (WHO) announced the worldwide outbreak of the COVID-19 virus to be an official pandemic. For more information, see the website of the WHO.

7. Conclusion

7.1 General conclusions

This research examined the role of shared micro-mobility in visions for the future of the city Berlin. By mapping existing visions from actors in the urban transport field, the following research question was aimed to be answered:

'How does shared micro-mobility play a role in visions of the urban transport future in Berlin?'

Two distinctive roles for shared micro-mobility were found, one being a stimulating role, the other being a niche role. The first vision states shared micro-mobility to be able to support low-carbon transport in the city, since it is an addition to other modes of transport when needed. This promotes intermodal travelling and leads to less car use. The niche vision only sees a select group using the shared micro-mobility offerings, which means there will be limited shared bikes available and even less to none e-scooters.

Since these roles for shared micro-mobility are inseparable from visions on city design and urban mobility, they are integrated in overarching visions. The found base for all visions is a green, low-carbon and liveable city. From this, two visions on urban mobility emerged where one vision sees new innovations as important for change. In this vision, shared micro-mobility always plays a stimulating role. In the other visions, behaviour is more important than new innovations and technological solutions and was therefore named the behaviour-based vision. In this vision, shared micro-mobility either plays a stimulating role or a niche role. This results in three visions:

1. A green, low-carbon and liveable city with a large role for innovation, and a stimulating role for shared micro-mobility
2. A green, low-carbon and liveable city with a focus on behavioural change, and a stimulating role for shared micro-mobility
3. A green, low-carbon and liveable city with a focus on behavioural change, and a niche role for shared micro-mobility

There is a high congruence between these visions for the future, especially when it comes to the objectives and orders of the visions. This is not only the case for city design (the base of all visions), but also for urban mobility where low-carbon transport, less cars and a better ecosystem for transport were important objectives in all visions, and regulations by the city of Berlin and collaboration were important orders. For shared micro-mobility, the objectives to focus on the suburbs and implementing docking stations where important in all visions. Furthermore, all visions see more regulations as a way to solve current problems with the micro-mobility systems. The biggest difference is seen in the technologies used in the visions, where one group states innovation to be more important and the other change in behaviour. Overall, there were many more similarities than differences between the visions.

7.2 Implications for the future

Since coalitions of actors that work together are important to reach desired futures, this shows optimism for the future of urban transport in Berlin. The next hurdle will be the alignment of measures to take to get to the wanted future, namely the difference between innovative interventions and

interventions to change behaviour. The visions all show a large role for the government to steer this process, together with citizens and companies.

The changing role for shared micro-mobility according to the visions mainly means the negative externalities should be diminished and the integration with current transport in the whole city should be increased. To establish this new role, there is a need for more involvement from the government. They should do this in two different ways, first regulate the current externalities of shared micro-mobility and second, adopt a supporting role for the suggested new implementations of shared micro-mobility, such as expanding the services to the suburbs of Berlin and effectuating docking stations. Following this, it is recommended that before implementing these plans, further research is done into the exact implementation.

To conclude, shared micro-mobility can support easily accessible intermodal traveling. When organised the right way, it is envisioned to support change towards a green, liveable, low-carbon city with less cars.

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Appendix A · Interview guide

Semi-structured interview guide English

I. *Thank you again for participating in my research on shared micro-mobility in Berlin.*

II. *Before we start, I would like to ask your permission to record this session, for transcribing purposes. The recording will not be shared with any third parties and will be deleted after the research is finished. Do you give permission?*

III. *As I stated before, my research here in Berlin is on the future of shared micro-mobility. In my case, I will be looking at the visions actors in the transport sector have on shared micro-mobility. The definition I use for shared micro-mobility is 'the short term rent of small vehicles, for example bicycles and (e-)scooter, excluding larger vehicles such as cars.*

IV. *Before we go into this, I would like to know a little bit more about you.*

Organisation and role

1. Could you first shortly describe your organisation?
2. What is your specific role in the organisation?

General visions

3. Before we go into shared micro-mobility, I would first like to go into more general visions of city design in Berlin in the future. Could you explain to me how you think the overall city design of the city will be in the future (and why).

a. If more information is requested: In this case city design is very broad. It has mostly to do with how the city looks like, but of course invisible infrastructures can also be important.

b. Follow up on objective(s) if this is not stated clearly yet.

4. Could you explain more about the specific technologies you just mentioned / What specific technologies would go with this vision according to you?

5. How are the institutions involved in this vision? What is their relationship with other important entities?

6. Are there any specific changes or pathways you think are needed to get to a city like you described?

Visions on transport

7. Now let's go more into detail on the transport aspect. Could you describe how you envision the transport sector in Berlin in the future?

a. *Follow up on objective(s) if this is not stated clearly yet.*

8. Could you explain more about the specific technologies you just mentioned / What specific technologies would go with this vision according to you?

. *If shared micro-mobility is stated:* We go into the shared micro-mobility later.

9. How are the institutions involved in this vision? What is their relationship with other important entities?

- *Follow up if the answer seems to be different from the general vision.* Is this different from your general vision and, if so, why?

10. *If not mentioned:* How does this vision correspond with the vision for the city you just described?

11. Are there any specific changes or pathways you think are needed to get to a transport system in the city like you described?

Shared micro-mobility

12. So, let's move on to shared micro-mobility in specific.

a. If not mentioned yet: Do you see a role for shared micro-mobility in the vision you just described?

b. *If already mentioned:* could you go into more detail on the role of shared micro-mobility in the vision you just described?

13. Could you explain more about the specific technologies that go with shared micro-mobility in the future?

14. *If not mentioned yet:* How are the institutions involved in this vision? What is their relationship with other important entities?

. *Follow up if the answer seems to be different from the general vision.* Is this different from your general vision and, if so, why?

15. If not mentioned: How does this vision correspond with the vision for the city and/or the vision on transport you just described?

16. Are there any specific changes or pathways you think are needed to get to a transport system in the city like you described?

Semi-structured interview guide in German

I. *Nochmals vielen Dank für Ihre Teilnahme an meiner Forschung zur geteilten Mikromobilität in Berlin.*

II. *Bevor wir beginnen, möchte ich Sie um Erlaubnis bitten, diese Sitzung zu Transkriptionszwecken aufzuzeichnen. Die Aufzeichnung wird nicht an Dritten weitergegeben und nach Abschluss der Recherche gelöscht. Wäre das okay für Sie?*

III. *Wie ich bereits sagte, beschäftige ich mich hier in Berlin mit der Zukunft der gemeinsamen Mikromobilität. In meinem Fall werde ich die Visionen der Akteure im Verkehrssektor zur gemeinsamen Mikromobilität untersuchen. Die Definition, die ich für die gemeinsame Mikromobilität verwende, ist „die kurzfristige Miete von kleinen Fahrzeugen, zum Beispiel Fahrrädern und (E-) Rollern, wobei die größeren Fahrzeuge (sowie Autos) ausgeschlossen sind.*

IV. *Bevor wir auf den Inhalt eingehen, würde ich mich freuen, wenn Sie mir etwas mehr über Ihren Hintergrund erzählen können.*

Organisation und Rolle

1. Können Sie Ihre Funktion beschreiben?

Allgemeine Visionen

2. Bevor wir uns der gemeinsamen Mikromobilität zuwenden, möchte ich zunächst auf ein allgemeineres Stadtdesign für Visionen in Berlin eingehen. Können Sie mir erklären, wie Sie denken, dass das gesamte Stadtdesign der Stadt in der Zukunft aussieht?

a. *Wenn weitere Informationen angefordert werden*: In diesem Fall ist das Stadtdesign sehr breit. Es hängt hauptsächlich davon ab, wie die Stadt aussieht, aber natürlich können auch unsichtbare Infrastrukturen wichtig sein. Der Zeitrahmen kann zwischen 2030 und 2050 liegen.

b. Verfolgen Sie die Ziele, wenn dies noch nicht klar angegeben ist.

3. Können Sie mehr zu den Technologien sagen, die Sie gerade erwähnt haben / Welche spezifischen Technologien würden Ihrer Meinung nach zu dieser Vision passen?

4. Wie sind die Institutionen an dieser Vision beteiligt? In welcher Beziehung stehen die Institutionen zu anderen wichtigen Einheiten?

5. Gibt es bestimmte Änderungen oder Wege, die Ihrer Meinung nach erforderlich sind, um zu einer Stadt zu gelangen, wie Sie sie beschrieben haben?

Visionen zum Transport

6. Lassen Sie uns nun näher auf den Transportaspekt eingehen. Können Sie beschreiben, wie Sie sich den Verkehrssektor in Berlin in Zukunft vorstellen?

a. Verfolgen Sie die Ziele, wenn dies noch nicht klar angegeben ist.

7. Können Sie mehr zu den spezifischen Technologien sagen, die Sie gerade erwähnt haben / Welche spezifischen Technologien würden Ihrer Meinung nach zu dieser Vision passen?

. Wenn gemeinsame Mikromobilität angegeben ist: Wir gehen später auf die gemeinsame Mikromobilität ein.

8. Wie sind die Institutionen an dieser Vision beteiligt? In welcher Beziehung stehen sie zu anderen wichtigen Organisationen?

. *Follow-up, wenn die Antwort von der allgemeinen Vision abweicht.* Unterscheidet sich dies von Ihrer allgemeinen Vision und wenn ja, warum?

9. *Wenn nicht erwähnt:* Wie entspricht diese Vision der Vision für die Stadt, die Sie gerade beschrieben haben?

10. Gibt es bestimmte Änderungen oder Pfade, die Ihrer Meinung nach erforderlich sind, um zu einem von Ihnen beschriebenen Verkehrssystem in der Stadt zu gelangen?

Gemeinsame Mikromobilität

11. Kommen wir also zu einer gemeinsamen Mikromobilität.

a. *Wenn noch nicht erwähnt:* Sehen Sie in der soeben beschriebenen Vision eine Rolle für die gemeinsame Mikromobilität?

b. *Wenn bereits erwähnt:* Können Sie die Rolle der gemeinsamen Mikromobilität, in der gerade von Ihnen beschriebenen Vision genauer erläutern?

12. Können Sie mehr zu den spezifischen Technologien erklären, die in Zukunft für die gemeinsame Mikromobilität erforderlich sind?

13. *Wenn noch nicht erwähnt:* Wie sind die Institutionen an dieser Vision beteiligt? In welcher Beziehung stehen sie zu anderen wichtigen Einheiten?

. *Follow-up, wenn die Antwort von der allgemeinen Vision abweicht*. Unterscheidet sich dies von Ihrer allgemeinen Vision und wenn ja, warum?

14. *Wenn nicht erwähnt*: Wie entspricht diese Vision der Vision für die Stadt und / oder der Vision für den Verkehr, die Sie gerade beschrieben haben?

15. Gibt es bestimmte Änderungen oder Pfade, die Ihrer Meinung nach erforderlich sind, um zu einem von Ihnen beschriebenen Verkehrssystem in der Stadt zu gelangen?

Appendix B · Tables

Table 13. Attended events in Berlin on transport February 2020

Name and date of the event	Description of the event
Umbau Karl-Marx-Allee: Einladung zum öffentlichen Bürgerdialog Translation: Remodelling Karl-Marx-Allee: Invitation to public dialogue *Date: 10-02-2020*	Karl-Marx-Allee is a major thoroughfare through the city, connecting Alexanderplatz and Frankfurter Tor. It is not only a residential area but also an important commute route (Mitte ←→ Friedrichshain-Kreuzberg). Karl-Marx-Allee has been renovated and redesigned since the summer of 2018. The final phase begins, and the street will be completed in a few months. The Senate Department for the Environment, Transport and Climate Protection has made some changes compared to the original plans. They concern traffic safety, the question of how the district can be made more climate-resistant and how Karl-Marx-Allee, in its overarching meaning for the whole of Berlin, can become a model for city-compatible and climate-friendly mobility. In this meeting, background information is given on the plan and there will be a citizen dialogue.
Kiezblocks – lebendige Straßenräume für alle Translation: Kiezblocks - lively street spaces for everyone *Date: 13-02-2020*	The idea of freeing neighbourhoods from through traffic is also taking up more and more space in Berlin. As in the Nikolaiviertel, Ernst-Thälmann-Park and soon also in the Bergmannkiez, numerous residents of the Ostkreuz, the Samariterkiezes and twelve Pankower Kiezen want to regain public space for everyone. Changing Cities is therefore having a round table discussion with the transport policy spokesmen of the Red-Red-Green Coalition and representatives of civil society to consider together: How do we implement #Kiezblocks in Berlin?
Treffen des Netzwerks Fahrradfreundliches Tempelhof-Schöneberg Translation: Meeting of the network for bicycle-friendly Tempelhof-Schöneberg *Date: 18-02-2020*	The network for bicycle-friendly Tempelhof-Schöneberg wants to make Tempelhof-Schöneberg bike-friendly with wit and activism. During this meeting, they are considering new activities in different working groups and are planning their next steps in the district. Anyone is welcome to join with their own topics.
Wissen schafft Durchblick: Wie gestalten wir die Stadt von morgen? Translation: Knowledge creates insight: How do we shape the city of tomorrow? *Date: 20-02-2020*	A panel discussion on the question: How do we shape the city of tomorrow? The social challenges and upheavals of THIS time are reflected in cities in a special way. Very practical, local and convincing solutions for a future worth living must be found. How can cities become greener, more sustainable and more social? Which conflicts between city and nature must be solved and which solutions already exist? In this event, the ideas for Berlin are examined and the potential role of design institutions such as the Museum of Natural History (location) and the Sparkasse (sponsor) are discussed.
Digitaler Salon – Faster, harder, E-Scooter **Translation: Digital Salon - Faster, harder, e-scooter** *Date: 26-02-2020*	In addition to rental bikes and car sharing, e-scooters have now become an integral part of our cities. They ride on bike paths and sidewalks and trigger anger, euphoria and scepticism at the same time. This discussion is be about the implication this new type of mobility means for cities. Why is public space given to private companies and what actually happens to the movement data? Who uses these e-scooters and for which user groups are these mobility offers based on digital technologies developed? How are offers created that are accessible to all citizens? And what will the mobility of the future look like in digital cities?

Table 14. Documents on urban transport futures used for coding

Name of the document	Author	Found through
The Evolution of Mobility	ADAC & ZukunfstInstitut	On website ADAC
Description The ADAC sees mobility changing and presented this study, conducted by the ZukunftInstitute, on the future of mobility. The research is about long-term trends and developments that, based on people's needs, could dominate mobility behaviour up to the year 2040.		
Reference ADAC ZukunftInstitute (2017). *The Evolution of Mobility.* München		
Urban mobility 2030: case study for Berlin	McKinsey & Company	Incognito search on Google: 'urban transport future Berlin'
Description The new forms of mobility also offer the potential to create economic value. In the study presented here, McKinsey & Company examined how Berlin, Germany's largest city, can profit from intelligent mobility solutions.		
Reference McKinsey & Company (2016). *Urban mobility 2030: How cities can realize the economic effects – case study Berlin.* Berlin		
Abgefahren! Infographic on transport	Agora Verkehrswende	Recommended by Felix Creutzig
Description Agora Verkehrswende published „12 Thesen zur Verkehrswende" (*12 theses on a traffic transition*)" and decided to repackage it into an infographic, based on scientific knowledge, to interest more people for the topic.		
Reference Agora Verkehrswende & Ellery Studio (2019). *Abgefahren! Eine infografische Novelle zur Verkehrswende.* Berlin		
Transportation Urbanism	Rafael Herzberger, Haowen Wu and Till Zihlmann	Recommended by Raoul Bunschoten
Description For a course from Chora conscious city, three students created the ideal city of the future in terms of transport. They created mobility pathways from the IPCC Report 2019		
Reference Herzberger, R., Wu, H., & Zihlmann, T. (2020). *Transportation Urbanism.* TU Berlin		
Berliner Mobilitätsgesetz (5-7-2018) *Translation: Berlin Mobility Law*	Gesetzgeber Berlin	Incognito search on Google: 'visions for the future transport Berlin'
Description The goal to make Berlin more mobile, safe and climate-friendly came about in the Mobility Law. All modes of transport - i.e. bus, train, bike, car, foot traffic - are considered with their strengths. The environmental association of pedestrian and bicycle traffic as well as public transport plays a special role because it is very efficient in the areas required.		
Reference *Berliner Mobilitätsgesetz (5-7-2018).* 9240-4, GVBI		

Table 15. Codes with total sources, responses and corresponding percentiles for city design

Codes on city design	Sources	Responses	Percentile
Less pollution in the future	11	11	P75
Resilient cities for climate change	6	8	P50
More pedestrian zones	12	14	P75
Create a liveable city	13	14	P75
Children can play outside / Streets for children	8	11	P50
Calmer city / Less noise	8	10	P50
City (areas) as places where people can hang out	5	6	P50
Connect with neighbours	3	3	P25
More interaction on the streets	3	4	P25
More life on the streets	3	3	P25
Bigger role for the public / Involve locals	7	7	P50
Get rid of wrong regulations	6	9	P50
More courage from the government	5	5	P50
More urban planners / Use an urban planning method	3	3	P25
Politics in Berlin are slow / Much bureaucracy in politics	4	8	P25
Free up the car parking spaces and reassign for other things	20	21	P100
Green is important in the future city	13	17	P75
Ecological city	2	2	P25
Freiraum / Free or open spaces	3	3	P25

Table 16. Codes with total sources, responses and corresponding percentiles for urban mobility

Most important codes	Sources	Responses	Percentile
Better regulation for mobility / more regulations	13	19	P75
Parking is too cheap / will be more expensive	7	7	P50
Politics should get more involved with traffic	3	3	P25
Regulations are focused on cars	3	3	P25
Responsibility between governing bodies can be a problem	4	5	P25
Mindset change / generation shift	6	7	P75
Awareness campaigns	4	5	P50
Let people experience alternatives	4	4	P50
Focus on behaviour, not technology	4	5	P50
Show people they do not need their car	4	5	P50
Collaboration between actors / companies in the sector	9	16	P50
Involve local companies / local authorities	9	9	P50
More / better / faster public transport	18	21	P100
Ban on polluting cars	7	8	P50
Existing transport (walking, cycling, public transport) will be most important	5	5	P50
Focus on the suburbs and transport after end stations	7	8	P50
Inclusiveness for all inhabitants / mobility for everyone	7	9	P50
Low carbon city due to low carbon transport	7	9	P50
Parked cars are a big problem	19	20	P100
Cars are a (big) problem (in general) / they own the streets	10	14	P50
Less (space) for cars (in general)	9	13	P50
Parts of the city will be car free	9	10	P50
The suburbs can be a problem if we want less cars	10	11	P50
More safety on the streets	10	14	P100
Invest in infrastructure for active modes (walking, cycling)	3	4	P50
More space for other mobility modes	7	7	P50
Intermodality / multimodality	13	20	P75
Being able to choose from different mobility options	7	8	P50
Mobility hubs	11	14	P50

Platform for mobility / one app	9	16	P50
Multimodal tickets	7	7	P50
Easy way to plan a trip / convenience	5	6	P50
Ecosystem for transport	3	3	P25
We do not know what the future technology will be / It is unpredictable	11	12	P100
Innovative mobility to give people what they want	4	6	P50
Technology alone will not get us there	4	4	P50
Technology is only a tool	2	2	P25
Use existing technologies / We already have it	2	3	P25
Cars are too cheap / Increase costs for cars	9	11	P50
Increase parking costs	7	7	P50
Cheaper public transport	3	3	P25
Wrong incentives for car use	3	4	P25
Car sharing and carpooling are important	7	7	P75
More MaaS in the future	11	11	P75
Car and ride sharing for special circumstances	4	4	P50
Less privately-owned vehicles in the future	8	8	P50
MaaS and sharing for people who still want a car	3	3	P50
Sharing is the future	5	5	P50
Ride sharing busses (as public transport)	4	5	P25
Sharing is the future	5	5	P25

Table 17. Codes with total sources, responses and corresponding percentile for shared micro-mobility

Most important codes	Sources	Responses	Percentile
Shared micro-mobility will play a role in the future (in general)	10	12	P75
New forms or vehicles for shared micro-mobility	6	6	P50
Shared bicycles are important in the future	6	6	P50
Shared cargo bikes should play a role	6	9	P50
Shared E-bikes are important in the future	5	6	P50
Systems do not work now but will in the future	5	6	P50
Collaboration between local authorities and companies	5	6	P50
Contracts for multiple years	2	2	P25
Political involvement to get shared mobility to suburbs	4	5	P25
Addition to current system	9	14	P75
Last-mile problem can be solved	5	5	P50
Dock on every corner / Park at junctions	5	6	P50
Station-based shared bikes and e-scooters are better	4	5	P50
Car parking becomes parking for shared micro-mobility	5	6	P25
Station-based shared bikes are better	3	4	P25
Digitization to support shared micro-mobility systems	6	8	P50
More regulations for shared micro-mobility	13	19	P75
Better parking policy for all shared micro-mobility	11	11	P50
Regulate the amount	2	3	P25
E-scooters are for tourists	3	3	P75
No need for e-scooters	2	3	P75
E-scooters are for fun	3	3	P50
People already have their own bike	2	2	P50
Suburbs should be included	6	7	P50
Competes with walking and cycling	2	3	P25
Reliability is important, especially in the suburbs	3	3	P25

Appendix C · Figures

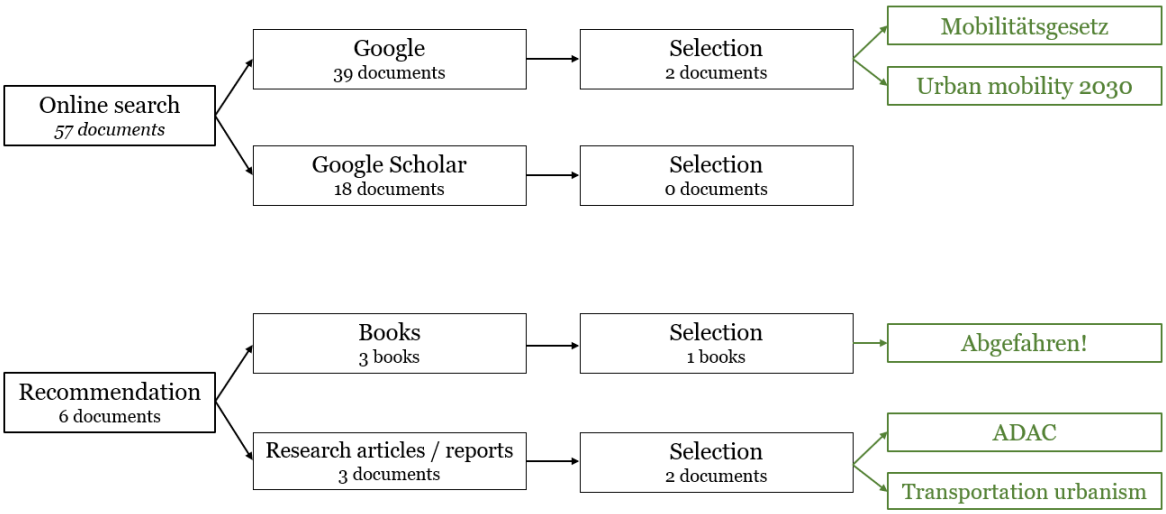

Figure 11. Selection procedure during document research, both online and from recommendations

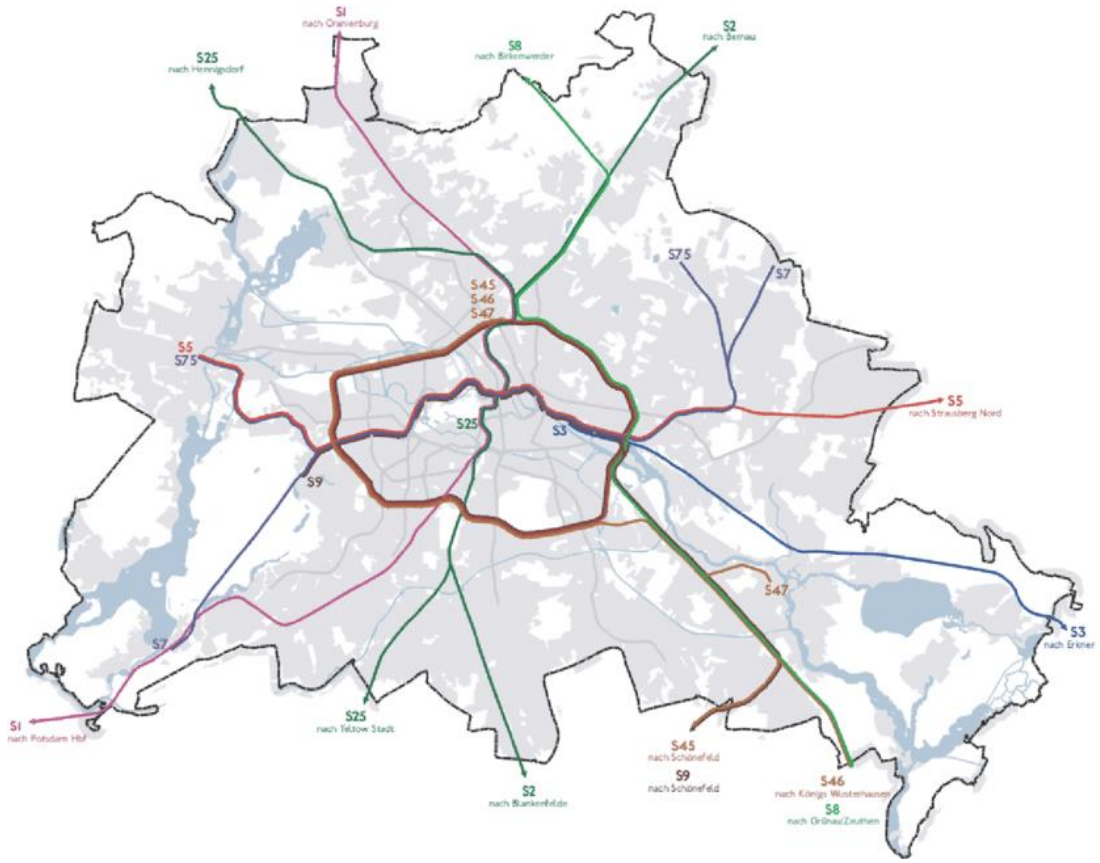

Figure 12. Map of railways in Berlin, including the Ringbahn (Peters, 2010)

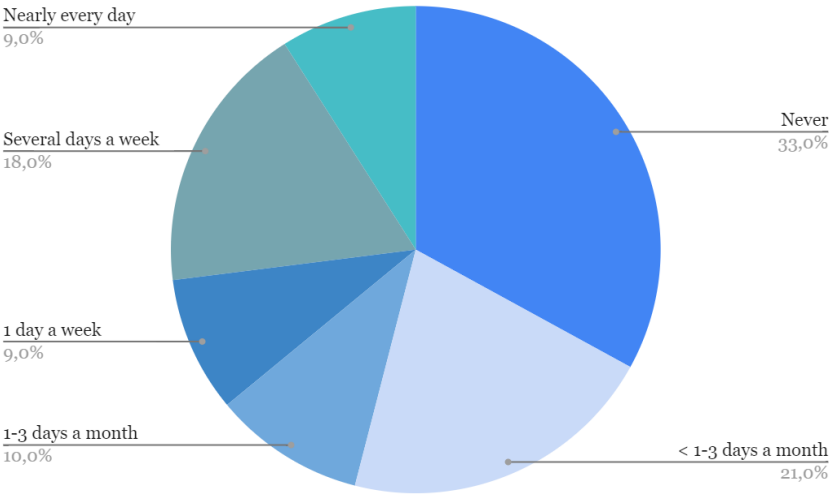

Figure 13. Average use of bicycles in Germany, adapted from Statista (2018)