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Living in a car-free housing development
Motivations and mobility practices of residents in nine developments in Switzerland and Germany

Daniel Baehler

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Living in a car-free housing development: motivations and mobility practices of residents in nine developments in Switzerland and Germany

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Abstract

Cars and the system of infrastructures and urban forms built to support them have many negative impacts such as pollution, greenhouse gas emissions and a high land use, particularly in cities. In response to this, car-free housing developments have emerged in different Western European cities. In these real-world laboratories of a mobility transition, residents commit to living without a private car in the long term. To overcome a car-centred society, it is important to understand why some households choose to voluntarily live car-free and move to these developments, and how they are mobile.

This thesis represents the first large-scale study of car-free housing residents. It analysed nine developments, five in Switzerland (Burgunder in Bern, FAB-A in Biel/Bienne, Giesserei in Winterthur, Oberfeld in Ostermundigen and Sihlbogen in Zurich) and four in Germany (Klein Borstel and Saarlandstraße in Hamburg, Stellwerk60 in Cologne and Weißenburg in Münster). These sites include a diversity of car-free developments in terms of different dwelling types (even though six of them represent forms of collaborative housing), sizes, ages and localisations. A mixed methods approach was adopted to study the residents' profiles, motivations and practices as well as their evaluation of the spatial and social context necessary to live car-free. A self-administered questionnaire survey (n=500) carried out in all nine developments was combined with in-depth interviews (n=50) conducted in six of them.

The analyses show that the residents have very particular profiles. They have a high level of education and ethical or altruistic values are very important to them. Nearly half of the households are families. Almost all of them live deliberately without a private car and this does not represent a sacrifice for them. Their motivations for living car-free refer mainly to a combination of practical and personal reasons. The first type of motivation includes no need for a car and the availability of alternative transport modes, the second mainly revolves around ecological motivations. Conversely, the affordability of a car as well as health or age reasons are of very little importance. The motivations to move to a car-free housing development are similar, practical reasons such as the accessibility of the location are highlighted, but social aspects such as living in a community are important, too, particularly in the cooperative housing projects.

The analyses of the residents' mobility capital and practices revealed four types of strategies how to be mobile without owning a private car. First, car-free housing residents rely on (augmented) alternative transport modes, i.e. the bicycle (with a trailer or as an e- or a cargo bike), public transport and walking. Second, they use mobility and transport services, including taxis and delivery services, but also limited use of (carsharing or other borrowed) cars. Furthermore, digitalisation facilitates car-free living, especially smartphone apps allowing access to all mobility forms and supporting their use. Third, the inhabitants favour car-less accessibility and, thus, proximity often influences the localisation of their everyday activities. Fourth, the community of car-free residents appeared important, too. On a practical level, neighbourly help or common activities in the development facilitate car-free living, but, beyond that, the community also empowers the residents and "normalises" this way of life.

Despite clear general tendencies for motivations and practices, an important diversity of car-free residents exists. A typology of lifestyles allowed us to uncover them. Based on their values and motivations to live car-free as well as on their mobility practices, six lifestyles of car-free residents were found: ecological, pragmatic and utilitarian cyclists and the same three types of multimodals, ecological, pragmatic and utilitarian.

Finally, a certain spatial and social context is also necessary to live car-free. On the one hand, it consists of transport and other infrastructures such as local supply or spaces for common activities in the development. On the other hand, it includes immaterial aspects, particularly social norms allowing to consider car-freeness.

In brief, a system of car-free mobility needs to be set up to overcome automobility. It consists of various individual strategies, but also of a spatial and social context allowing car-free living.

Résumé

Les voitures et le système d'infrastructures urbaines construit autour d'elles ont de nombreux impacts négatifs tels que la pollution, les émissions de gaz à effet de serre et une importante consommation d'espace, en particulier dans les villes. En réponse à cette problématique, des habitats sans voitures ont émergé dans différentes villes d'Europe occidentale. Dans ces laboratoires d'une transition vers une mobilité durable, les habitant·e·s s'engagent à vivre sans voiture sur le long terme. Pour surmonter une société basée sur la voiture, il est important de comprendre pourquoi certains ménages choisissent volontairement de vivre sans voiture et d'emménager dans ces habitats, ainsi que les caractéristiques de leur mobilité.

Cette thèse représente la première étude à grande échelle de résident·e·s d'habitats sans voitures. Elle a analysé neuf quartiers, cinq en Suisse (Burgunder à Berne, FAB-A à Bienne, Giesserei à Winterthour, Oberfeld à Ostermundigen et Sihlbogen à Zurich) et quatre en Allemagne (Klein Borstel et Saarlandstraße à Hambourg, Stellwerk60 à Cologne et Weißenburg à Münster). Ils couvrent la diversité des habitats sans voitures en termes de types de logements (six d'entre eux représentent des formes d'habitat collaboratif), de taille, d'âge et d'emplacements. Une approche basée sur des méthodes mixtes a été adoptée afin d'étudier le profil des ménages, leurs motivations, leurs pratiques, ainsi que leur évaluation du contexte spatial et social nécessaire pour vivre sans voiture. Une enquête par questionnaire auto-administré (n=500) réalisée dans les neuf quartiers considérés a été combinée avec des entretiens approfondis (n=50) menés dans six d'entre eux.

Les résultats des analyses démontrent que les habitant·e·s ont des profils particuliers à plusieurs égards. Ils et elles ont souvent un haut niveau de formation et accordent une grande importance à des valeurs éthiques ou altruistes. Presque la moitié des ménages sont des familles. Quasiment tous les ménages vivent volontairement sans voiture sans que cela ne représente un sacrifice pour eux. Leurs motivations à vivre sans voiture se réfèrent surtout à une combinaison de raisons pratiques et personnelles. Le premier type de motivations inclut le fait de ne pas avoir besoin d'une voiture ainsi que la disponibilité de modes de transports alternatifs tandis que le deuxième type représente principalement des motivations écologiques. Au contraire, les raisons financières ainsi que de santé ou d'âge n'ont qu'une très faible importance. Les motivations pour emménager dans un habitat sans voitures sont similaires. Les raisons pratiques telles que l'accessibilité de la localisation, mais aussi des aspects sociaux tel que le fait de vivre en communauté, en particulier dans les coopératives, sont mis en évidence.

L'analyse du capital de mobilité et des pratiques des résident·e·s a révélé quatre types de stratégies permettant d'être mobile sans posséder une voiture. Premièrement, les habitant·e·s s'appuient sur des moyens de transports alternatifs (améliorés), en particulier le vélo (avec remorque, en tant que vélo-cargo ou avec assistance électrique), les transports publics et la marche. Deuxièmement, ils et elles recourent à des services de mobilité, comme des taxis et des services de livraisons, mais aussi à l'utilisation ponctuelle d'une voiture partagée. De plus, la numérisation facilite la vie sans voitures, particulièrement les applications pour smartphones qui permettent l'accès à de nombreuses formes de mobilité et facilitent leur usage. Troisièmement, les habitant·e·s favorisent l'accessibilité sans voiture, et donc souvent la proximité pour leurs activités quotidiennes. Quatrièmement, la communauté d'habitant·e·s apparait également comme un facteur important. Au niveau pratique, l'aide de voisinage et les activités communes dans l'habitat facilitent le fait de vivre sans voiture. De plus, l'esprit de communauté encourage aussi les habitant·e·s et « normalise » cette manière de vivre.

Malgré des tendances générales clairement définies concernant les motivations et les pratiques, une diversité d'habitant·e·s existe. Une typologie des modes de vie permet de les mettre en lumière. Sur la base des valeurs et des motivations des habitant·e·s à vivre sans voiture ainsi que de leurs pratiques de mobilité, six modes de vie ressortent de l'analyse : les cyclistes écologiques, pragmatiques ou utilitaristes ainsi que les mêmes trois types de multimodaux, écologiques, pragmatiques et utilitaristes.

Enfin, un contexte spatial et social spécifique est également nécessaire pour vivre sans voiture. Il consiste d'une part en des infrastructures liées à la fois aux transports mais aussi à l'approvisionnement local ou aux activités communes dans l'habitat. D'autre part, le contexte inclut des aspects immatériels, en particulier des normes sociales qui permettent d'envisager une vie sans voiture.

En résumé, un système de mobilité sans voiture doit être mis en place pour surmonter l'automobilité. Il consiste à la fois en des stratégies individuelles variées et en un contexte spatial et social permettant de vivre sans voiture.

Zusammenfassung

Autos und das für sie aufgebaute System an Infrastrukturen haben viele negative Auswirkungen, wie Schadstoff- und Treibhausgasemissionen und einen hohen Bodenverbrauch, insbesondere in Städten. Als Antwort darauf sind in verschiedenen westeuropäischen Städten autofreie Wohnsiedlungen entstanden. In diesen Reallaboren einer Mobilitäts-Transformation verpflichten sich die Bewohner*innen dazu, langfristig ohne eigenes Auto zu leben. Um eine autodominierte Gesellschaft zu überwinden ist es wichtig zu verstehen, weshalb Haushalte sich freiwillig dazu entscheiden autofrei zu leben und in diese Siedlungen zu ziehen, und wie sie mobil sind.

Diese Doktorarbeit beinhaltet die erste gross angelegte Studie von Bewohner*innen autofreier Siedlungen. Sie hat neun davon analysiert, fünf in der Schweiz (Burgunder in Bern, FAB-A in Biel, Giesserei in Winterthur, Oberfeld in Ostermundigen und Sihlbogen in Zürich) und vier in Deutschland (Klein Borstel und Saarlandstraße in Hamburg, Stellwerk60 in Köln und Weißenburg in Münster). Diese beinhalten die unterschiedlichen Arten von autofreien Wohnsiedlungen bezüglich Wohnform (auch wenn sechs davon Genossenschaften oder Wohnprojekte sind), Grösse, Alter und Lage. Ein Mixed-Methods-Ansatz wurde angewandt um die Profile, Motivationen und Praktiken der Bewohner*innen zu erforschen, sowie deren Einschätzung des notwendigen räumlichen und sozialen Kontexts um autofrei zu leben. Eine Befragung mit einem selbst auszufüllenden Fragebogen (n=500) in allen neuen Siedlungen wurde kombiniert mit ausführlichen Interviews (n=50), die in sechs Siedlungen geführt wurden.

Die Resultate zeigen, dass die Bewohner*innen sich durch sehr spezifische Profile auszeichnen. Sie verfügen über ein hohes Ausbildungsniveau und ethische oder altruistische Werte sind ihnen am wichtigsten. Beinahe die Hälfte der Haushalte sind Familien. Fast alle von ihnen leben freiwillig ohne eigenes Auto und dies bedeutet kein Verzicht für sie. Ihre Motivationen autofrei zu leben beziehen sich hauptsächlich auf eine Kombination aus praktischen und persönlichen Gründen. Erstere beinhalten keinen Bedarf für ein Auto und die Verfügbarkeit von alternativen Transportmitteln, letztere vorwiegend ökologische Motivationen. Finanzielle sowie Gesundheits- und Altersgründe spielen hingegen nur für sehr wenige Haushalte eine Rolle. Die Motivationen, in eine autofreie Wohnsiedlung zu ziehen, sind ähnlich. Praktische Gründe wie die Erreichbarkeit der Lage der Siedlung werden hervorgehoben, aber auch soziale Aspekte wie das Gemeinschaftsleben, insbesondere in den Genossenschaften.

Die Analysen des Mobilitätskapitals und der Mobilitätspraktiken der Bewohner*innen zeigen vier Arten von Strategien, die ihnen ermöglichen, ohne eigenes Auto mobil zu sein. Erstens bauen die Bewohner*innen auf die Nutzung von (erweiterten) alternativen Transportformen, d.h. das Velo (mit Anhänger oder in Form eines E- oder Cargo-Bikes), öffentliche Verkehrsmittel und zu Fuss gehen. Zweitens nutzen sie Mobilitätsdienstleistungen wie Taxis und Lieferdienste, aber auch punktuell Carsharing- oder andere Leih-Autos. Ausserdem vereinfacht die Digitalisierung autofrei leben, insbesondere Smartphone-Apps, welche Zugang zu allen Mobilitätsformen ermöglichen und deren Nutzung unterstützen. Drittens favorisieren die Bewohner*innen autofreie Erreichbarkeit und daher für ihre Alltagsaktivitäten oft Ziele in der Nähe. Viertens erschien die Gemeinschaft der Bewohner*innen auch als wichtig. Auf der praktischen Ebene erleichtern Nachbarschaftshilfe oder Gemeinschaftsaktivitäten in der Siedlung autofreies Leben, darüber hinaus stärkt die Gemeinschaft die Bewohner*innen auch und „normalisiert" diese Lebensform.

Obschon für Motivationen und Praktiken klare Tendenzen bestehen, existiert eine grosse Vielfalt an Bewohner*innen. Eine Lebensstil-Typologie ermöglicht es, diese hervorzuheben. Basierend auf den Wertvorstellungen und Motivationen der Bewohner*innen, autofrei zu leben, wie auch auf deren Mobilitätspraktiken, wurden sechs Lebensstile gefunden: ökologische, pragmatische und nutzenorientierte Velofahrende sowie die selben drei Typen von Multimodalen, ökologische, pragmatische und nutzenorientierte.

Schliesslich braucht es auch einen räumlichen und sozialen Kontext, um autofrei zu leben. Einerseits besteht dieser aus Verkehrs- und anderen Infrastrukturen wie Nahversorgung oder Räumen für Gemeinschaftsaktivitäten in der Siedlung. Andererseits beinhaltet dieser aber auch immaterielle Aspekte, insbesondere soziale Normen welche ermöglichen, Autofreiheit in Betracht zu ziehen.

Zusammengefasst muss ein System von autofreier Mobilität aufgebaut werden, um die Automobilität zu überwinden. Es besteht aus vielfältigen individuellen Strategien, aber auch aus einem räumlichen und sozialen Kontext, der autofreies Leben ermöglicht.

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Burgunder, Bern (©Daniel Baehler)

Sihlbogen, Zurich (©Daniel Baehler)

1. Introduction

While the car still dominates transport and space in most urban areas, a new form of sustainable urbanism has emerged in some Western European cities: car-free housing—new-build housing developments where the residents commit to living without a private car. The aim of this thesis is to shed light on car-free housing developments and the households living there, their profiles, motivations and (mobility) practices living without a private car, as well as the context necessary to do so. To start, this part presents the interest of car-free housing and the motivations to study it. Then, the objectives, methods and case studies are summarised. Finally, the structure of this thesis is outlined.

1.1. The interest of car-free housing

The mobility system and, thus, also urban areas in Western Europe are dominated by privately owned cars. The car remains the major transport mode for everyday trips, except in most metropolises where public transport and active mobility modes are predominant (Newman & Kenworthy, 1999). However, in some European cities, there are "Gallic villages" where the residents have chosen to live without private automobiles: car-free housing developments. Their choice is remarkable in the context of a still very car-centred society, structured by the "system of automobility" (Urry, 2004) or "regime of automobility" (Böhm, Jones, Land, & Paterson, 2006). These concepts highlight that a car is more than just a vehicle—a socio-technical system has been built around it, including most forms of spatial organisation depending on it (this will be further explained in chapter 2.1). Starting from North America and spreading all over the world (Urry, 2004, p. 26), the car was initially a symbol of freedom, movement, autonomy, privacy, development and progress (Böhm et al., 2006). There is a "social ideology" (Gorz, 1973) behind the car, trying to maintain the illusion that it remains this symbol despite a completely different context nowadays. In fact, the car is more than just a technical element with its infrastructure, it is the core of a "hegemonic car culture" (Sattlegger & Rau, 2016).

While in many parts of the world, it still fulfils its role of a vehicle allowing to move independently and reach any place at any time, in urban areas, the car system became more and more inefficient with mass motorisation. Moreover, and everywhere, a set of negative effects appeared, including high energy consumption, pollution, greenhouse gas emissions, high land use and externalities as well as inequality, health and security issues (details see chapter 2.2.2). The negative impacts of the car touch particularly urban areas. In Western Europe, they have reached a level where an ecological transition to more sustainable forms of mobility and urbanism has become necessary. Actually, different elements of a "post-car world" (Rigal, Rudler, & Ourednik, 2015) or a "new post-car system" (Dennis & Urry, 2009) appear in big cities: they become attractive places of residence again and cycling is increasing while car use and ownership are declining and the car losing its role of a status symbol, not least in the context of digitalisation which facilitates car-free mobility (details see chapter 2.2.3).

Finally, broader societal changes such as growing individualisation observed for a couple of decades in Western societies (Beck, 1986) also influence and challenge the housing sector (Glaser & Hagn, 2018). Housing is mainly still based on traditional models such as nuclear family households even if these structures are changing, lifestyles diversifying and mobility increasing. A particularly interesting trend in the context of car-free housing is the re-emergence of "co-housing" (Tummers, 2016) or "collaborative housing" (R. Lang, Carriou, & Czischke, 2018)—i.e. collective self-managed or self-organised housing—observed in Europe since the beginning of the 21st century (R. Lang et al., 2018; Tummers, 2016). This "third way of housing" is a pragmatic or idealist response to different challenges characterising life in contemporary Europe. Empirical studies of

co-housing research demonstrate its success for social and environmental sustainability (Tummers, 2016). A broader review of collaborative housing research confirms that most studies insist on strong ideological dimensions of this type of housing. People are often driven by the intention to invent new ways of living (R. Lang et al., 2018). Therefore, similarly to car-free housing, even if it rarely accounts for more than 5% or even 1% of the housing stock (Tummers, 2015), *"Co-housing is promoted as an opportunity for sustainable urban development"* (Tummers, 2016, p. 2036). Furthermore, *"Co-housing initiatives present microlaboratories for new urban models for social interaction"* (Tummers, 2016, p. 2037). Car-free housing can also be considered as real-world laboratories, or "living labs" ("Reallabore" in German) (Defila & Di Giulio, 2018), representing an element of a transdisciplinary research approach by which this thesis was inspired (see chapter 4.2).

1.2. Motivations to study car-free housing

In this context, studying car-free housing residents is particularly interesting because of their long-term commitment to live car-free, not only moral in most cases but confirmed by signing an annex to their rental contract. Unlike other car-free households, their decision to live without a private car is not easily reversible, it needs a change of residence. Hence, for sustainability policies as well as transition initiatives, it is important to understand why households choose to live car-free and what their profiles and practices are. Very little is known about voluntary car-free households, their mobility practices and car-free housing developments. There is only a small number of studies from the 1990s or early 2000s even if, recently, a certain renewal of interest in car-free households or car-free urban developments is observed (see next chapter). Thus, when I started my thesis in 2014, there was an important research gap in the field of car-free housing, confirmed in personal e-mails by Professor Ulrike Reutter and Dr. Steve Melia, two of the few scholars having worked on the subject.[1]

At the same time, even if it remains a niche, there was an important increase in car-free housing developments, especially in Switzerland[2]. Thus, a detailed scientific study comparing different housing developments, looking at recent and older ones and different contexts, seemed of great interest. It also responds to some of the research gaps Ulrike Reutter (2011) identified: the lack of evidence on the sustainability of car-free housing regarding mobility practices of its residents, taking into account subjective as well as objective aspects, and comparing different developments.

Finally, the choice of this topic is explained by personal experiences and motivations, too. Before starting this thesis, I worked at a Swiss environmental organisation (VCS/ATE) where I was, among other tasks, co-director of a platform on car-free and car-reduced housing[3]. In this project, we noticed, too, the research gaps mentioned above and the many open questions relevant not only in a scientific perspective, but also for practice and policy. Therefore, I quickyly choose to make use of the five years I could (partly) spend on my thesis at the University of Lausanne to study car-free housing, also in order to contribute at least a little piece of understanding to achieve the more-than-ever necessary mobility transition. Similarly to what Gibson-Graham (2008) described for economic geography, I understand knowledge as performative and thus the

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[1] Similar research gaps are found for collaborative housing, the organisational form of many car-free housing developments: there is a lack of evidence on their contribution to social cohesion or healthy cities or socio-demographic characteristics of inhabitants (R. Lang, Carriou, & Czischke, 2018; Tummers, 2016).

[2] In Switzerland, they increased from one in 2011 to eight car-free housing developments with 19 and more dwellings in 2014 (Plattform autofrei/autoarm Wohnen, 2019a).

[3] It is called "Plattform autofrei/autoarm Wohnen" in German (see www.wohnbau-mobilitaet.ch) and "Plateforme habitat à mobilité durable" in French (see www.habitat-mobilitedurable.ch).

aim to study this "other world" that car-free housing developments represent also contributes to "*making them visible as potential objects of policy and politics*". (2008, p. 620). Actually, in our car-centred societies, even if car-free households represent the majority in many big cities, urban transport policies often do not reflect this, also because car-free households do not have the same strong lobby as car drivers.

1.3. Objectives, case studies and methods

The aim of this thesis is to shed light on why and how people live in car-free housing developments. In other words, it aims to understand why some people voluntarily stay out of or even quit the "automobile system" and how they are mobile.

The main objectives are to know and better understand these households, especially their profiles, motivations and (mobility) practices. Even if their number and share is growing (see 2.4.1), very little is known about car-free households, especially about people living deliberately without a private car. What is interesting in the particular population of car-free housing residents is their commitment, much stronger than simply not owning a car when living in an urban area, because other households can buy a car whenever they would want to. Residents of car-free housing developments are probably not representative of car-free households in general, but they made an innovative choice. The interest in studying them is to understand why and how this type of urban housing works as well as if and how it contributes to a more sustainable society.

A secondary objective of this thesis is to understand the social and spatial context necessary to live without a private car. We know that in historic, dense, mixed-use urban areas, many households live car-free, not least because of the absence of parking for every dwelling in older buildings dating from before the diffusion of cars. But we know less about how new-build projects need to be designed—and where they should be located—to attract and enable car-free living.

Nine case studies were chosen, five in Switzerland and four in Germany. They represent the diversity of car-free housing. There are pioneer developments existing since the beginning of the millennium as well as more recent ones. They include a very small development of 20 dwellings and one of the biggest with over 400 units. Some developments are located in the city centre while others are at the outskirts of an urban agglomeration. Finally, there is social housing as well as rental and owner-occupied dwellings, developed by cooperatives, public housing societies or private companies.

To gain at the same time an overview about a rather unknown population group as well as to better understand the residents' motivations and practices to live differently than the majority of the population in Germany and Switzerland, one research method is not sufficient. Therefore, a mixed methods approach was adopted. A mainly quantitative survey was used to get an overview over the 1,200 households living in the nine developments while interviews conducted with 50 of them in six developments added qualitative data to illustrate and understand car-free housing residents more in detail. Visits, factual interviews with representatives of the housing developments and other complementary methods were mainly used to analyse the context.

1.4. Structure of the thesis

This thesis contains three segments. The first one includes a literature review, the theoretical framework, the research questions and methods as well as the case studies (parts 2 to 5). The second one presents the results (parts 6–10) and the last one the conclusions (part 11).

To start, part 2 addresses the topic and its broader context, automobility and car-free living, including car-free households and car-free housing. In part 3, the theoretical framework is pre-

sented, including the three main concepts which are mobility, lifestyles and a territory's hosting potential. Part 4 explains the five research questions and the methods used to answer them, mainly a questionnaire survey and interviews. Finally, part 5 presents the nine case studies in Switzerland and Germany.

The second segment contains the analyses of the results. Part 6 addresses the profiles of the car-free households and compares some of their characteristics to the overall urban population. Part 7 answers why households live car-free and why they moved to a car-free housing development. Their different practices are addressed in part 8. First, the mobility capital underlying their mobility practices is presented, followed by the (daily) mobility practices themselves. Then, three particular types of (mobility) practices are analysed: shopping, leisure activities and holiday travels. Part 9 proposes a synthesis of these results through a typology of lifestyles. Finally, part 10 is about the social and spatial context and presents the territory's hosting potential needed for car-free living.

Finally, as usual, the last part (11) includes a synthesis of the results as well as the limits and future research needs. Furthermore, it presents the main messages in a practice-oriented perspective, including recommendations.

2. Automobility and car-free living

The issue of this thesis is embedded in a broader topic that may seem paradoxical at first sight: automobility. Due to the importance of the car in the contemporary mobility system—it actually represents the core of its own system—we first need to review this before car-free living can be addressed. Despite its central importance, not only for transport but for space and society in general, and cities in particular, the car got relatively little attention in social sciences (Canzler, 2016; Sheller & Urry, 2000), even if a substantial volume of works on the automobile was published (Böhm et al., 2006, p. 3). After the presentation of the frame that automobility represents, a brief history of cars and cities as well as a chapter on their negative impacts and one on trends towards a post-car world, show how the ground was prepared for car-free urban areas. Then, a particular type of them is presented—the issue of this thesis: car-free housing. Finally, car-free households in general are addressed.

2.1. Automobility as a system or regime

The car is considered a "symbol of modernity" (Sachs, 1984, p. 46) and thus, automobility is a characteristic of modern societies (Böhm et al., 2006; Canzler, 2016), or *"civil societies of the West are societies of 'automobility'"* (Sheller & Urry, 2000, p. 738). It has configured contemporary economy, culture, politics and society to such an extent that *"Currently, a household with one or more vehicles is considered normal. [...] Few can deny the fact that the possession of an automobile today is the norm of modern society."* (M. Flamm & Kaufmann, 2006, p. 173). In a Swedish study, for most of the interviewed families *"The very idea of living without private cars was not considered a valid option"* (Thomsen & Löfström, 2011, p. 969)—an opinion probably shared by a majority in Western societies. As different authors note, the car is more than a simple mode of transport: it represents a cultural symbol embedded in desires (Sachs, 1984), an ideology (Gorz, 1973) or as Canzler (2016, p. 14) puts it: the car is affecting not only individual actions, thinking and feeling, but also serves the individual's representation and distinction in the social context[4]. As mentioned in the introduction and as this chapter details, the role of the car is changing, but automobility remains crucial.

The automobile is at the centre of a whole system: *"Such a system consists of cars made of steel and weighing about 1 ton, powered by petrol, each seating at least four people, personally owned, and each driven independently of others."* (Dennis & Urry, 2009, p. 28). John Urry offers the most important conceptualisation of what he calls the "system" of automobility: *"Automobility can be conceptualised as a self-organising autopoietic[5], non-linear system that spreads world-wide, and includes cars, car-drivers, roads, petroleum supplies and many novel objects, technologies and signs. The system generates the preconditions for its own self-expansion."* (Urry, 2004, p. 27). With Mimi Sheller they propose *"that automobility should be examined through six interlocking components. It is the unique combination of these components that generates the 'specific character of domination' of automobility across most societies across the globe."* (Sheller & Urry, 2000, p. 738). These six components of "automobility" are:

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[4] *"Das Automobil ist also ein technisches Artefakt, das sowohl individuelles Handeln, Denken und Fühlen affiziert als auch der Repräsentation und Distinktion des und der Einzelnen im sozialen Kontext dient."* (Canzler, 2016, p. 14).

[5] Urry (2004, p. 27) cites Luhmann's definition of "autopoiesis": *"everything that is used as a unit by the system is produced as a unit by the system itself. This applies to elements, processes, boundaries, and other structures and, last but not least, to the unity of the system itself. (1995: 3)".* The Oxford English Dictionary defines autopoietic as self-maintaining and self-regulating.

1. The car as the "quintessential *manufactured object*" produced by one of the most powerful and iconic industries within capitalism of the 20th century, from which key concepts such as Fordism have emerged.
2. The second most important "item of *individual consumption*", after housing, that provides status (through associated values of freedom or flexibility) and is an object generating desire, affection and crime.
3. "An extraordinarily powerful *machinic complex*" linked technically and socially to other sectors, including oil and road construction, but also urban design and planning.
4. The major form of "quasi-private" *mobility* which subordinates other types of mobility and influences people's everyday life in determining how, when and where activities can take place.
5. The dominant *culture* at the base of major discourses about the good life, citizenship of mobility, and which provides a potent source for literature and other arts.
6. One of the most important causes of *environmental resource-use* and of emissions and pollution with consequences on health and social life.

Urry insists on the "lock-in'[6] this system created since the end of the 19th century, not only for economies, but also for social life (Urry, 2004, p. 27). Sheller and Urry explain this as a result *"from two interdependent features of automobility: that the car is immensely flexible and wholly coercive. […] Automobility (in some respects) is a source of freedom, the 'freedom of the road'. Its flexibility enables the car-driver to travel at speed, at any time, in any direction along the complex road systems of western societies that link together most houses, workplaces and leisure sites. Cars, therefore, extend where people can go and hence what as humans they are literally able to do. […] But, at the same time, this flexibility and these rights are themselves necessitated by automobility."* (Sheller & Urry, 2000, p. 743). They even state that *"Automobility is a Frankenstein-created monster, extending the individual into realms of freedom and flexibility whereby one's time in the car can be positively viewed, but also structuring and constraining the 'users' of cars to live their lives in particular spatially stretched and time-compressed ways."* (Sheller & Urry, 2000, p. 744). Moreover, automobility also dominates how non-car users organise their lives in time and space. It shapes the flows of people and goods, motorways being the iconic example of this aspect (Sheller & Urry, 2000, p. 745).

Urry's conceptualisation of automobility has been criticised for different reasons such as its universalism downplaying variations in automobilities and different geographical contexts. The power of the automobile lobby but also "landscapes of automobility" including elements such as architecture of roads, traffic rules or driving styles are not similar in every Western country (Featherstone, 2004, p. 5; Schwanen, 2015, p. 305).

Böhm et al. (2006) raise another critique: *"The notion of system tends to underplay collective human agency in the production of automobility and to avoid the political questions about the shaping of the automobile 'system'."* (Böhm et al., 2006, p. 5). Even if they agree with automobility's structured and systemic patterns, they propose to speak of a "regime of automobility", as do other authors (Geels, 2012; Manderscheid, 2014b). This allows not only to emphasise the systemic aspects of automobility, but to bring out the relations of power making it possible and, thus, *"avoid the sense of closure in the notion of system, where its internal relations, feedback mechanisms, create a closed loop reproducing its logics relentlessly".* (Böhm et al., 2006, p. 6). Based on Foucault, Böhm et al. (2006) develop this idea by addressing automobility's regimes of truth, power and subjectivity. The regime of truth is illustrated by the argument that the automobile

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[6] Lock-in highlights that individuals (or society as a whole) can not escape it anymore (at least not without fundamental changes).

industry, as well as car drivers or politicians and even scholars, tends to show cars as efficient, convenient, cheap, stylish, modern or progressive as well as democratic and liberating. Regimes of power imply the regulations and institutions related to cars and even geopolitical dimensions, illustrated by wars for oil. The regime of subjectivity means automobility is coupled to individualism and neoliberalism, but driving is also normalised: *"car driving is what* normal people *do"* (Böhm et al., 2006, p. 8). They also highlight the antagonisms of the regime of automobility: congestion, the ecological unsustainability, the dependency on oil and the high number of accidents regarded as "normality". Finally, they see it as the task of today to put radically into question the universality of automobility, especially to delink autonomy from mobility (Böhm et al., 2006, p. 15).

Holzapfel (1997) emphasises this, too, in his book entitled "*Autonomie statt Auto*" ("*Autonomy instead of automobile*") where he outlines how education, economy and state organisation create clear preferences for the car to an extent that car-free life is practically punished. Moreover, in countries such as Germany, the presence of car manufacturers plays an important economic and political role, but as Canzler (2016, p. 82) raises, the power of the car industry does not help to understand automobility—otherwise countries with no existing car manufacturers, such as Switzerland, should not have the same high motorisation rates as car-producing countries[7]. However, in Switzerland, too, a strong car lobby exists which influences politics (Haefeli, 2008).

2.2. Cars and cities

This chapter presents the evolution of the automobile and cities. It starts with a brief history followed by an overview of negative impacts of cars. Then, trends towards a post-car or car-free world and, finally, car-free urban areas are addressed.

2.2.1. A brief history of cars and cities

Before the present (and future) are further investigated, let us go back in time to understand how automobility developed, focusing on cities, according to the issue of this thesis. Cities have ever since been shaped according to the predominant transport modes (Newman & Kenworthy, 1999). After a long period of the walking city, first, public transport and, then, the car significantly changed the forms of urban development during a period of only a few decades in the 19th and 20th centuries. Many cities today combine parts of all three urban structures. This chapter will briefly present the history of cars and cities, with a focus on Germany and Switzerland, to understand how the car attained its actual dominating place.

As for all important inventions, the birth of the car was long and different contrasting stories exist. However, we can assume that the car as we know it today was invented by the end of the 19th century in Germany (for further details see e.g. Dennis & Urry, 2009, Chapter 2). At the beginning, three main types of energy were used: petrol, steam and electric batteries. Petrol-fuelled cars first seemed the least efficient, but for some accidental reasons—such a vehicle was one of only two completing a "horseless carriage competition" in Chicago in 1896—they became established. As Urry sums up: *"Thus small causes occurring in a certain order at the end of the 19th century turned out to have irreversible consequences for the 20th century, what we might call the century of the car."* (Urry, 2004, p. 32).

In a first period, the car was a pleasure for the rich, a development of the carriage enabling the desire of liberty and control of time and space. Therefore, it was a prestige symbol adopted espe-

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[7] In 2016, there were 555 cars per 1,000 inhabitants in Germany and 537 in Switzerland; to compare, the average in the EU-28 was 510 (Eurostat, 2018).

cially by the nouveaux riches (Sachs, 1984, p. 22). However, unlike other innovations or technologies, the car went beyond the private sphere and influenced society by its need for streets to drive on, raising the question to whom they belong (Sachs, 1984, p. 23). The car was strongly criticised because it made the streets unsafe, both in cities as in small towns. Antimodern and conservative reasons, including antiurban reflexes, characterised this first phase of car critique when accidents and exhaust gases were already put forward (Canzler, 2016, p. 67). In the Swiss canton of Graubünden, for example, a car ban was decided in 1900 and abolished only in 1925 in the 10th referendum on the issue (Sachs, 1984, p. 31).

The critical attitude of the population towards the car changed when mass production of the Ford T model started in the USA in 1907, transforming the car from a luxury good to a utilitarian transport mode. The change reached Western Europe in the 1920s. Then followed a long period of enthusiasm for technology and progress that lasted until the Second World War. In Germany, the development of a "Volkswagen" ("people's car") (although never realised, even if over 300,000 people had transferred savings for it) and the construction of motorways were important pillars of the Nazi regime (Sachs, 1984, p. 63). In the USA, the car industry not only provided accessible cars for a large part of the society, it was also accused to have bought and dismantled public transport systems, the most important alternative to the car (Dennis & Urry, 2009, p. 35), but this thesis proposed in the 1970s has later been debunked by historians (Schrag, 2000). Town centres with public spaces were destroyed by favouring the development of suburbs based on the car, dominated by roads and parking with separated business and residential districts (Sheller & Urry, 2000, p. 746). What was later called "car-dependence" was born. In urbanism, this functional separation was established to a principle of the modern city in the "Athens Charter" of 1933 (Corbusier, 1971).

After the Second World War, the car became quickly one of the economic and symbolic columns of the Federal Republic of Germany (Canzler, 2016, p. 71) and to a lesser extent also spread over Switzerland. At that time, there was nearly no critique to the car, all societal and political forces were in favour of its development as a part of the "Wirtschaftswunder" (economic miracle) following World War II. So, the car grew from a niche product to one of the most important consumer goods in the second half of the 20th century. Canzler (2016, pp. 61–62) highlights three main reasons for this success of mass motorisation in Western Germany:

– a proactive political promotion, including tax incentives to drive to work and mass motorisation being an objective of social reform politics, that should lead to more social participation and democracy;
– the creation or addition of a legal and planning framework, especially the "Stellplatzpflicht" (parking requirements) and the concept of the "autogerechte Stadt" (car-friendly city) establishing a car-oriented environment;
– a cultural meaning: the shift from a luxury good to an everyday consumer good, with a symbolic and ideological meaning (freedom, progress e.g.) unlike any other.

In terms of urban and spatial forms, a network of motorways was built in both Germany and Switzerland and suburbs developed which both relied on and implied the car's development and lead to urban sprawl. The cities were adapted to the car under the paradigm of the "autogerechte Stadt" (Reichow, 1959) aimed at (car) traffic flow and thus restricting public space for all other transport modes and activities. This model was especially applied in German cities destroyed in the Second World War and much less in Switzerland, spared by the war. But everywhere, roads were built as a response to the growing numbers of cars. Thus, large parts of territories and the population became what is called "car dependent" (Dupuy, 1999; Newman & Kenworthy, 1999). In many countries, this led to social exclusion for people who could not access a car for financial

or physical reasons (Dupuy, 2011) or to "forced car ownership" and "transport poverty" for households with limited resources (Mattioli, 2017; Mattioli et al., 2017).

First critical voices to this car-oriented development were raised in the 1960s. One of the most famous was Jane Jacobs who identified in *"The death and life of great American cities"* (first published in 1961) the motor car and its related spaces and infrastructure as *"powerful and insistent instruments of city destruction"* (Jacobs, 2011, p. 440). In the USA, the lacking safety of cars was also challenged and the high number of road fatalities were highlighted by the media (Canzler, 2016, p. 63). In Europe, in 1963 the British "Buchanan report"[8] was one of the first critiques of this car-centred urban development and influenced planning also in Germany. Later, other authors, such as Sennett and Lefebvre, pointed out the negative effects of cars on urban public spaces, too (Sheller & Urry, 2000, p. 742). At the same time, the advantage of the car in its early stage—responding to a desire of freedom, choice, progress, wealth and status, speed and saving time—was more and more restricted with mass motorisation and replaced by new forms of dependence (Sachs, 1984, p. 121).

The positive attitude towards automobility changed more radically in the 1970s when the environmental consequences of the car began to become visible. The car was declared "Umweltfeind Nr. 1" (enemy of the environment no. 1) (Sachs, 1984, p. 233). At the same period, the press also started to report about congestion and the harmful effects of air pollution. In 1972, the Club of Rome presented its famous report "The limits to growth" (Meadows, Meadows, Randers, & Behrens, 1972) raising the finite nature of oil resources. A year later, the first oil crisis showed the dependence of Western Europe from oil-producing countries. This lead to a short period of experimentation in the car sector and some technical developments, but at the end of the 1970s a "rollback" (Canzler, 2016, p. 63) happened and motorisation went on. Nonetheless, many cities began to change their urban transport and planning policies (see next chapter) and a broad environmental movement developed. It maintained protest against the oil and car industry until today, for example after the recent "diesel emissions scandal". These protests are often somehow contradictory: *"[…] although many people may 'love' their car, the system that it presupposes is often unloved, resisted and raged against. Civil society is significantly remade through contestations over the power, range and impact of the system of automobility. The same people can be both enthusiastic car-drivers, as well as being very active protesters against schemes for new roads […]."* (Sheller & Urry, 2000, p. 751).

A third phase of automobile critique was mainly the work of scientists that presented concepts how to overcome automobile dependence. In analogy to energy, they demanded a transition in the transport sector, too (Canzler, 2016, p. 63). Scholars analysed the effects of automobility on space, and cities particularly. The functional separation of the Athens charter was challenged because it did not provide anymore a sufficient quality of life. While the negative impacts of the functionally mixed and dense industrial city had led at the beginning of the 20th century to separate economic activities from housing and recreation, the negative impacts of the car system (see below) reached a level which made necessary to reconsider this model's quality of life. There are also critical voices stressing effects on society: cars and roads cut and destroy social living spaces such as urban streets or places (Gorz, 1973; Sachs, 1984). Even though cars can facilitate social life as they allow to reach any place at any time, car dependence, inherent to many urban forms, has also produced social exclusion. In these areas, daily life without a car has become difficult, e.g. to reach workplaces, for shopping or participation in social activities (Dupuy, 2011; Lucas, 2004).

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[8] Published for the UK Ministry of Transport by a group directed by the architect, civil engineer and planner Professor Sir Colin Buchanan, a short edition was published as a book under the title "Traffic in Towns" (Crowther, 1964).

But the car was also from its very beginning indispensable for tourism (Sachs, 1984, p. 178), even if the romantic idea to access untouched nature has been more and more destroyed by the masses of cars, roads and parking spaces built in many recreation areas.

The critiques of the car did not, however, prevail and the development of the automobile system went on. Car manufacturers adapted their product, or at least gave the impression to improve the safety and consumption (Canzler, 2016, p. 77), but as the latest scandal of diesel cars showed, no real change happened. The most recent strand of car critique integrated the fact that the car must be part of a future mobility and cannot be completely opposed (Canzler, 2016, p. 78). Finally, the desires of free individual movement and social status which the car satisfied for a certain time also started to change in the 1970s with the democratisation of the car (Canzler, 2016, p. 75). The car did not provide freedom and independence anymore, its role as a desire of the masses declined in a context where the bicycle became attractive again, a slower society desirable and enthusiasm shifted from combustion engines to another new technology: small computers (Sachs, 1984, p. 10).

To sum up, in the 20th century *"Separated land uses, low density, and ample free parking create drivable cities but prevent walkable neighbourhoods. Although city planners did not intend to enrich the automobile and oil industries, their plans have shaped our cities to suit our cars."* (Shoup, 2018, p. 1). Or, in more drastic terms, the car was compared to a virus that infected our brains and destroyed our cities and landscapes (Knoflacher, 2013).

2.2.2. Negative impacts of cars

Today, the negative effects of a car-based transport system and the urban forms relying on it are well-known. In Switzerland, transport—i.e. mainly the car—makes 36% of the final energy consumption (OFEN, 2018) and is responsible for 32% of the greenhouse gas emissions, international air travel not included (OFEV, 2017). In Germany, about a quarter of the CO_2 emissions of private households are due to transport, 80% of them are caused by the car (Umweltbundesamt, 2015, p. 34). On a global level, the transport sector was responsible for 23% of total greenhouse gas emissions in 2010, of which road transport accounts for 72% and 94% of the transport energy demand was supplied by oil (IPCC, 2014). Furthermore, cars are highly inefficient in transforming energy into movement, also cause other types of air pollution and are an important source of noise, the major problem related to quality of life mentioned by city residents (Christ & Loose, 2001, pp. 11–12).

Moreover, cars and parking use a large part of space. Particularly in cities where space is rare and alternative land use such as green spaces would have much more positive effects on health and quality of life. A car moving at 50 km/h needs 40 m², a tram on average 7 m², a cyclist 5 m² and a pedestrian 2m² (Gemeente Amsterdam, 2017). While a parked bicycle uses 2 m² and a pedestrian at rest 0.5 m² (Gemeente Amsterdam, 2017), a typical parking space requires 12 to 19 m², off-street parking even about 30 m² per space, including access lanes (Litman, 2011). Furthermore, cars are parked 95% of the time and move only 5% of their lives (Shoup, 2005).

Cars, and again parking, also have high costs that are not all covered by the car users themselves (Shoup, 2005). This is particularly the case for the cost of externalities such as environmental and road damage, accidents, congestion, and oil dependence, which are not reflected in the current market prices of road transport (Santos, Behrendt, Maconi, Shirvani, & Teytelboym, 2010). Related to housing, another aspect is the price of building parking spaces. In Switzerland, a parking place costs at least 30,000 CHF, in underground garages it can be much higher, depending on the type of soil (Plattform autofrei/autoarm Wohnen, 2018c). When these parking spaces cannot be sold or rented in new-build developments in central urban areas, their costs are often transferred to all renters and thus, car-free dwellers pay for parking, too. Recently, in Switzerland,

Germany or Austria, high vacancy rates in new built housing developments are reported (Anlauf, 2014; Merkt, 2014; Senk, 2018). The real estate consulting company Wüest & Partner makes the same observations in its report on the Swiss real estate market. They even found that 12% of building permits for housing projects of less than 5 million CHF had not planned any parking, the smaller a project was, the more likely it was without parking (Wüest & Partner, 2016, p. 62). Thus, they conclude that for the construction of car parking a paradigm change is necessary, from both politics and investors (Wüest & Partner, 2016, p. 60). This points out another issue, the laws made for cars—as well in general as in particular the construction laws demanding parking when building new housing (see chapter 2.3).

Moreover, as mentioned before, a car-dependent transport system also raises questions of inequality and social exclusion. Cars are not available to everyone—children, disabled people or low-income households e.g.—but in many car-dependent contexts, mainly rural but also certain suburban areas, they are necessary to participate in the labour market and social life (Dupuy, 2011; Lucas, 2004; Mattioli, 2014).

Cars are highly problematic for health reasons, too: traffic-related environmental exposures such as air pollution, noise, local temperature rises or reduction of green space as well as car crashes and physical inactivity have negative impacts on health (Douglas, Watkins, Gorman, & Higgins, 2011; Nieuwenhuijsen & Khreis, 2016). Especially in cities where car traffic is dense, they increase premature mortality and morbidity, whereas car-free cities, particularly through higher levels of active travel, have a positive impact on public health (Nieuwenhuijsen & Khreis, 2016, p. 252). Douglas et al. (2011, p. 165) state that *"cars are the new tobacco"* and, hence, should be addressed by public health. They found that the car industry's tactics to resist car use restrictions are similar to those of the tobacco industry, and even if it may seem radical today, banning cars from cities could, thus, be accepted as quickly as the smoking ban.

Furthermore, there are also security issues. Children are particularly vulnerable and restricted by cars. In cities, they are limited in their freedom to play and stay outdoors and, when they are younger and especially in rural areas, also to move independently due to the absence of alternatives to the car (Holzapfel, 1997, pp. 63–71). Moreover, driving a car seems to lead to more aggression and violence in general (Holzapfel, 1997, pp. 72–78).

2.2.3. Trends towards a post-car or car-free world

All these negative effects of the car have reached a level where an ecological transition becomes necessary. Or as, Dennis and Urry state, *"[…] some very powerful forces around the world are undermining this car system and will usher in a new system at some point in this century"*. (Dennis & Urry, 2009, p. 2). While most authors imagine a future beyond automobility (Böhm et al., 2006; Canzler, 2016; Dennis & Urry, 2009; Lyons, 2015; Rigal & Rudler, 2014), some are more sceptical. Schwanen (2016) argues that the capacity of automobility to endure results mainly from the inherited physical infrastructures of cities as well as societies influenced by car industry. Indeed, the "resilience of automobility" (Schwanen, 2016) can be observed in strategies as delaying radical forms of change by the car manufacturers as well as policymakers. Some voices are even thinking that the car faces a second triumph due to its attractive characteristics and especially its transformation, autonomous driving and electric cars especially, but also due to new practices such as car- or ridesharing (Papon & Flonneau, 2017).

Urry (2004) highlights that a new system will need to be as flexible and provide similarly autonomous mobility. Together with Dennis they propose a "new post-car system" that is *at least as effective as the current car at meeting people's economic, aesthetic, emotional, sensory and sociability requirements"*. (Dennis & Urry, 2009, p. 64). It includes four technological developments and four organisational transformations:

- new fuel systems (biofuels, (plug-in-) hybrid-electric vehicles and hydrogen);
- new materials (reducing weight of vehicles without sacrificing security, including recycling issues, but also traffic management efficiency);
- smart vehicles (communicating with other cars, roads and environments);
- digitisation (shifting vehicles from private spaces to privatised and paid spaces);
- de-privatising vehicles (including carsharing, cooperative car clubs and smart car-hire schemes but also lift-sharing, or bicycle ride-share schemes—all reflecting the shift from economies of ownership to economies of access);
- new transport policies (move from "predict and provide" policy models to "new realist" policies integrating public transport, facilities for cyclists and pedestrians, advanced traffic management, real-time information systems and a broad understanding of transport impacts on the environments at a local and global scale);
- new living, work, leisure practices (reduce the "need" for travel: encourage people to live in more densely organised places to gain better access through proximity in a "compact city", develop work at home to reduce business and commuting travel, shopping at local suppliers or on the internet as well as adapt long-distance travel and leisure patterns);
- "disruptive" innovation (all types of agents need to develop innovations that may engender low carbon futures).

In fact, different trends or weak signals supporting a mobility transition are observed since the beginning of the 21st century in Switzerland and in other countries in the global North. It starts with reurbanisation (Rérat, 2016a), meaning that after a period of decline, the population of core cities is growing again for several reasons such as immigration, longer periods of education and young adults staying in the city even if they found a family, which was not the case before. Numerous studies showed that dense, mixed-use and well-connected urban areas imply shorter distances (Næss, 2003), also for leisure (the "barbecue effect" hypothesis is rejected (Munafò, 2017), see 3.1.1.1) and, therefore, a high potential to live car-free.

An important other trend for the future is that young adults are less car-oriented, get their driver's licence later and buy fewer cars (Kuhnimhof et al., 2012; Puhe & Schippl, 2014; Rérat, 2018). The share of the car in daily mobility of young adults, but also residents in big cities overall, is decreasing (Buehler, Pucher, Gerike, & Götschi, 2016; Deibel, Schelewsky, & Schönduwe, 2013; Delbosc & Currie, 2013). More generally, the hypotheses were proposed that "peak travel" (Millard-Ball & Schipper, 2011) and "peak car" have been reached in industrialised countries (Goodwin & Van Dender, 2013; Kuhnimhof, Zumkeller, & Chlond, 2013).

In line with these trends, in many Western metropolises and big cities, motorisation rates are declining (Buehler et al., 2016) and the share of car-free households rising (Follmer, 2018; OFS / ARE, 2017). In Switzerland, it appears that especially households living voluntarily without a private car are increasing (Haefeli & Arnold, 2015). Given the importance of car possession for modal choice (Van Acker & Witlox, 2010), car-free households represent an important element of a transition towards more sustainable mobility. The importance of a place of residence excluding private cars is even more important, considering the fact that 73% of the trips in Switzerland start and/or end at home, emphasising the role of its accessibility and location (OFS / ARE, 2017). Even if there is only few research, different studies showed clearly the influence of (residential) parking supply on car use and ownership (Christiansen, Engebretsen, Fearnley, & Usterud Hanssen, 2017; Guo, 2013a, 2013b; Marsden, 2006). Today, parking is considered one of the main means of urban transport policy to reduce car use (Baehler & Kaufmann, 2017). Thus, car-free housing is one of the most effective measures to achieve a more sustainable mobility system—of course only if a dense urban context and alternative transport modes are attractive enough. In-

deed, different European cities have started or announced to ban cars from their centres (Nieuwenhuijsen & Khreis, 2016), this will be further developed in the next chapter.

Moreover, the car seems to lose its role of a social marker and status symbol for large groups of the society, some authors even identify *"the 'unhipisation' of car culture"* (PostCarWorld, 2017). The car's meaning changes more and more from an object of desire or a symbol of personal freedom towards a neutral and functional mobility tool in a context where social equity and sustainability issues become growing concerns (Kruse, 2009). After a long period when it was almost a social norm to own a car if the financial situation allowed it, today, particularly young adults living in cities have a more pragmatic attitude towards cars and have other status symbols such as smartphones (Puhe & Schippl, 2014). Several press articles also point in the same direction—some authors even call it a "media hype" (Brown, 2017): *"End of the car age: how cities are outgrowing the automobile"* in "The Guardian" (Moss, 2015) or *"The End of Car Culture"* in "The New York Times" (Rosenthal, 2013). Especially in the USA, numerous contributions from people that went car-free (some only temporarily) were published in major newspapers, another aspect of an important change towards the role of cars in society (Brown, 2017).

The freedom of owning a car—also because in cities, it does not provide anymore independence to move but is often slower than alternatives—has been replaced by a more important freedom to *use* transport modes or services adapted to a particular situation, especially shared cars (Kent & Dowling, 2013). It also addresses the fact that cars are not moving most of the time (Canzler, 2016, p. 78). Carsharing can be seen as a practice that is "puncturing automobility", it is *both immersed in and distinct from the regime of automobility".* (Kent & Dowling, 2013, p. 90). Immersed because it builds on the same system with its "materials, meanings and competences" as the private car, except—and this is the distinction—the personal ownership of the vehicle itself. This important difference makes it, however, a more sustainable mobility mode, as it does not stand alone but is part of a mobility system with public transport and active modes *"that has the potential to challenge the hegemony of the private car primarily because it draws on many of the skills, images and materials currently associated with car use".* (Kent & Dowling, 2013, p. 87). This evolution happens in the context of a broader change towards a "sharing economy" of using or accessing rather than possessing and a society where nothing is to be fixed and flexibility is key. Nonetheless, a rising awareness of environmental issues may also play a role for a certain part of the population and the fact that the negative effects of car use are now very well-known. However, carsharing remains a niche product even if in Switzerland, each of the 3,000 cars of the national provider "Mobility" substitutes nine private cars (Mundler & Kaufmann, 2017).

Unlike the car, an alternative transport mode faces a renaissance, in urban areas particularly: the bicycle. Especially big cities observed an important increase in cycling (Baehler, Marincek, & Rérat, 2018; Pucher & Buehler, 2017). E-bikes (Fishman & Cherry, 2016), cargo bikes (Ghebrezgiabiher & Poscher-Mika, 2018) and bikesharing systems (Fishman, 2016) all offer significant contributions to this revival of urban cycling.

Another important trend supporting car-free mobility is digitalisation, and particularly smartphones (Canzler & Knie, 2016; Geels, 2012; Lyons, 2015; Rammler, 2017). They play the role of "technical integrators" which provide information and match and create transitions between different mobility services and, thus, facilitate inter- or multimodal mobility practices but also provide navigation and infotainment tools (Rammler, 2017). Virtual mobility is another domain of digitalisation than can, theoretically, lead to less physical mobility. However, the effect of digitalisation on mobility, and on the society as a whole, are still largely unclear and include many sustainability deficits, but they can be compensated (Sühlmann-Faul & Rammler, 2018). The most important risks or challenges that need to be considered are data protection, the resilience of digital systems and the resources and energy necessary—as well as possible rebound

effects of technological innovations (Rammler, 2017). Lyons (2015) also highlights the importance of the "digital age" for the fundamental transition of transport we are facing. As the car before, it offers another technological response to access people, goods, services and opportunities. According to Lyons, we are living a transition from "motor age" to a "regime of multimobilities" where *"Car ownership will seem increasingly less important and car use will seem increasingly banal. Shared use of mobility resources will be favoured. While use of cars […] will continue, the car will be seen as a background technology serving a purely functional purpose."* (Lyons, 2015, p. 15). Others also compare the impact of the advent of automobiles to the one of mobile phones and computers as both reduce major costs and efforts related to travel, comparable to what the car previously did (Dal Fiore, Mokhtarian, Salomon, & Singer, 2014).

Taking up these different trends, since the end of the "car century", urban planning was adapted to overcome automobile dependence and reach "sustainable cities" (Newman & Kenworthy, 1999). Today, in Western cities, sustainable urban development is widely accepted, with concepts such as "Transit-Oriented Development (TOD)" or "New Urbanism" in North America and, in Europe, the "compact city" or "city of short distances" ("Stadt der kurzen Wege") which became the guideline in German planning policy (Christ & Loose, 2001, p. 9). This latter concept is an ideal building on functional mixity to reduce car traffic and allow daily mobility by public transport, bicycle or walking, thus being more energy-efficient and socially inclusive (Gebhardt, Joos, & Martin, 2005, p. 268). While the benefits of the compact city are evident and the concept adapted by many cities, there are also some critiques relating to its effectiveness or the possible loss of urban quality due to densification (Gebhardt, Joos, & Martin, 2005, p. 268). In Switzerland, a similar change has been observed (Rérat, 2008). In other words, cities are planned at a "human scale" again (Gehl, 2010).

Many cities have also developed broader sustainable urban development initiatives such as "transition towns" in the UK or under the objective of a "2000-watt society" in Switzerland, including mobility and urbanism. In a different political system, the city-state of Singapore is heading towards a car-free future with comparatively strong measures (Senzel, 2018). In 2018, a cap on the "certificates of entitlement" necessary to own a car was introduced at 575,000 cars. Together with a toll and high parking costs, driving a car is very expensive. At the same time, the authoritarian government of this 5.6-million-country develops public transport and infrastructure for cycling and walking in order that people have no need to drive a car anymore. The government also wants to change the narrative related to cars, being car-free shall become cool and show status, successful people have no need for cars.

However, the future of cars is not that clear. While most facts argue for a decline, there are some sceptical voices, too, as presented at the beginning of this chapter (Papon & Flonneau, 2017; Schwanen, 2016). Instead, more radical authors propose even almost entirely "car-free cities" (Crawford, 2002; Knoflacher, 2013; Windes, 2017). To critiques, they state that *"Carfree cities are indeed possible and offer an approach to building cities and urban transport systems that better serve human needs."* (Crawford, 2002, p. 17). The benefits are numerous: *"Carfree cities can offer rich human experience, great beauty, and true peace. They can greatly reduce the damage we are doing to the biosphere. They permit the construction of beautiful districts in the manner of European city centres, with parks but a short walk away. Carfree cities are a practical alternative, available now. They can be built using existing technology at a price we can afford. They offer a real future for our children."* (Crawford, 2002, p. 33). Nonetheless, up to now, such radical structures have never been realised on a large scale—but at least small-scale examples exist, as the next chapter shows.

2.2.4. Car-free urban areas

The critics of car-dependent spatial development have not completely changed the automobile system's influence on planning, but at least some car-free areas have been developed—some already early in the 20th century. Bieda (2016) argues that similar to propositions emerging at the beginning of the 20th century in response to the crisis of the industrialised city (such as Ebenezer Howard's "Garden City"), the crisis of the "Automobile City" (Newman & Kenworthy, 1999) needs new visions. He mentions Clarence Perry's "neighbourhood unit" proposed in 1929 in New York, probably the first idea to protect residents from car traffic. Later, the "Buchanan report" (see above) proposed a technical concept ("environmental area") to control and restrict car traffic according to the environmental capacity of different city areas. This led to the first traffic calming measures in the Netherlands at the end of the 1960s (Bieda, 2016, p. 53). Another interesting Dutch example is Houten, a New Town south of Utrecht, developed since 1966, where the different neighbourhoods built around a railway station are connected by car only through a peripheral ring road. Thus, the whole inner space of this 50,000-inhabitants-city is dedicated to walking and cycling (Foletta & Field, 2011).

Another important type of mainly car-free spaces are pedestrian streets. While they exist already since the end of the 1920s in some German city centres with historically narrow streets, they were mainly developed after the Second World War in most big cities in Germany (Monheim, 2000). Later, pedestrian areas were created in city centres throughout Western Europe, including smaller towns. While they were in the beginning a reaction to pedestrian flows becoming too important for narrow pavements, they were later a measure to increase the attractiveness of the city centres in an era where the first shopping malls in the suburbs emerged. These measures went together with the construction of new parking facilities next to the pedestrian areas and had no intention to reduce car traffic. This changed in the 1970s, when diminishing noise and pollution as well as the enhancement of the historic cityscape became essential. In the 1980s, finally, extensive traffic calming became more important to increase quality of life and transform city centres also into attractive residential areas (Monheim, 2000, pp. 42–43).

This resulted in so-called "car-free city centres", but meant car-limited city centres, as usually at certain times or for certain groups (e.g. residents, delivery) access by car was still possible. Nonetheless, in several cities car traffic could be reduced by half (Topp & Pharoah, 1994, p. 246). In Italy, Bologna was the first of a series of cities which introduced a traffic-limited zone in the entire old town in 1989, with exceptions for residents, delivery and holders of private parking spaces (Topp & Pharoah, 1994, p. 235ff.). In Germany, Lübeck or Aachen for example, implemented similar measures, first only on Saturdays and then expanded them in time and space. It appeared that the most important condition for car-free city centres to develop its intended effect is attractive and efficient public transport (Topp & Pharoah, 1994, p. 232). The most difficult discussions about car-free city centres were with retail trade representatives, they were always strongly opposed first, but then the turnover of shops increased nearly everywhere (Topp & Pharoah, 1994, p. 234). The introduction of car-free zones has another important role: *"The wider benefit of car-free city centres may be in the longer term not so much their direct contribution to traffic reduction, but rather their ability to demonstrate to the city's inhabitants the benefits of car-free living."* (Topp & Pharoah, 1994, p. 246).

An iconic example is the Spanish city of Pontevedra which pedestrianised its whole city centre. Moreover, all surface car parking was closed (but free underground parking opened). Together with refusing permits for shopping centres, the small shops survived and the city centre's population grew, in a context of shrinking cities in Galicia (Burgen, 2018). Actually, shopping centres and commercial areas located in the periphery of the cities have been identified as a major reason for the "death" of the centres of small and medium-sized cities in France (Razemon, 2017).

In the 1990s, there was a growing interest for car-free cities (Topp & Pharoah, 1994, p. 232). In 1994, a "Car-Free Cities Club" was founded by over thirty European cities but this did not lead further than to a charter and a general development towards more sustainable urban transport policies—mostly conservative, i.e. economy-led, sustainable development resulting in car-free city centres to expand shopping or tourism opportunities (McKenzie, 1999). In Germany, propositions how to transform existing neighbourhoods into car-free areas were made (O. Reutter & Reutter, 1996, Chapter 7) and later, a model project tried to transform a neighbourhood in Halle/Saale into a car-free or at least car-reduced area (O. Reutter, 2002). More recently, such ideas have been developed again. In Berlin, for example, several bottom-up movements (residents' initiatives) propose to transform small or large neighbourhoods into car-free areas (Initiative Autofreier Wrangelkiez Berlin, 2018; Stein, 2016). In Wuppertal-Elberfeld, a guideline for a large-scale car-free city centre going beyond a small pedestrian zone was proposed (O. Reutter, Koska, Reutter, Rudolph, & Spiker, 2017).

In a different context, in South Korea, a neighbourhood in the city of Suwon at least tested this: during one month in 2013, cars were banned as part of the first "EcoMobility Festival" (Otto-Zimmermann & Park, 2015). Even if many residents regretted the car-free streets, cars came back afterwards. But there were fewer vehicles, sidewalks were widened, speed reduced in the entire neighbourhood and car-free Saturdays once a month are organised in one street (Valmero, 2015)—small steps towards a real car-free city. Another "EcoMobility World Festival" turned car-free a neighbourhood in the Taiwanese city of Kaohsiung in October 2017 (Chiu, Liao, & Otto-Zimmermann, 2018).

Indeed, there is an increasing popularity of temporary car-free areas since the end of the 20th century. Typical examples are car-free (Sun)days organised in many cities. In Switzerland, the first car-free Sundays were already held during the oil crisis in 1974. Since the 1990s, they are organised annually in Europe and later also in other parts of the world. The 22nd of September has been declared "World Car-Free Day"—not by the United Nations, but by a bottom-up movement of non-governmental organisations (Loo, 2017). Car-free days *"showcase the possibility of a different kind of city"* and are *"effective in demonstrating that, for many people, behaviour change is possible without any significant changes to existing infrastructure, and can at the same time bring citizen's concerns about the path of future development to city officials"* (Badiozamani, 2003, p. 302). But of course, due to their exceptional and temporary character, they do not change fundamentally the cities unless they result in durable adaptations.

Actually, today, there are numerous initiatives around the world to reduce car dependency and develop car-free cities. In 2015/16, a study found over 200 examples in 95 cities (Ortegon-Sanchez, Popan, & Tyler, 2017). They are classified into initiatives making cars more expensive or less convenient, making alternative transport modes more attractive and convenient, reviving social functions of streets, comprehensive sustainable housing developments and residential area improvements, reducing air pollution, and addressing urban freight management. More than half of them are already in place, the others planned, temporal or bottom-up social movements.

So, *"Although it is hard to imagine a world without cars, many cities are beginning to shift their mobility solutions away from the private car and towards more environmentally friendly and citizen-focused mobility means."* (Nieuwenhuijsen & Khreis, 2016, p. 252). In the years of completion of this thesis, different European cities have announced plans to reduce or ban cars in their city centres (Nieuwenhuijsen & Khreis, 2016, p. 253). Paris has plans to close more streets to car traffic after the success of closing embankment roads. Oslo introduces an important car-free zone in its city centre already by 2019. Madrid has already created an extended pedestrian area in the city centre. Helsinki is planning to provide "mobility on demand" to overcome the necessity for its residents to own and use cars (Cathcart-Keays, 2015). In Germany, new coalition governments

are planning to achieve car-free city centres by 2024 in Potsdam (Kramer, 2019) and by 2030 in Bremen (Schnackenburg, 2019). Barcelona, finally, is creating "superblocks" ("superilles") where streets in between are turned into "citizen spaces" and car traffic restricted to the big roads around them (Bausells, 2016).

But such measures are also contested by certain groups. The "gilets jaunes" movement in France emerged partly because of higher taxes on car fuels. In Madrid, for example, after recent elections leading to a right-wing majority forming the city government, the car ban seemed to be in danger (O'Sullivan, 2019a). The president of the Madrid region even declared that traffic congestion is "*a sign of Madrid's identity*" (Intxausti, 2019). However, a large part of the population protested in defence of the anti-pollution plan (Planelles, 2019). Together with court judgements backing the measures, *"The strong citizen backlash suggests that European cities' car bans are not, in fact, in peril."* (O'Sullivan, 2019b).

In Switzerland, referenda also showed that the population, overall, still is in favour of the car and the development of its infrastructure (Miserez, 2017)—unlike in the big cities, where they face important opposition movements such as in Biel/Bienne where a motorway through the city, including accesses in the centre, is planned (Komitee Westast so nicht, 2019).

A representative survey in Germany shows that 59% of the respondents cannot imagine living without a car in their household (Petersen, 2017)—this reflects the fact that in many parts of Germany, car-free living is still difficult today due to the absence of alternatives and the distance to places of everyday life. However, this survey also confirms that the attitude towards cars seems to be more pragmatic than in the past. Actually, the population's general opinion on changes in urban and transport planning has evolved. The attitudes of the residents towards car-free planning are favourable, as another German survey shows. Overall, 82% (even 92% of the 14 to 17-year-olds) approve redeveloping cities and towns to make them independent from the car (Umweltbundesamt, 2015, p. 50). A discrete choice experiment in Berlin showed that around 60% of the respondents are in favour of a car-free city centre with the current infrastructure—and this willingness strongly increases if cycling infrastructure and the public transport network are improved (Gundlach, Ehrlinspiel, Kirsch, Koschker, & Sagebiel, 2018).

In Switzerland, "PostCarWorld"—a cross-disciplinary prospective study—found that the relationship of Swiss people to the car has also evolved. They may now, under certain conditions, be ready to live car-free and to move from a car-centred society in which privately owned cars represented a dream or even a myth, to a service-oriented society based on a new approach to mobility (Perroud, 2017). But they still have a complex relationship with cars and *"This does not mean that there is an emerging consensus, even a majority standing against the present-day role of cars. It solely means that, from now on, few people would be outraged, or shocked, or even surprised if we addressed with them car issues. […] the society is divided but open to change."* (PostCarWorld, 2017). Furthermore, interviews with urban planners showed that they all want to rethink public space, give more importance to shared spaces and no longer favour cars over pedestrians. The economic viability of a car-free Switzerland was investigated, and the result of a model is positive. Technically, it would not be difficult to develop a car-free society, the existing infrastructure just needs to be adapted (Perroud, 2017).

First results of a similar prospective study ("Post-Car Île-de-France") reveal, instead, that mobility and lifestyle aspirations in the French capital region do not tend to a car-free city, except for residents living in Paris and dense suburbs and already travelling without a car (Berroir et al., 2018). Quantitative and qualitative data showed that the car plays an important role for residents overall, even if 32% of the households are car-free and car use has declined. Individual aspirations

are characterised by a wish to slow down, an improvement of accessibility by public transport and, secondary but still important, a quest for proximity.

Finally, few historically car-free places have remained entirely car-free, Venice being the most famous exception. Several other places, such as some German islands or Swiss mountain villages, are still car-free, with exceptions for emergency services e.g., probably originally because of their size and the complicated access for cars and then also for tourism reasons—even most car drivers prefer to spend their holidays protected from noise and air pollution of road traffic. To conclude this section: *"Carfree living is not a utopian ideal; it has always been with us. It is growing in our cities and among younger generations and it offers an opportunity for the future."* (Melia, 2015, p. 162).

2.3. Car-free housing

On a smaller scale than whole cities or urban areas, car-free housing developments are another important example of spaces without private cars that emerged at the end of the 20th century. This chapter first addresses the different definitions of car-free housing, then retraces their history and presents their benefits and limits.

2.3.1. Definitions of car-free housing

There is no universal definition of car-free housing but very diverse meanings exist, ranging from housing where cars are completely banned to estates where they are only absent at the ground level within the development. Typologies based on two main aspects are proposed: 1) limitation of parking or cars owned by residents, and 2) presence and place of cars at the surface and within the development (see Table 1).

Three definitions also mention that car-free housing is developed to create advantages for households living without a private car (Dittrich & Klewe, 1996; Melia, Parkhurst, & Barton, 2010, p. 28; autofrei leben!, 2015a). Dittrich and Klewe (1996) even base their definition of car-free housing on this aspect[9]. Other authors also point out the wider benefits for the environment and the economy and the adaptation to children, thus the attractiveness for families. Scheurer's (2001b, p. 275) model of parking reduction in housing development is more general and includes physical, legal and demand-responsive approaches to reach the target of a car-free housing development.

Melia et al. (2010, p. 28) propose the following definition of car-free developments: *"Carfree developments are residential or mixed use developments which:*
– *Offer no parking or limited parking separated from the residence, and;*
– *Normally provide a traffic free immediate environment, and;*
– *Are designed to enable residents to live without owning a car."*

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[9] *"Autofreies Wohnen bezeichnet ein Wohnangebot, das sich speziell an Haushalte ohne* (eigenes) *Auto richtet, mit dem Ziel, für diese Vorteile zu schaffen."* (Dittrich & Klewe, 1996, p. 2).

1. **Limitation of car parking or cars owned by residents:** most definitions suggest a threefold division of developments based on these two aspects (autofrei leben!, 2015a; Christ & Loose, 2001, pp. 9–11; Heil, 2008, p. 32; Morris, Enoch, Pitfield, & Ison, 2009, p. 21; Plattform autofrei/autoarm Wohnen, 2018a; VCÖ, 1995, pp. 17–18):	2. **Presence and place of cars at the surface and within the development:** even if these aspects are inherent to the definitions based on the limitation of parking or cars, many do not detail them. Four types can be found (Melia et al., 2010, pp. 25–28; Morris et al., 2009, p. 21):
1.1. Without any formal limitation (but without cars within the development)	2.1. **"Visually car-free":** without cars at the surface or within the development, the parking is pooled at the edge or in underground parking garages
1.2. **"low-car" or "car-reduced"** ("auto-arm"/"autoreduziert"): reduced number of parking per dwelling (defined as 0.3 to 0.5 or even up to 0.7 parking spaces per dwelling, according to the spatial context)	2.2. **"Vauban Model"** ("stellplatzfrei"): named after the neighbourhood in Freiburg im Breisgau where all streets are accessible for cars, although pedestrians have the priority and children are allowed to play, but there is no on-street parking, it is reduced and pooled at the edge of the development and not linked to housing, residents do not need to buy or rent parking together with a dwelling
1.3. **"car-free"** ("autofrei"[10]): no parking for residents, meaning they do not have cars (eventually with some justified exceptions); up to 0.2 parking spaces per dwelling for visitors, delivery services, maintenance, etc.	2.3. **"Limited access model":** developments where motor vehicles cannot enter, there can be exceptions (e.g. for emergency services, relocation) in developments where streets are technically accessible to cars and not only pedestrian and cycling paths (autofrei leben!, 2015a; Plattform autofrei/autoarm Wohnen, 2018)
	2.4. **"Pedestrianised centres"/historic neighbourhoods:** pedestrian zones in city or district centres and areas historically without parking that kept this characteristic can also be considered as car-free housing

Table 1: Types of definitions of car-free and car-reduced housing

Based on these definitions, I propose for my thesis the following **definition of car-free housing**, already presented in the introduction:

New-build housing developments of any size where the residents commit to living without a private car. There is no parking for residents, but a context enabling car-free living, including infrastructures for and access to alternative mobilities (mainly bicycles, public transport and carsharing) as well as shops and services for daily needs.

2.3.2. History of car-free housing

Before the development of cars in the 20th century, every housing was car-free. The success of cars then led to a change because on-street parking was not able to absorb all the cars anymore. But car parking requirements were introduced already in 1939 by the Nazis in Germany as part of their motorisation policy: the "Reichsgaragenordnung" ("Reich's Garage Code") required that every housing construction needed to supply a sufficient number of car parking spaces (Knierim,

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[10] 'Autofrei' (car-free) is the most common term, but some other are used, too: "autobefreites Wohnen" (car-freed housing) or "Wohnen ohne (eigenes) Auto" (housing without a (private) car). Palz (1999) proposes "Wohnen mit Anschluss" (housing with connection) to emphasise a positive aspect instead of the absence of the car.

2016, p. 38). After Second World War, all states (Länder) in Western Germany introduced similar parking requirements in their building codes. Minimum numbers—often one parking space per residential unit—were defined as well as some exceptions. In the latter case, normally, a payment to the municipality is due that will be used to offer public parking facilities, or, more recently, also for other transport infrastructures (Scheurer, 2001b, p. 276). The main reason for these parking requirements, besides the lack of space, was to avoid socialisation of the costs.

For a long time, there was little flexibility. But during the 1990s, several German Länder adapted their parking regulations and introduced the possibility to reduce car parking, in order to build car-free housing developments. In the city-states of Berlin and Hamburg, there is no parking requirement for housing anymore (Dittrich & Klewe, 1996, pp. 15–17). In Switzerland, the situation is similar. Only the city canton of Basel-Stadt has no minimum parking requirements. In most cantons, the municipalities can decide to reduce the parking requirements, based on cantonal regulations, of which only two mention explicitly car-free housing, Bern and Aargau (Plattform autofrei/autoarm Wohnen, 2018d).

Many cities in Europe have reduced parking requirements in residential areas to influence car ownership and use (Antonson, Hrelja, & Henriksson, 2017; Foletta & Field, 2011). However, one space per housing unit is still the norm (Kodransky & Hermann, 2011), even if in some cases reductions are possible as the existing car-free housing developments show (see below). Some municipalities at least separate parking from housing. The Norwegian city of Stavanger, for example, follows the recommendation of Knoflacher (2006) that parking should be situated at least as far from housing than the nearest public transport stop (Christiansen et al., 2017). Important sustainable new-build housing developments such as Vauban in Freiburg im Breisgau or Französisches Viertel in Tübingen also adopted this model and pooled car parking at the edge of the area, permitting cars to access but with no priority within the development (Christ & Loose, 2001; Foletta & Field, 2011; Foletta & Henderson, 2016).

In this context, car-free housing represents a paradigm change in the relation between the city and mobility (Christ & Loose, 2001, p. 12). It emerged out of the critics to the models of the 20th century, mentioned above, that structured the city around the car. In a first stage, pedestrianisation of city centres, where often also many residents live (Melia et al., 2010), was adapted to new-build residential areas such as Tscharnergut in Bern or Langwasser in Nuremberg (Baier, Grunow, & Peter-Dosch, 2004, p. 2)[11].

Car-free housing as defined in this thesis emerged in the 1990s in the context of a project on car-free households at the Institute of sociology at the University of Bremen (Burwitz, Koch, & Badoni, 1992). It was later qualified as the starting point of the car-free housing movement in Germany (Koerdt, 2002). Based on the discrepancy between a very critical attitude towards car traffic but participation in the car system that characterised many urban residents, the sociologists in Bremen proposed an experiment consisting to renounce temporarily to the car. They saw this as the only mean to show car dependence. In an interview published in the local edition of "die tageszeitung"—an alternative, ecologist daily newspaper—they made a call to find households to participate in their study. Six households, all but one couples with children, with relatively high incomes and levels of education, then lived one month without a car. They did not perceive it as a sacrifice but as a personal benefit. So, after the experience, five households aban-

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[11] Tscharnergut is an iconic housing estate built between 1958 and 1965 in the Western district of Bern-Bethlehem. About 1,200 dwellings in different types of buildings, including five high-rises, as well as shops, services and a school are situated in a car-free area (Im Tscharni, 2019). In the area P of the Langwasser neighbourhood in Nuremberg, between 1976 and 1987, about 1,000 dwellings were built around a pedestrian zone and parking pooled at the periphery (BV Nürnberg-Langwasser, 2014).

doned their car, three had already thought about it before. However, they were all very critical towards car use, for ecological and other reasons, and most did not like driving, whereas many were already cyclists but rarely used public transport and had little knowledge about timetables and lines. This experience may seem strange today, it is impressive to read at what point multi-modality and living without a car were not at all common practices for households with strong ecological convictions in the early 1990s.

However, the small book published based on this experiment can be seen as the starting point of a development aiming to develop "a human city" as its subtitle proposes (Burwitz et al., 1992). Actually, the three sociologists then developed the idea of a car-free housing area, together with the environment and planning authorities of Bremen (Koerdt, 2002). A model project was set up in 1992: Bremen-Hollerland. Nonetheless, after a promising start—350 households interested to get one of the 41 dwellings—the project failed. Critics of car-free housing saw this as a proof that it does not work, but the failing can be explained by specific factors (Dittrich & Klewe, 1996, p. 9). First, the site at the outskirts of the city, connected only by a bus line and with few shops and services available, was not adapted for car-free living. Furthermore, the design of the neighbourhood was not perceived as sufficiently beneficial or different from a development with parking. Finally, the communication highlighted the ban of cars and not the advantages of car-free living, as the design of the information leaflet illustrates (see Figure 1).

Figure 1: Information leaflet of the failed project Bremen-Hollerland ("Living without a private car"), source: Dittrich & Klewe (1996, p. 9)

Photo 1: The first car-free housing development, Grünenstraße in Bremen[12]

However, this failed example at the beginning at least helped to avoid these flaws in the development of following car-free housing projects. It was actually also in Bremen that the first car-free project in Germany has been realised in 1995: a housing cooperative built 23 flats in Grünenstraße (see Photo 1). The first large car-free housing development with 600 dwellings, GWL-terrein, was completed between 1996 and 1998 in Amsterdam (Dittrich & Klewe, 1996; Foletta & Henderson, 2016). In Switzerland, the first car-free housing development opened in 2011, "Burgunder" in Bern-Bümpliz.

Associations and administrations have played an important role in the development and promotion of car-free housing, through publishing reports (Ernst, Döring, & Preuß-Bayer, 2015; Foletta

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[12] All figures where no source is mentioned are personal photos or illustrations.

& Field, 2011; VCÖ, 1995; L. Wright, 2005) or developing networks, websites and newsletters (ILS, 2002; Plattform autofrei/autoarm Wohnen, 2018b).

In parallel with the first car-free housing developments, scientific research appeared in the same countries. An important number of studies and reports were published in the 1990s and early 2000s, particularly in Germany: notably a report on urban development and ecological qualities of car-free and car-reduced housing (Christ & Loose, 2001) and the above-mentioned study on car-free living in cities and transforming existent neighbourhoods (O. Reutter & Reutter, 1996). The "Research Institute for Regional and Urban Development (ILS)" played an important role, it developed a network on living without a (private) car ("Netzwerk Wohnen ohne (eigenes) Auto") until 2002 (ILS, 2002). Later, research also developed in other countries, whereas in Germany, more recent research is limited to student dissertations. Three different strands of literature have been found: evaluations and case studies of developments (including residents' profiles and motivations but also energy issues), studies on the potential of particular areas or populations to move to a car-free housing and research on the planning and characteristics of car-free housing development. They will be presented in the next sections, after an overview over existing car-free housing developments.

2.3.3. Existing car-free housing developments

As of August 2019, 16 car-free (or car-reduced) housing developments of at least 19 residential units exist in Switzerland (see Table 2).

City	Name	Number of dwellings	Year of completion	Parking per dwelling
Bern-Bümpliz	Burgunder	80	2011	0.18
Zurich-Schwamendingen	Avellana	19	2012	0.05
Winterthur	Giesserei	150	2013	0.32
Zurich-Leimbach	Sihlbogen	220	2013	0.29
Ostermundigen / Bern	Oberfeld	100	2014	0.1
Biel/Bienne	FAB-A	20	2014	0
Zurich-Leutschenbach	mehr als wohnen	370	2014	0.3
Zurich	Kalkbreite	97	2014	0.07
Biel/Bienne	Wasenstrasse	56	2015/18	0.11
Bern	Stöckacker Süd	146	2016	0.16
Baden	Gartenstrasse	19	2017	0.05
Geneva	Soubeyran	38	2017	0.47
Zurich	Kronenwiese	99	2017	0.38
Basel	Erlenmatt Ost	300	2018	0.1
Winterthur	Hagmann-Areal	50	2018	0.3
Aegerten	Kochermatte	32	2018	0.55
Neuchâtel	Coopérative d'en face	21	2019	0.1

Table 2: Existing car-free or car-reduced housing developments in Switzerland (Source: Plattform autofrei/autoarm Wohnen, 2019a)

In Germany, a series of car-free or car-reduced neighbourhoods have been developed at the end of the last and the beginning of this century, whereas there are only few recent projects as shows Table 3.

City	Name	Number of dwellings	Year of completion	Parking per dwelling
Bremen-Neustadt	Grünenstraße	23	1995	0
Munich-Haidhausen	Kolumbusplatz	75	1996	0.44
Munich-Riem	Messestadt Riem (different small projects with 10 to 49 dwellings)	114	1999 to 2015	0.21 to 0.4
Hamburg-Barmbek	Saarlandstraße	170	2000 / 2009	0.15
Kassel-Unterneustadt	Christophstraße	78	2000	0.1
Münster (Westphalia)	Gartensiedlung Weißenburg	138	2001 / 2003 / 2018	0.2
Cologne-Nippes	Stellwerk60	430	2006	0.23
Hamburg-Ohlsdorf	Klein Borstel	60	2008	0.05
Munich-Sendling-Westpark	"Minimalprojekt" Hinterbärenbadstraße	80	2015	0
Berlin-Kreuzberg	Möckernkiez	464	2018	0.21

Table 3: Existing car-free or car-reduced housing developments in Germany (Sources: autofrei leben!, 2015b; Baier et al., 2004; GWG München, 2016; Heil, 2008; Möckernkiez Genossenschaft, 2018; Wohnen ohne Auto, 2018) and own research)

For other European countries, the situation is less clear. Some emblematic existing car-free housing projects are presented in Table 4, but this list is not exhaustive.

City (country)	Name	Number of dwellings	Year of completion	Parking per dwelling
Amsterdam (Netherlands)	GWL-terrein	600	1998	0.2
Vienna (Austria)	Autofreie Mustersiedlung Floridsdorf	244	1999	0.1
Vienna (Austria)	Sargfabrik MISS Sargfabrik	73 39	1996 2000	0.1
Edinburgh (UK)	Slateford Green	120	2000	0.1
Malmö (Sweden)	Ohboy	55 (+31 hotel rooms)	2017	0

Table 4: Some existing car-free housing developments in other European countries (Sources: Christ & Loose, 2001; Hauschild + Siegel Architecture, 2017; KOKOS, 2018; Sargfabrik, 2018; Wohnen ohne Auto, 2018)

In the United Kingdom, planning policies support car-free housing more actively than elsewhere (Melia et al., 2010, pp. 24–25; Morris et al., 2009, p. 20). However, this means only the absence of parking and nothing more. For example, many London boroughs encourage car-free housing with zero parking and exclude residents from street parking permits and public garages (Guo & Ren, 2013, p. 1198). This measure has led to lower car ownership rates resulting in area-wide traffic restraint which is the aim of these boroughs—unlike many European projects improving more directly the quality of life of car-free housing residents (Melia, 2014, p. 8). Thus, car-free housing developments in the UK are mostly small and located in London. In the borough of Camden, for example, 2,400 units were built at 260 sites between 2000 and 2011 (Melia, 2014, p. 8; Morris et al., 2009, pp. 22–23). They play a significant role in reducing parking in the British capital: "*Because car-free developments accounted for approximately 25 per cent of all developments and 23 per cent of the total reduction in parking, the importance of this type of policy cannot be ignored.*" (Guo & Ren, 2013, p. 1198). In the London borough of Hackney, almost 90% of developments

under construction in 2015 are completely car-free, and the council guarantees alternatives to private cars, such as car-clubs within a three minutes' walk for every resident (Moss, 2015).

In France, despite the important number of "écoquartiers" ("eco-neighbourhoods"), car parking is not limited to a level that could be called car-free or -reduced, even if it is more and more dissociated from housing and its place less central (Meunier-Chabert & Perrin, 2012). However, probably the first car-free housing, a building with 25 flats, was completed in 2015 in Paris (Le Parisien, 2015). Furthermore, even in much more car-dependent countries like Australia, Canada and the USA, first car-free housing projects have appeared in big cities (Cheng, 2017; Dudnick, 2016; Hume, 2014; Klingbeil, 2017). "Discovery Bay" on Lantau Island in Hong Kong with over 12,000 residents is probably the largest car-free development in the world (Loo, 2017).

Finally, a growing number of projects is at the planning or construction stage. In Switzerland, at least seven car-free or car-reduced housing developments are on the path to realisation (Plattform autofrei/autoarm Wohnen, 2019b). In Germany, new car-free housing is also being planned, for example in Berlin (Schroth, 2019).

2.3.4. Residents of car-free housing developments

As mentioned above, an important strand of literature consists of evaluations and case studies of particular developments. It provides insight on residents' profiles, motivations and practices in Saarlandstraße in Hamburg (Baier et al., 2004), Messestadt Riem in Munich (Ernst, 2008), Stellwerk60 in Cologne (Brosig et al., 2015), Stellwerk60 and Weißenburg in Münster (Mantau, 2010), Floridsdorf in Vienna (P. Moser & Stocker, 2008; Ornetzeder, Hertwich, Hubacek, Korytarova, & Haas, 2008), GWL-terrein in Amsterdam, Slateford Green in Edinburgh and Floridsdorf (Scheurer, 2001b) and Burgunder in Bern (Bürgi & Hari, 2013; Ganitta, 2011). These different case studies showed that about half of the households in most developments are families with (young) children. There are nearly no foreign nationalities, and residents with university degrees are highly overrepresented.

Results on mobility practices show the significant role of the bicycle. In GWL-terrein for example, even in a Dutch context, the car-free residents cycle more often: the overall mode share for all trips of the bicycle is 50% compared to 29% in Amsterdam, for work it is even 63% compared to 32% (Foletta & Henderson, 2016, pp. 20–21). Thus, nearly all households in car-free housing developments own bicycles, a significant number also own bicycle trailers. They are used for all trip purposes, and particularly for shopping. For this, walking is important, too. Second most important mode is public transport, in bigger (and less cycling-oriented) cities and less centrally located developments it has a higher importance. A majority of households uses carsharing, but most of them less than once a month, mainly for visiting friends and relatives, leisure and exceptional shopping. Most residents actually have a driving licence and are carsharing members. About one third of the households never owned a car before and one to three out of ten abandoned a car at move-in while one third to half of the residents owned and abandoned a car earlier. Most residents believe they will stay car-free in the future. For holiday travels, cars are used, too, but car-free residents mainly travel by train. They also travel by air as often, or even more, than the overall population, except in subsidised housing developments.

A study on a car-reduced neighbourhood in Gothenburg (Sweden) with 0.57 parking spaces per residential unit showed that the consequences of this reduced parking requirement were small (Antonson et al., 2017). In only 19% of the households, car ownership reduced because of the parking provision in the new-build development, 39% of the households own no private car and 25% drive less frequently. Actually, residents have access to parking in neighbouring residential areas, meaning that everyone can find parking. This shows that a real restriction is needed to have important influences on car ownership and use, even if there are positive effects such as less

car use, more walking, cycling and public transport use. However, this is also due to the neighbourhood's location near the city centre and the nearby retail area.

The residential trajectories of car-free housing residents show that an important majority of residents already lived in the same city before, and many even in the same district or similar neighbourhoods (Baier et al., 2004; Mantau, 2010). Motivations for housing choice (the motivations for car-free living in general will be presented in section 2.4.3.) include different aspects (Brosig et al., 2015; Ernst, 2008; Mantau, 2010; P. Moser & Stocker, 2008; Scheurer, 2001b): social ones such as living in a community and having more social relationships, more practical ones related to cyclist- and pedestrian-friendliness and public transport, but also a child-friendly environment and the will to live without negative aspects of the car and, finally, ecological reasons, too. Financial reasons vary strongly according to the development, whereas the dwelling's characteristics are less important than the development's. Finally, car-freeness in itself is a motivation for only very few residents (Bürgi & Hari, 2013; Ernst, 2008; Mantau, 2010; Ornetzeder et al., 2008).

The residents nearly all have a very positive attitude towards their housing development and most are highly satisfied (Baier et al., 2004; Brosig et al., 2015; Mantau, 2010; P. Moser & Stocker, 2008). Participation and self-administration of community facilities were for example highlighted in Floridsdorf in Vienna (P. Moser & Stocker, 2008). Another study on this development concluded that the residents see community life and infrastructure and the possibility to participate in the development and its management as main social benefits (Tödtli, 2011). Only very few residents report major problems or disadvantages (Ernst, 2008) and a majority participates at least from time to time in common activities in the development (Brosig et al., 2015; Mantau, 2010). With regards to the social acceptance of car-free living, most residents experienced positive (about one third), half-half (23–45%) or no reactions from their friends and families to their car-freeness (Ernst, 2008; Mantau, 2010).

Different studies addressed sustainability issues. The evaluation of Saarlandstraße found for example differences between tenants and cooperative members, the latter living even more "sustainably" (Baier et al., 2004). A comparative study of the car-free development of Floridsdorf with a "conventional" housing development addressed energy aspects (Ornetzeder et al., 2008). It found that residents of the car-free housing development have only a slightly lower environmental impact, due to air transport mainly, whereas their other transport and energy-related environmental impacts are significantly lower. Compared to average Austrian per capita CO_2 emissions, both settlements have much lower values. The study also showed that a stronger social cohesion and social contacts in the car-free housing development contribute to environmental behaviour.

In Switzerland, a study on the first car-free housing development Burgunder in Bern found that the residents of this car-free project cause much lower mobility-related energy emissions (Bürgi & Hari, 2013). As their daily mobility relies on walking, cycling and public transport they use only 1/5 of the energy and cause 1/7 of the emissions of the average resident in the city of Bern. Overall, the project respects the target values of the 2000-watt-society. Data from GWL-terrein in Amsterdam shows similar results: transport-related emissions are less than half that of the average resident of Amsterdam and less than a third of an average Dutch resident (Foletta & Henderson, 2016, pp. 20–21). This is explained mainly by the fact that even in a Dutch context, car-free housing residents cycle more often (as presented above).

2.3.5. Potential for car-free housing

A second strand of literature analysed the potential for car-free housing. Steve Melia's PhD thesis addressed this issue in the UK (Melia, 2009). He conducted an online survey of members of environmental and cycling organisations, a random postal survey in the London borough of Camden and a household survey in a low-car development in Poole in Southern England. His findings

confirm that a (potential) demand for car-free housing exists in the UK, the most likely group of early adopters are "carfree choosers" who live without a car by choice, mainly in inner areas of larger cities. Another group are "carfree possibles"—car owners willing to give up car ownership under certain circumstances. Melia and his colleagues from the University of the West of England in Bristol also published some papers on the issue (Melia, 2014; Melia, Barton, & Parkhurst, 2013; Melia et al., 2010). Other British publications focused on the potential for car-free housing in York (Ghent, 2012) and on its links with community travel plans (Morris et al., 2009).

Scheurer (2001b) derives an indication for substantial latent demand from the fact that existing car-free housing developments attracted many households with children. Actually, different studies support that the potential is not limited to already car-free households. In Germany, market surveys in five cities in North Rhine-Westphalia, including Cologne and Münster revealed that 40 to 50% of the interested households still owned a car (ILS, 2001). Over 2,300 in Cologne and between 200 and 350 households in the other cities stated interest in car-free housing. Their average age was relatively young and besides one- and two-person-households, families with children were particularly interested. They highlight the key determinants to live without a private car such as the importance of good bicycle parking and public transport access as well as carsharing and a central location (or at least good infrastructure and cycling distance to the city centre). They are not particularly driven by ecological motivations but by the will to increase their quality of life, including less noise and pollution and more green spaces. Two thirds also mention a child-friendly environment. Furthermore, the potential for car-free housing in Germany was addressed related to brownfield development around railway stations (Palz, 1999).

Swiss research also focused on car-free housing's potential, on behalf of a building cooperative in Zurich (S. Schneider & Brunner, 2005) or on a regional level in Biel, Zurich and Lucerne (Rebmann & Zahn, 2007; Schärer & Höchli, 2003; Stadt Luzern, 2014). A market study in the region of Bern showed that about a third of the households in the city and a quarter in the surrounding municipalities are very interested in car-free or car-reduced housing. About half of these households in the city (N=8,800 households) and a fifth of those in the suburbs (N=3,600) would even renounce to a private car by contract (Büro für Mobilität, 2007). These numbers are often used to prove that there is a demand for car-free housing developments.

Finally, in France, a study was conducted for the RATP (public transport authority of Paris and Île-de-France) on *"housing developments with sparing parking"* (*"Les quartiers d'habitat économes en stationnement"*) to provide insight on potential interested households, projects in the inner suburbs around Paris and acceptance in the public and private sectors (Faure & Lasserre, 2005).

2.3.6.   Planning of car-free housing developments

A third strand of literature reveals evidence on the planning of car-free housing developments. In his PhD thesis, Jan Scheurer analysed nine neighbourhoods with various ecological innovations in six European cities, including five car-free or car-reduced developments—thus conducting *"the first international comparative study of 'carfree' neighbourhoods"*. (Scheurer, 2001b). He states that in order to be successful, these developments have to emphasise the positive aspects for the residents and the residential environments, such as saving costs and less noise or pollution. The projects should ideally integrate frequent public transport, be connected to a good cycling network and host basic services and shops (or be located in short walking distance from them). Scheurer also points out *"the impact of resident participation in the conceptualisation of the mobility management package"*: car-free mobility practices can only be achieved when residents participate in the development of mobility management programmes (Scheurer, 2001b, p. 321). He found that to achieve urban ecology innovations in neighbourhoods, it is necessary to adopt more democratic and open-ended planning processes; the concepts must be determined by

the users' needs and aspirations. Furthermore, concepts need a cooperative approach between communities, authorities and private actors and the location and design play a crucial role to achieve sustainability, including in mobility.

A study in the Norwegian city of Trondheim in the context of the planning process of a new neighbourhood aimed to understand what is needed to reduce car use or live car-free (Thomsen & Löfström, 2011). Through focus group interviews with people living nearby the building site, these authors found *"that it will not be sufficient to facilitate for car-free living in the residential area only by means of urban form such as limited parking lots, better cycle and walking conditions, and accessible local services. Creating a car-free residential area also requires people who are willing to consider alternative ways of living and transportation."* (Thomsen & Löfström, 2011, p. 970). An important "mental challenge" related to the "unnormal" identity of living without a car appeared, too. This seems more important than the practical issues that can be resolved with alternatives such as carsharing. However, the authors identified some "situations of opportunity" such as retiring or leaving the parents' house, when car-free living, if it is perceived as an alternative worth considering, can become a normal way of life.

A study based on expert interviews focusing on the cities of Berlin, Cologne, Freiburg im Breisgau and Munich also tried to find what factors are important to develop car-free housing (Blechschmidt, 2016). It appears that legal requirements have a certain relevance but are not decisive, as the cities with no parking requirement but no car-free housing developments show. Nonetheless, finding arrangements regarding existing strict parking requirements can be an important issue prolonging the planning process. Real estate actors and investors are very reticent, whereas the media or external experts play only minor roles. Municipal politics and planning, instead, are central and residents, particularly associations or cooperatives, also play an important role for the development of car-free housing. As the first completed examples show, they were mostly either the result of the engagement of a small group of future residents or a project pushed by the municipality.

An earlier study surveying German, Swiss and Austrian municipalities' planning departments (Heil, 2008) found that most of them ignore existing car-free housing developments, except Vauban (which, however, does not correspond to my definition of car-free housing). Thus, Heil concludes that the concept needs to be more promoted. Furthermore, legal framework has to be adapted to facilitate car-free housing, the various interests of the different actors in planning better considered and financial as well as informative incentives for car-free living in general created. Finally, he proposes that mixed concepts (such as Vauban) should be promoted, including parts with and without cars.

Despite the different context, the conclusion of a review of Discovery Bay in Hong Kong resembles to those of studies in Europe: *"The key is to develop positive measures to fulfil people's various needs without private cars and reinforcing the pleasantness of the car-free environment to live and to raise a family, rather than focusing mainly on the control measures such as restrictions on parking, high parking charges, control of density and the banning of private cars."* (Loo, 2017, p. 48).

2.3.7. Benefits and limits of car-free housing

As already mentioned, car-free housing has many benefits compared to car-dependent urban developments (Christ & Loose, 2001; Melia et al., 2010). Melia and colleagues propose a schema to illustrate them (see Figure 2). The two main aspects, exclusion of vehicles and reduction in car ownership, have different consequences from which result direct or indirect benefits for the residents, the wider local area and national/global environment in terms of environment, quality of life and health.

Aspect:

Exclusion of Vehicles   Reduction in Car Ownership   Direct effects

Consequence:

Less land for roads and parking   Less car use   More walking and cycling

Indirect effects

Benefits for:	Environment	Quality of Life	Health
Residents	Better air quality Less noise More green space	More shared/open space More social interaction Reduced risk and fear of road accidents Children more independent More viable local services.	Increased fitness and reductions in associated disease Reduced respiratory illness Improved mental health
Wider local area	Better air quality Reduced need for development land	Reduced congestion More viable local services.	Reduced respiratory illness
National/Global Environment	Reduced CO_2 and other emissions Retention of more green land		

Figure 2: Benefits of car-free developments (Source: Melia et al., 2010, p. 31)

Even if a study from Finland found that car-free living can have important rebound effects due to increased consumption such as holiday travel by plane (Ottelin, Heinonen, & Junnila, 2017)—in line with the results of Ornetzeder et al. (2008) on the car-free housing development of Floridsdorf in Vienna—we can assume that, overall, car-free living is more energy-efficient and causes fewer emissions than living with a private car. As several studies proved (see 2.3.4), mainly due to absent or at least very limited car use, their environmental impact is significantly lower than the one of the overall urban population (Bürgi & Hari, 2013; Foletta & Henderson, 2016; Laakso, 2017; Ornetzeder et al., 2008).

There are also economic benefits of car-free housing developments. If no car parking is built, especially underground garages, the building costs can be significantly reduced: a parking space costs between 30,000 and 60,000 CHF depending on the characteristics of the building ground (Hauber, 2001; Plattform autofrei/autoarm Wohnen, 2018c). These savings can be used to offer cheaper housing or be invested in higher ecological building standards, common rooms or other shared amenities, etc.

When no parking is built, the developers have more liberties in designing neighbourhoods. If public space is not used for parking and car access, but for green and shared spaces, playgrounds

and other activities, this improves quality of life, as indicated in the schema. In a context of urban densification and inner development of cities, the absence of cars allows both a high quality of life and to build more housing on the same space, as cars need about 95% more space to move and stay than a pedestrian (Christ & Loose, 2001, p. 99). Moreover, from an urban planning perspective, car-free developments also have various benefits and constitute a *"building block for the European city of the 21st century"* as they are linked to the renaissance of soft locational factors such as urbanity[13].

Regarding the aspect "reduction in car ownership", even if the literature on car-free housing is rather limited, *"it does provide some fairly strong evidence that they reduce car use and increase walking and cycling"*. (Melia et al., 2010, p. 30). As presented above, research on car-free housing (also on only "visually car-free neighbourhoods") confirms low shares of car use (and possession).

Car-free housing also enables households living without a private car to have various benefits of their personal mobility choice that lead to a higher quality of life. There are social benefits: Ornetzeder et al. (2008) found that residents in the car-free development of Floridsdorf in Vienna report significantly higher shares of good neighbourly relationships, solidarity within the housing development and residents helping each other than in the reference settlement. Car-free residents also know more neighbours by sight and have more friends among them. This is enabled by all the common spaces in the development. In many cases, not only car-freeness, but collaborative housing forms and participation in the planning process also favour social life. Another social benefit related to the absence of cars is the higher safety, especially for elderly people or children. A study of the neighbourhood of Nuremberg-Langwasser P (Nützel, 1993) shows that children played outdoors at a younger age (average 3.8) than in conventional neighbourhoods nearby (average 5.6 years).

Concerning health aspects, no particular research on car-free housing was found, but broader studies show that more movement, an attractive environment and less air pollution have clear health benefits (Melia et al., 2010; Nieuwenhuijsen & Khreis, 2016).

Finally, households giving up a car save a significant amount of money they can—and do—use for other consumption (O. Reutter & Reutter, 1996). There are especially benefits for the local economy: residents of car-free housing developments use much more shops and services in the neighbourhood as they most likely travel on foot and by bicycle to satisfy their daily needs (Melia, 2009; Palz, 1999). A recent French study found that savings due to the absence of a car are partly invested in more expensive grocery shopping in small shops in the neighbourhood (Deleuil, Barbey, & Sintès, 2017).

Regarding limits, car-free housing developments need, of course, an appropriate context where residents are able to handle everyday life without a private car. Therefore, the location, its accessibility and available (mobility and other) infrastructures especially matter (Blechschmidt, 2016; Christ & Loose, 2001). Thus, a certain urban context is needed, or at least high-quality public transport as well as shops and services at proximity. Such building sites are not easy to get and, in the case of brownfields, decontamination can represent another limit or contribute to lengthening a planning and construction process that is already longer than for a "conventional" housing development.

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[13] *"Zusammenfassend können wir feststellen, dass sich die autofreien/autoarmen Stadtquartiere in vieler Hinsicht als Baustein für die europäische Stadt des 21. Jahrhunderts eignen: Sie belegen eindrucksvoll eine Renaissance "weicher" Standortfaktoren, zu denen u.a. Urbanität, damit eng verknüpft, eine Kultur des Ortes und, deutlich spürbar, die Chance, vielfältige soziale Beziehungen vor Ort aufbauen zu können, zählen."* (Christ & Loose, 2001, p. 109)

Examples that were not successful revealed other limits: Hammarby Sjøstad in Stockholm showed that if flats are sold as ordinary housing and the ecological aspects and parking limitation not promoted, residents with cars will come and demand parking (Thomsen & Löfström, 2011). I found the same in the development of Christophstraße in Kassel and isolated negative examples also appeared in some successful developments.

Another limit is that car-free housing developments need to find residents willing to "play the game" and really live without a private car. This is not given in all, even urban, contexts and demands sometimes an extra effort when looking for new residents to ensure they understand the car-free concept and are willing to live accordingly.

2.4. Car-free households

This chapter addresses households owning no car in general. There is a relatively small body of literature that is concerned with car-free households, but numerous studies on car ownership include findings on carless[14] households, too. However, most of them are based only on statistics on car ownership and some socio-demographic variables to understand profiles of car-free households. Even if a certain increase has been observed during the last years, qualitative studies and research addressing motivations to live without a car are very rare, as well as studies on mobility practices, for example to understand issues of social exclusion (Mattioli, 2013, 2014). This chapter will first review evidence on the importance and evolution of car-free households, then present what is known about their profiles and, finally, about their motivations.

2.4.1. Importance and evolution of car-free households

An important number of studies on motorisation rates at national or international levels also mention the shares of car-free households (Haefeli & Bieri, 2008, p. 6; Preisendörfer & Rinn, 2003, p. 27). Overall, in the Western world, the share of car-owning households has constantly increased since the beginning of mass motorisation in the 20th century (Dennis & Urry, 2009). But since the beginning of the new millennium this increase seems to have stopped and a "peak car" is observed (Goodwin & Van Dender, 2013).

Even if automobility is still dominating, there is a significant part of households not owning a car, about one fifth in both Germany and Switzerland (Follmer, 2018; OFS / ARE, 2017). However, important differences between spaces exist. Data from 2014 reveals that the share of car-free households is 10 to 20 percentage points higher in major cities compared to national averages—in Berlin, Brussels or New York City even more than 20 points (Adomaitis, 2015).

In Switzerland, the "mobility and transport microcensus" reveals every five years the share of car-free households. Overall, the share of car-free households has only slightly increased from 18.8% in 2005 to 21.8% in 2015 (OFS / ARE, 2017), even if, after 50 years of decline, this increase is a significant evolution (Haefeli & Arnold, 2015, p. 6). In the five biggest cities, their share has grown by about 10 points between 2000 and 2015 (see Figure 3). Therefore, Haefeli and Arnold (2015, p. 30) state that in big cities' transport policies, they can no longer be perceived as an insignificant minority.

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[14] Note that in this thesis, "car-free" is used to characterise all households who do not own private cars, regardless of their reasons. Some authors differentiate between voluntary car-free households and constrained car-less households (Brown, 2017).
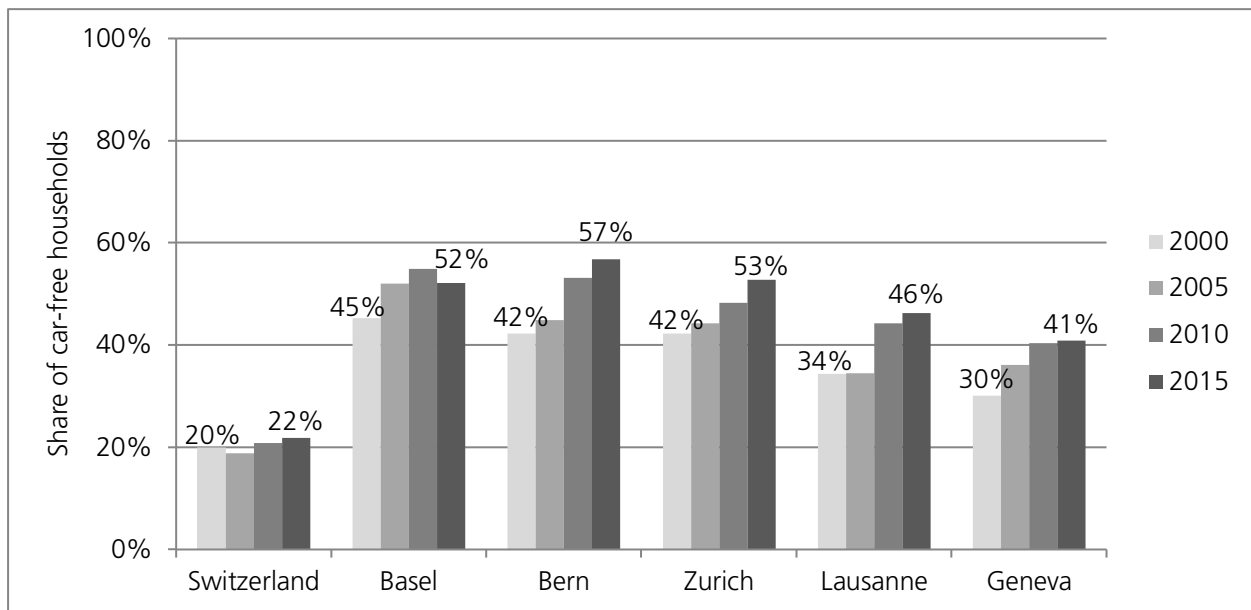
Figure 3: Evolution and share of car-free households in Switzerland (Source: Mobility and transport microcensus)

In Germany, "Mobilität in Deutschland (MiD)" reveals similar evolutions and differences (see Figure 4). Since 2008, an increase is observed: only slight on the national level (from 18% to 22%) but important in the three city-states of Berlin (from 41% to 51%), Hamburg (from 34% to 43%) and Bremen (from 28% to 43%). In 2017, in metropolises all over the country, there are 42% of households without a car whereas in small towns and villages in rural areas, there are only 10% (infas, 2018).
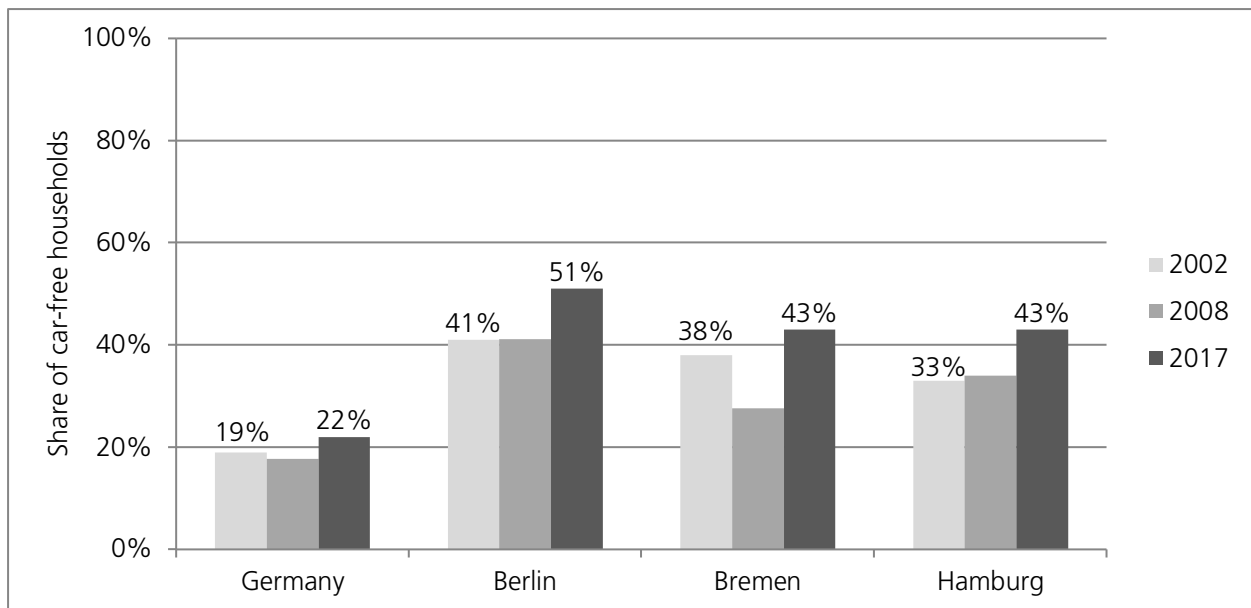
Figure 4: Evolution and share of car-free households in Germany (Source: Mobilität in Deutschland)

Similar trends are reported in other countries. In France, for example, 19% of all households were car-free in 2008 (Demoli, 2012, p. 4) but 58% of the households in Paris live without a car (APUR, 2010). Their share decreases to 32% in the inner suburbs ("Petite Couronne") and to 16% in the outer suburbs ("Grande Couronne"). In the London borough of Hackney, car-free households increased from 56% in 2005 to 65% in 2015 (Moss, 2015). The rise in car-free households in larger cities can be explained by more single and two-person-households, young adults and elderly peo-

ple living in cities (Scheurer, 2001b, p. 273), but also by a growing number of households choosing to live car-free, as the next section shows.

2.4.2. Characteristics of car-free households

Based on different literature reviews, I found three types of characteristics which influence car ownership (Haefeli & Bieri, 2008; Kühne, Mitra, & Saphores, 2018; Mitra & Saphores, 2017; Preisendörfer & Rinn, 2003):

1) **Household profile:** Household size, income and the number of adults and children all have a negative effect on being car-free.
2) **Household members' profiles:** Women are more often car-free whereas employment and a high education level are correlated to growing car ownership. Increasing age first leads to a higher share of car-free households (i.e. young adults have few cars after leaving their parents' home), then it changes to the opposite, an indication for life-course effects (see below).
3) **Residential context and transport infrastructure:** With increasing size and density of the place of residence, the share of car-free households grows, as well as for households living in row houses or flats. Car-related costs are also positively correlated with car-free households, whereas it is the opposite for costs of public transport. Parking supply was also found to have a significant positive effect on car ownership (Guo, 2013a).

The three most important elements to explain the absence of a car are household size, income and type of residential area, i.e. size and density (Haefeli & Bieri, 2008; Preisendörfer & Rinn, 2003). Data from Switzerland and Germany illustrates this (see Table 5 and Table 6).

Household size	1 person	42%
	2 persons	14%
	3 persons	11%
	4 persons	7%
	5+ persons	6%
Household income per month	<4,000 CHF	47%
	4,001–8,000 CHF	21%
	8,001–12,000 CHF	11%
	>12,000 CHF	9%
Type of residential area	Urban centres	27%
	Areas under the influence of urban centres	11%
	Other areas	13%

Table 5: Shares of car-free households in Switzerland (Source: OFS / ARE, 2017)

Household size	1 person	41%
	2 persons	11%
	3 persons	8%
	4 persons	6%
	5+ persons	8%
Economic status of the household	Very low	48%
	Low	39%
	Medium	21%
	High	10%
	Very high	8%
Type of residential area	Metropolis	42%
	Regiopolis, big city	31%
	Central city, medium-sized city	19%
	Urban area	13%
	Small town, village areas	11%

Table 6: Shares of car-free households in Germany (Source: MiT 2017, 2018)

Further analyses based on Swiss data until 2010 also confirmed most other factors cited above, with two important exceptions: When the household income is divided through the number of persons and the mean income per person analysed, the difference between car-free and car-owning households is only small (Haefeli & Arnold, 2015, p. 18). And the share of persons living car-free with a university degree increased from 17.2% to 20.4% between 1994 and 2010 (Haefeli & Arnold, 2015, p. 10). This is in line with evidence showing that higher education can lead to greater environmental awareness and reduced car ownership (B. Flamm, 2009; Kühne et al., 2018). Probably, it also includes the growing number of young working people without children living in the city. Furthermore, in Switzerland the age group of 36-to-40-year-olds has the highest growth among car-free households, in 2010 one out of six households in this age group was car-free (Haefeli & Arnold, 2015, p. 29). Regarding mobility practices and access, it appears that in 2010, 19.2% of the households without a private car are members of a carsharing organisation—compared to only 1.8% of car-owning households. 88% of car-free household members have a public transport pass, but only 52% in car-owning households (Haefeli & Arnold, 2015, p. 11). People living car-free travel much shorter distances per day, especially for shopping trips, use more public transport and bicycles and, of course, less cars, but still 5 km per day on average (Haefeli & Arnold, 2015, p. 13). Overall, they travel only 77 minutes per day compared to 85 minutes for car-owning household members (Haefeli & Arnold, 2015, p. 14).

To summarise the different car-free households existing in Switzerland, Haefeli and Arnold (2015) proposed a typology with four clusters (see Table 7). The first, "urban elites", have a high income and education level, are rather young and employed. They have a driving licence, a public transport pass and a quarter of them a carsharing subscription. "Urban elites" are the most mobile cluster. Their share has more than doubled between 1994 and 2005 and, despite a small decrease, still represents about a quarter of the car-free households in 2010. Unlike the other clusters, "urban elites" seem to choose to live car-free as they have a high income. Thus, Haefeli and Arnold (2015) state that in Swiss cities there is a stable tendency towards a deliberately car-free lifestyle.[15] Similarly, the PostCarWorld project also found that there is already a consistent, but minority, group that has positively chosen a car-free lifestyle in Switzerland. These antici-

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[15] *"Es zeigt sich also in den Schweizer Städten eine stabile Tendenz zu einem bewusst gewählten autofreien Lebensstil."* (Haefeli & Arnold, 2015, p. 28).

pating representatives of a "pre-post-car-world" mainly live in city centres or at transportation nodes where public transport is satisfactory (PostCarWorld, 2017). Even if secondary data analysis cannot answer the question about motivations, the three other clusters proposed by Haefeli and Arnold seem to live car-free mainly for economic but also health reasons. "Underprivileged people" are relatively young, working, have a low income and education level, often no driving licence and about half live in core cities. The two other clusters include elderly people. "Low-income pensioners" are mainly women without driving licence—their share has decreased as the gap between men and women holding one gets smaller with every generation. The last cluster, "elderly middle-class", are primarily retired people, often also without driving licence but with public transport passes.

	1994	2000	2005	2010
Urban elites	13.1%	20.8%	28.9%	26.7%
Underprivileged people	29.7%	27.4%	26.5%	34.7%
Low-income pensioners	49%	34.7%	25.7%	22.6%
Elderly middle-class	8.3%	17.2%	18.9%	16.1%

Table 7: Types of car-free households in Switzerland (Source: Haefeli & Arnold, 2015, p. 23)

A comparable study in France found a similar typology (Demoli, 2012). However, the share of the type corresponding to the "urban elites" is—although increasing—only very small: 3.7% in 1984 and 5.2% in 2006. In addition to that, another group of 10% in 2006 is formed by working women with a rather high education, living alone in the Paris region. These results, as those of an analysis of British data (Mattioli, 2014), indicate that higher car dependence of peripheral and rural regions plays an important role in the composition of car-free households.

An important number of studies addressed changes between car ownership and car-free living (B. Clark, Chatterjee, & Melia, 2016; Kühne et al., 2018; Mitra & Saphores, 2017; Müggenburg & Lanzendorf, 2015; Nolan, 2010; Prillwitz, Harms, & Lanzendorf, 2006). It appears that carlessness is mainly a temporary condition (or "fluid"), often people had a car earlier or think of having one later in life (Deleuil et al., 2017; Klein & Smart, 2017; Laakso, 2017; Lagrell, Thulin, & Vilhelmson, 2018; McLaren, 2016). Even if becoming car-free often takes time and "*changes do not happen from one day to another*" (Laakso, 2017, p. 139), several moments (or "key events", see 3.1.3.2) when a car is abandoned or purchased have been identified. One of the most important events is couples entering into parenthood (B. Clark et al., 2016; Oakil, Manting, & Nijland, 2016; Prillwitz et al., 2006). But childbirth is not necessarily followed by car ownership (Lanzendorf, 2010), several recent studies addressed families living voluntarily without a car in dense urban areas (Dowling & Maalsen, 2019; Lagrell et al., 2018; McLaren, 2016). In general, an adult leaving the household (B. Clark et al., 2016) or the departure of the last child (Deleuil et al., 2017) are moments when households give up a car, whereas an increase in the number of household members—also adults, a partner e.g.—often leads to car ownership. Similarly, first employment, a higher income and high travel time to work by public transport are important arguments to leave car-freeness (B. Clark et al., 2016; Prillwitz et al., 2006).

On the other hand, moving house, especially when public transport is better, can be taken as an opportunity to review car ownership, regardless of the change in built environment and other life events (B. Clark et al., 2016; Deleuil et al., 2017; Laakso, 2017). However, Müggenburg and Lanzendorf (2015) found that the type of residential area—and its accessibility—does not influence car ownership due to "self-selection" effects (see below) of a residential context enabling certain mobility practices rather than others. This German study on work-related life events highlighted that job training and starting a first job are linked to an increase in car availability. The same study also showed that a change of workplace and independence predict significantly a decrease,

while the start of studying can have both effects. Other such trigger factors to get car-free are getting retired, a professional retraining and unemployment (Deleuil et al., 2017; Laakso, 2017) as well as a lower income and employment status (B. Clark et al., 2016). Furthermore, an opportunity to sell the car and the arrival of new transport services, such as carsharing, were also found to be reasons to become car-free (Deleuil et al., 2017).

As for mobility practices of carless persons, first results of a French study on newly car-free households in central Lyon and Villeurbanne showed that they use mainly public transport for daily mobility and walk, the bicycle is used only by those who already did so before. Taxis are used more often, (private) rented cars frequently and the advantages of carsharing are appreciated (Deleuil et al., 2017). A comparative study on car-free and car-owning households in Munich (Preisendörfer & Rinn, 2003, pp. 115–122) showed that transport practices, of course, vary: whereas 70% of the car-free respondents use public transport nearly every day, only 25% of the car owners do so, but only 16% of them never do. Instead, one third of the car-free interviewees never use a car. Satisfaction with different transport modes and infrastructures as well as the car are similar, both groups appear tolerant towards other mobility modes. Finally, only few differences were reported between the two groups regarding activities.

Two recent studies addressed the differences between voluntary and involuntary car-free households (Kühne et al., 2018; Mitra & Saphores, 2017). They show that voluntary car-free households in California are living in more walkable and diverse areas with better public transport than involuntary car-free households (Mitra & Saphores, 2017). A comparison of California and Germany showed that in both places, households living in denser neighbourhoods, closer to public transport stations, having a lower income and fewer children are more likely to live voluntarily without a car. Higher education leads to more voluntary car-free households in Germany but not in California. The effect of employment density and public transport is higher in Germany than in California. Residential self-selection (choosing a residential location fitting with personal travel preferences) appears, too—and cultural preferences as well as different land use patterns behind it: in Germany, high-income and highly educated households are more likely to live in urban, high density neighbourhoods with good public transport, whereas in California they tend to live in suburban areas (Kühne et al., 2018). However, this represents an ideal not necessarily corresponding to the reality of residential choice which is often also influenced by constraints (see 3.1.1.2). Nonetheless, it is important to offer all households the possibility of being independent from a private car.

2.4.3. Motivations to live car-free

While we have a rather good idea of the characteristics of car-free households, there are only few studies having addressed their motivations, although recently, a renewed interest has been observed. This is partly due to the nature of most studies presented before, based on quantitative analysis of secondary data. To understand why the members of a household live without a private car, a more direct approach—ask car-free households why they do so—is needed. In the two countries studied, Switzerland and Germany, three studies have been found, all dating from the turn of the millennium (O. Reutter & Reutter, 1996; Müller & Romann, 1999; Preisendörfer & Rinn, 2003). Furthermore, the German mobility survey "MiD" includes reasons for car-free living, but the Swiss microcensus does not[16].

The three studies mentioned are all based on telephone surveys. Reutter and Reutter interviewed 146 persons in Dortmund, Müller and Romann 300 persons aged younger than 65 in Bern, Basel

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[16] Other mobility surveys include reasons, too, e.g. in California (Kühne, Mitra, & Saphores, 2018).

and Zurich. Preisendörfer and Rinn criticise these small samples and the absence of a control group and therefore based their work on interviews with 600 car-free and with 600 car-owning households in Munich. These studies found that the most important reasons to live without a car are the absence of a need (or worthlessness), the quality of alternatives (especially public transport), health or age, and too high costs or other financial reasons (e.g. preferring to spend money on other things). Environmental reasons appear to be the second most important motivation in the two older studies (details see below). However, as Preisendörfer and Rinn (2003, p. 34) notice, it would be premature to conclude that ecology plays a central role for car-freeness[17]. Actually, their analysis of existing German data showed that an ecological attitude has no significant effect on car ownership. Even if this can seem paradoxical, other studies support this finding (Preisendörfer & Rinn, 2003, p. 36).

In their study, the two authors asked first the interviewees to state spontaneously the main reason why they live car-free. Only 4% mentioned ecology, the main reasons were affordability (30%), the absence of a need (18%), good quality of public transport and no driving licence (11% each) (Preisendörfer & Rinn, 2003, p. 105). In a second question, respondents were asked to evaluate ten motivations—the method the two other studies used, too. The most important reasons are: public transport in Munich is very developed (80%), in a city like Munich you do not need a car (71%), save money (51%), for ecological reasons (39%), being a passionate cyclist (38%), it is more comfortable to live car-free (36%), a car cannot be afforded (32%) (Preisendörfer & Rinn, 2003, p. 103). A typology of car-free households is proposed: elderly/sick people (19%); environmentalists (5%), poor people (32%); "cool calculators" who could afford a car but estimate it too expensive (9%), pragmatics who do not need a car and see more difficulties related to own one, whereas public transport is effective (35%) (Preisendörfer & Rinn, 2003, p. 108). Moreover, it appeared that most households live car-free by choice and do not feel restricted in their activities (Preisendörfer & Rinn, 2003, p. 148).

Reutter and Reutter (1996, pp. 45–50) proposed ten reasons to live without a private car. The following reached the highest approbation: absence of a need (75.3%), environmental protection (54.1%), like to travel on foot, bicycle or public transport (52.1%), age/health reasons (50%), too tiring or annoying (43.8%), save the costs of a car (23.1%), risk of an accident for oneself or others evaluated too important (40.4%), be credible with one's convictions (25.3%), retreat of driving licence (4.1%) and shared cars (3.5%). They summarise the persons in three types: "careful", "cost conscious" and "ecologists"—ecology being rarely the only reason, but mostly combined with others.

In Müller and Romann's (1999) study, the following reasons attained the highest scores (rated 5 or 6 on a scale of 6): public transport offer is sufficient for mobility (80%), protect the environment (76%), preference to buy other things than a car (74%), habit to live car-free (74%), not want a car (68%), health reasons (8%—remember that people over 65 years were excluded in this study). Using a factor analysis, they propose four types to explain the absence of a car: 1) to reduce effort, stress and dangers; 2) for health reasons; 3) for financial reasons; 4) as an element of the lifestyle.

In Germany, the national mobility survey "MiD" showed in 2017 that the most important reasons not to own a car are the absence of a need and costs (see Table 8). What is called "deliberate abstinence" appears as important when multiple answers can be given, but it is much less important when only the priority reason is asked for. Health or age play a role for one household out of five and costs for one third (infas, 2018).

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[17] *"Daraus jedoch zu schlussfolgern, Umweltschutzüberlegungen würden als Bestimmungsfaktor und Beweggrund für die Autofreiheit eine zentrale Rolle spielen, wäre voreilig."* (Preisendörfer & Rinn, 2003, p. 34)

	No car needed	Deliberate abstinence or do not want to afford a car	Cannot afford to buy or maintain a car	Health or age reasons	Other reasons
Multiple answers	39%	29%	29%	21%	21%
	No car needed	**Deliberate abstinence**	**Too expensive**	**Health or age reasons**	**Other reasons**
Prioritised answer (row = 100%)	28%	11%	29%	18%	13%

Table 8: Reasons not to own a car in Germany (Source: infas, 2018)

An analysis of the previous edition, "MiD 2008", proposed a typology of car-free households based on the presence of a driving licence and the motivations why a household has no car Table 9. They are not equally present in all spatial contexts (Mattioli, 2013). The "age-related clusters" have similar shares, whereas the others all increase with the size of the municipality where the households live. The results do not show a clear opposition between choice to live car-free and being forced to do so, the absence of a need and affordability are often associated.

	Car abstinence	Too old to drive	Car deprived	No driving licence	Car free	Health impaired	Total carless households
Cluster size	35%	19%	17%	14%	10%	5%	**100%**
Not necessary	67%	29%	27%	12%	100%	0%	**45%**
Deliberate abstinence	100%	39%	27%	4%	0%	0%	**43%**
Too expensive	56%	39%	100%	20%	27%	17%	**50%**
Health reasons	13%	49%	6%	0%	8%	100%	**20%**
Age reasons	5%	100%	0%	5%	0%	0%	**21%**
Other reasons	17%	17%	0%	100%	9%	14%	**25%**
No driving licence	38%	65%	19%	84%	60%	69%	**50%**

Table 9: Types of car-free households (columns) in Germany and reasons (rows) important to live car-free and share of driving licences (Source: Mattioli, 2013)

As mentioned above, research on car-free housing residents also addressed the general reasons to live car-free. A survey conducted in 2007 on about 100 dwellings in four car-free or -reduced projects in the Messestadt Riem in Munich found that the residents" reasons to live car-free are costs (55% agreed with this reason), no need for a car (55%), environmental protection (30%), good public transport making a car superfluous (13%), less stress without a car (13%) and only for 6% health or no driving licence (Ernst, 2008, p. 10). For the residents of car-free GWL-terrein in Amsterdam, the decision not to own a car is mainly based on the reason that cycling (or, to a lesser extent, public transport) makes a car superfluous, due to environmental reasons and a healthier lifestyle. Costs and the difficulty to find parking near their residence are much less important (Foletta & Henderson, 2016). In the subsidised housing of Weißenburg in Münster, instead, financial reasons play a much more important role, they were important for about 40% of the respondents, similar to the role of deliberate abstinence, no need and the bicycle making a car superfluous (Mantau, 2010). In Stellwerk60, the same study found that two thirds agreed

with no need, and still half with deliberate abstinence, and bicycle as well as public transport making a car superfluous, whereas financial reasons applied only for about one fifth. A more recent study in this car-reduced development found that environmental reasons and costs play a role for 55%, no need for 72% (Brosig et al., 2015).

In Melia's study on potential car-free housing residents in the UK (see above), for 61% of the "car-free choosers" living without a car by choice, environment was a main reason, no need for a car attained 39% and not liking driving 31% (Melia, 2009, p. 162). In Great Britain overall, only 4% answered that environmental reasons apply to their household (Aston & Budd, 2006). The most important reasons why households were carless in 2005 are the following: no household member can drive (38%), costs of car/driving (32%), a car is not necessary or other transport available (31%) and health/physical difficulties (19%). A recent study based on a survey on "mobility as a service"[18] in London showed that 67% of non-car owners believe there is no need to own a car in London (wherever they live in the British capital)—the younger the respondents were, the higher the share (nearly 80% for under 30-year-olds). Moreover, 59% think owning a car is a big hassle in London (Kamargianni, Matyas, Li, & Muscat, 2018).

In the very different, more car-dependent context of California, a study based on data from 2012 found that 80% of the car-free households are so by constraint (Brown, 2017). Based on motivations to live car-free, there are five types of car-free households. Two chose to live car-free: for environmental concerns (less than 2%) and no need of a car/use other modes (19%). The three other groups do not own cars by constraint: 48% mainly for economic reasons, 11% due to age/health and 21% cannot drive or have no driving licence.

A mixed-methods study on car-free households in Strasbourg in France and Quebec City in Canada found that living without a private car is often explained by a combination of choice—based on alternative transport modes including carsharing and a residential location enabling it—and constraints, mostly economic or also the absence of a driving licence (Villeneuve, 2017). Villeneuve found that social exclusion due to non-motorisation exists in both cities, but is much more present in highly car-dependent Quebec City. It is associated with the fact of having to find an alternative to the car to be able to reach certain destinations, with a feeling of being left out of the political process and mobility policies and being judged and misunderstood by others, or even facing aggressive behaviour by motorists. However, the respondents also reported they felt liberated from the burdens of owning a car (costs, maintenance, etc.).

Finally, some recent qualitative studies on car-free households addressed their motivations. Rigal (2018) interviewed Swiss residents focused on their mobility practices and lifestyles. He found three types of persons restricting their car use: those who do not have the competences to drive, those who wish to completely abandon driving and those who restrict their car use to certain predefined situations. There are multiple motivations: a strong ecological awareness, appreciation of simplicity and sobriety, negative experiences with cars or positive experiences with other transport modes as well as imitation of or discussion with a close person who does not drive. These reasons apply particularly when there is another change happening such as breaking points in private or professional life ("key events", see 3.1.3.2).

In contrast to other findings, the first results of a study based on interviews with households in central Lyon and Villeurbanne that gave up a car, show that they did not have an ideological discourse or an aversion to cars (Deleuil et al., 2017). They live in central places where many alternatives to the car are available and proximity to places of everyday life is given. They develop

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[18] With "mobility as a service (MaaS)", "*travellers would be able to purchase mobility services that are provided by the same or different mobility operators by using just one platform and a single payment.*" (Kamargianni, Matyas, Li, & Muscat, 2018, p. 3).

different pragmatic arguments, economic primarily. The car is not indispensable due to parking constraints, maintenance and the traffic regime in the city. Secondary motivations related to the environmental impact and quality of life are also mentioned, but they are not decisive. For young people, it is normal to live without a car whereas for the older, this change is a "cultural revolution" or "paradigm change". Even if at the beginning, they were not ideologically motivated, they find it now absurd to own a private car when living in the city and ask for car-free areas and alternative transport modes. They rethink the organisation of their daily life, spend more time in the city and the neighbourhood and therefore request an adapted environment for their virtuous car-free life.

Another qualitative study is based on interviews with fifteen households in the Vienna region in Austria (Sattlegger & Rau, 2016). The authors used a reconstructive approach based on mobility biographies to understand why people live car-free. Their interviewees experienced different transport modes during childhood and youth, but the car once became dominant, often due to unplanned external influences. Two ideal-typical paths towards carless mobility are found: "cosmopolitan globetrotters" (highly flexible and mobile persons, using different transport modes pragmatically, trying to avoid car ownership, seen as too inflexible and inefficient) and "settled Viennese" (people rather stable in Vienna, grown up already in the region, aware and familiar with the public transport or cycling opportunities). Sattlegger and Rau propose six patterns of meaning that explain evolving mobility practices: a) mobility as means to an end; b) mobility as personally meaningful; c) mobility as intrinsically social practice; d) mobility as a social value; e) mobility as a sacrifice; f) mobility as joyful activity. Furthermore, they address the fact that prevailing pro-car norms and discourses need to be challenged, social acceptance plays a key role in the normalisation of car-free mobility: *"As soon as carless mobility is seen as a possibility to increase the quality of life, as opposed to a sacrifice of restriction, new perspectives and scopes of action emerge."* (Sattlegger & Rau, 2016, p. 30). Car-free housing projects, existing in Vienna, are cited as examples to spread sustainable, car-free mobility. Finally, they also found that (in)formal car sharing can reduce car ownership because it helps to normalise alternative mobility practices, too.

A Swedish study found, too, that the "norm of owning a car" was often difficult to overrule for the three families trying to live car-free for a year, but they adopted new practices to continue their activities (Hesselgren & Hasselqvist, 2016). A last study on voluntary car-free households also addressed values (or lifestyle issues) and norms regarding car ownership, finding that: *"Moral beliefs and convictions regarding refraining from car-dependent norms and lifestyles were important, but instrumental perceptions of car ownership as burdensome and entailing practical inconveniences were at least as significant. Carlessness was in some respects perceived as norm-breaking, but also considered self-evident and part of a preferred lifestyle."* (Lagrell et al., 2018, p. 225). The authors emphasise that carlessness is situated socially, as well as geographically, and is related to constraints of everyday activities (Lagrell et al., 2018).

2.5. Conclusion

This part, first, showed the importance the car has attained in present Western societies, highlighted by the concept of "system (or regime) of automobility" built around it. The negative consequences, in particular in cities adapted to cars after the Second World War in the context of mass motorisation, resulted in questioning the car and especially its place in contemporary cities. As Holzapfel wrote already 20 years ago, this evolution led to a pragmatic consideration of the

car, seeing it as a product that was once quite modern but will in the future be used only for purposes where it really still makes sense, and these are rare[19].

Dennis and Urry (2009), for example, outline a "post-car system". Even if they do not mention car-free housing, it represents what they call "models" of a future "after the car". They are an example of a world with de-privatised vehicles, new transport policies and new living, work and leisure practices. This last aspect contains encouragement to live in urban areas with "*increased density of living and potentially lower levels of car ownership and use, especially for day-to-day journeys*". (Dennis & Urry, 2009, p. 103).

Actually, since the end of the 20th century, many cities began to adopt a less car-dependent urban development and recently, even first examples of car-free cities or at least city centres and urban areas appeared. In this context, car-free housing developments were realised since the turn of the millennium in Germany and other European countries, a decade later also in Switzerland. Even if they represent a minority in a society where motorisation rates are still growing (but the share of car-free households increases, especially in big cities), the benefits of car-free housing are numerous, not only ecological but also economic and social. However, only few (and even less recent) studies on car-free housing exist and most of them are student works or grey literature addressing only one particular housing development (Baier et al., 2004; Brosig et al., 2015; Ernst, 2008; Mantau, 2010; P. Moser & Stocker, 2008; Ornetzeder et al., 2008; Scheurer, 2001b). Nonetheless, they provide some insights especially on the residents' characteristics:

– Many are families with children and they have a very high education level;
– the bicycle is very important for daily mobility and public transport, too, especially in less centrally located developments;
– most residents have a driving licence and use carsharing (but not very often), and the majority owned a car once in their life;
– for holidays, most travel by train, only a minority uses a car whereas aeroplanes are used similarly or even more often than the overall population;
– most residents lived in the same city or even district before;
– residential motivations include social and mobility-related aspects, positive aspects of car-free living, child-friendliness, ecological reasons and financial aspects, whereas car-freeness in itself is a motivation only for very few;
– and, finally, there are very positive attitudes and high satisfaction rates.

More evidence is available on car-free households in general (Haefeli & Bieri, 2008; Kühne et al., 2018; Mitra & Saphores, 2017; Preisendörfer & Rinn, 2003). Overall, they differ significantly from car-free housing residents. Three types of characteristics influence the absence of a car in a household: its profile (size, income and number of adults and children have a negative effect), its members' profiles (men, employed and highly educated people have a negative effect, increasing age first a negative then a positive effect) and residential context (size and density of the place of residence have a positive effect) as well as transport infrastructure (car-related costs are positively correlated, whereas it is the opposite for public transport). However, it appears that since the turn of the century more and more households with uncommon profiles live car-free, including families and young, highly educated and high-income urban households (Haefeli & Arnold, 2015; Lagrell et al., 2018; McLaren, 2016). In Switzerland and Germany, overall, only about one out of five households has no car, but their share is increasing in big cities, the bigger cities are, the higher the share is. The rare evidence on motivations of car-free households shows that high

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[19] "*[...] das Auto als das zu sehen, was es eigentlich ist: Ein Produkt, das in bestimmten Zeiten des 20. Jahrhunderts einmal ganz modern war, das man aber zukünftig nur noch zweckgerichtet in den Bereichen benutzt, in denen es wirklich noch Sinn macht – und das ist eher selten der Fall.*" (Holzapfel, 1997, p. 89)

costs, the absence of a need (including the presence of alternatives, bicycle and public transport mainly) and health or age reasons are important (Müller & Romann, 1999; Preisendörfer & Rinn, 2003; O. Reutter & Reutter, 1996). Lastly, the importance of ecological convictions is not decisive (Brown, 2017; Deleuil et al., 2017), except for particular groups living car–free by choice (Melia, 2009), such as residents of car–free housing developments (Ernst, 2008; Foletta & Henderson, 2016).

3. Theoretical framework

In this part, I present the main theories and concepts used in this thesis. First, mobility is considered as a practice, a type of capital and in a biographical approach. Then, the frame concept to understand the residents is presented, "lifestyle." Finally, I introduce the concept used to analyse the spatial and social context, "a territory's hosting potential".

3.1. Mobility: practices, capital, and biographies

This chapter addresses the types of mobility studied in this thesis and the concepts used (see Figure 5). After a short general introduction on definitions and approaches of spatial mobility, I start by explaining why mobility is understood as a practice. Then, its two main forms, daily mobility and residential mobility, are presented. The realised mobility practices of both forms are understood as the outcome of a motivation based on an individual's mobility capital (the concept presented in the following section), but also influenced by habits and routines, individual values as well as the social and spatial context ("a territory's hosting potential", see chapter 3.3). Finally, mobility is not static, but can change over the life course and is influenced by past practices—linking to a "mobility biographies" approach, which is addressed in the last section of this chapter.
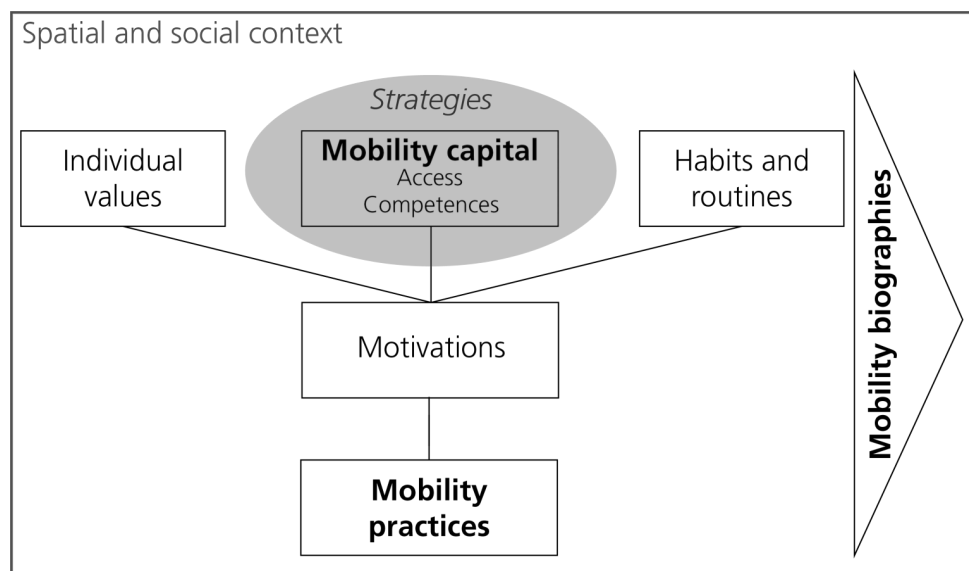
Figure 5: Conceptualisation of mobility adopted in this thesis

To start, "mobility" needs to be defined. This thesis is interested in spatial mobility which can be defined as any movement in physical (or geographical) space of individual or collective actors of society, regardless of its duration, distance, modes used, causes and consequences (Bassand & Brulhardt, 1980, p. 19). Spatial mobility has become a major interest of social sciences only towards the end of the 20th century, when a "mobility turn" occurred (Urry, 2007).[20] In this context, Kaufmann (2015, pp. 9–10) identifies some limitations in the notion of mobility as it is mostly used: it is only seen as a spatial phenomenon and social change related to movement is not considered; it is only about realised movements and not potential mobility; it is focused on measures of spatial movement and time and not interested in experiences and imaginaries; and it is applied only to individuals. As Cresswell states, *"mobility is practiced, it is experienced, it is embodied"*. (2006, p. 3), thus, *"it's about more than getting from A to B"* (2011, p. 555).

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[20] Even if some earlier works exist, Sorokin and the Chicago School in the 1920s (Kaufmann, 2011).

To overcome these limits, I adopt the approach of mobility presented above (see Figure 5), which is based on the three dimensions of mobility proposed by Kaufmann (2011):

1. The accomplished spatial movements ("mobility practices", see next sections)
2. The abilities of an actor to move ("mobility capital", see section 3.1.2)
3. The range of possibilities to be mobile a given space offers (the "hosting potential of a territory"—the spatial and social context, see chapter 3.3)

To investigate the different types of (realised) spatial mobilities, a distinction is helpful. Kaufmann (2011, p. 25) defines four types of spatial mobility (see Table 10) depending on reversibility of movement or whether there is a return to the starting point (or not), and on the spatial setting where movements take place. Within a short time period, daily mobility consists of movements happening inside a population basin, whereas travel consists of those outside a population basin. Within a long time period, residential mobility takes place inside a living area and migration outside of it. While there are also intermediate or hybrid forms of mobility such as long-distance commuting or multilocality, these four types of spatial mobility reflect the different research areas developed around them.

	Short temporalities (cyclic movement, reversible)	Long temporalities (linear movement, irreversible)
Within a population basin	Daily mobility	Residential mobility
Outside of a population basin	Travel	Migration

Table 10: The four types of spatial mobility (Source: Kaufmann, 2011, p. 25)

This thesis focuses on the daily mobility of car-free households, but their residential mobility is also an important aspect and travel is addressed as another example of mobility practices. In some cases, migration appears, too, when residents lived outside their current living area before.

3.1.1. Mobility practices

I use the term "mobility practices" instead of the more common "mobility behaviour" to highlight an open approach and to avoid a behaviourist connotation. Practice, or in particular "spatial practice", is a large and commonly used term in human geography to relate to human activities and their spatial dimension (Lussault, 2003).

"Practices" are also at the centre of "social practice theory", recently introduced in daily mobility studies (Greene & Rau, 2018; Heisserer & Rau, 2017; Kent & Dowling, 2013; Laakso, 2017; Rau & Sattlegger, 2018; Shove, Pantzar, & Watson, 2012; Watson, 2012). I discovered this approach during my research and adopted some of its elements, even if I mainly focus on the individuals, while in practice theory, practices constitute the "unit of enquiry" (Shove, 2010, p. 1279) and individuals occupy secondary roles as "carriers" of these practices.

Social practice theory is a large and relatively recent field of social research, centred on observed practices and critical of too strong theoretical abstractions and formalisations (Hillebrandt, 2014). Unlike other theoretical approaches, research based on (social) practice theory does not presuppose out of which structures or intentions social practices emerge (Hillebrandt, 2014, p. 11). Applied to spatial mobility, this means that movements in space are not considered as mechanical or influenced only by external structures, but as independent practices, constituting themselves.

So, what are "practices"? In short: *"Empirically, any recognisable activity can be considered a practice."* (Watson, 2012, p. 489), but they are also *"key constitutive elements of human social life"*.

(Heisserer & Rau, 2017, p. 585). More detailed, Reckwitz defines a practice as *"a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge"*. (Reckwitz, 2002, p. 249). Based on this, Shove, Pantzar and Watson (2012, p. 24) propose a simpler scheme including three elements: *"practices are defined by interdependent relations between materials, competences and meanings"*. Materials include objects, infrastructures, tools and the human body itself—which other theories see as an element of context rather than part of practices. Competences are all forms of understanding and practical know-how related to performing practices. Meaning represents the social and symbolic significance of participation in a practice, including emotions and motivations (Shove et al., 2012, p. 23). This threefold conception of practices allows to address their dynamic character: links between elements are made and broken (Shove et al., 2012, p. 36) and the whole practices can collapse or transform (Shove et al., 2012, p. 74). They are more likely to last if they afford scope for innovations, have some symbolic or normative anchoring, and are related to or dependent on other practices (Shove et al., 2012, p. 75).

The interest of a practice-theoretical approach to mobility also lies in its attention to how practices are interconnected and interdependent, or, in other words, *"bundle together"* (Watson, 2012, p. 491) in the organisation of people's everyday life. It is elementary to understand mobility practices as part of a wider social life. This relates to activity-based travel approaches, but goes further by not taking present activity patterns as given or static (Watson, 2012, pp. 493–494). Similarly, Shove et al. (2012) highlight the importance of time and space for practices.[21] Generally, there are four relations between space and practices. First, elements constituting practices are limited by space, they cannot move everywhere, there are physical and social limits of pre-existing practices that *"constitute uneven landscapes of possibility"* (Shove et al., 2012, p. 132). Second, practices integrating new sites re-make space, especially when they form bundles or complexes. Third, communities of practice form co-located practice spaces that can also be virtual (e.g. on the internet). Fourth, *"the conclusion that space and time are produced and reconstituted through the enactment of practices is significant in that consequences of such enactments accumulate and persist in the temporal-spatial fabric of society"*. (Shove et al., 2012, p. 133). In fact, one of the key propositions of social practice theory is that individual sets of everyday practices reproduce social structures (Bourdieu, 1977; Giddens, 1984).

As mentioned above, using "practice" instead of "behaviour" does not mean this thesis is based on practice theory, but indicates my open approach to understand the residents of car-free housing developments and in particular their daily and residential mobility which are addressed in the following sections.

3.1.1.1. Daily mobility practices

For a long time, daily mobility was treated only by economists or engineers. The neoclassical model of "homo economicus" was applied and mobility behaviour understood as the result of a rational choice based mainly on minimising costs and transport time. Until the 1970s, transport planning and research were mostly related to the development of infrastructure in societies experiencing economic growth. At this turning point, described above related to automobility, the need to better understand mobility practices emerged (Gather, Kagermeier, & Lanzendorf, 2008,

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[21] Shove et al. illustrate this by an example in line with this thesis: *"Systems of automobility have, for example, enlarged what we might think of as the global resource of 'total potential access to space-suited-to-the-enactment of practices'. In effect, driving has simultaneously taken space, in the form of roads, parking areas and so on, and made it possible for more people to do more things in more places than ever before."* (2012, p. 131).

p. 164). In the following decades, sociological approaches to daily mobility were developed in Germany, France or the Netherlands, based on the fact that the rationality assumed in economic models was not often found to be true in practice. Interdisciplinary approaches were needed to understand mobility, including sociology, social psychology and geography (Kaufmann, 2000, p. 3). This new research field built on Hägerstrand's work on "time geography" to include the importance of time in actions or on the approaches of the "Aktionsraumforschung" developed by the "Munich school" of social geography (Gather et al., 2008, p. 164; Scheiner, 2009, p. 17). Different social or psychological approaches have since been developed, stressing the importance of factors internal or external to an individual to understand his or her mobility practices (Gather et al., 2008, pp. 176–181).

These individual factors are the main research field in social sciences on daily mobility. The importance of habits, especially for regular (and repetitive) daily mobility practices such as commuting, has been highlighted by many scholars (Bamberg, 2003; Buhler, 2015; Gärling & Axhausen, 2003; Lanzendorf, 2003; Verplanken, Walker, Davis, & Jurasek, 2008). The short- and medium-term stability found in most analyses of mobility practices emphasises this, too (Scheiner, 2007, p. 164). Other research showed the importance of representations of transport modes as well as symbolic or identity aspects (Bamberg, 2003; Beckmann, Hesse, Holz-Rau, & Hunecke, 2006; M. Flamm, 2004; Kaufmann, 2003). Several socio-psychological theories were proposed to explain mobility practices such as the "theory of planned behaviour" (Ajzen, 1991) stating that attitudes, norms and perceived behavioural control influence intentions which predict behaviour. Similarly, the "value-belief-norm theory" (Stern, Dietz, Abel, Guagnano, & Kalof, 1999) shows how values and beliefs can lead to personal norms that result in actions, e.g. in favour of the environment.

To sum up, a diversity of theories and approaches are used to study and explain daily mobility based on individual factors. While some are contradictory, many are in fact complementary. As a result of this, Kaufmann (2000) developed an interdisciplinary approach to daily mobility, based on different rationalities. Inspired by the work of Max Weber, he defines a theoretical perspective considering mobility as a system (daily mobility is not isolated from other social aspects neither from other forms of mobility), a process (formed over time) and the individual's latitude (the possibilities of action). He proposes four ideal types of individual rationalities that need to be considered to explain modal practices:

– Economic rationality (based on the neoclassical "rational choice model" and the importance of time and costs)
– Axiological or value-based rationality ("reason of the heart", preferences, values and convictions)
– Perceptive rationality (perception and feeling of a situation, including the experiences and life history of an individual)
– Habitual rationality (habits incorporated in lifestyles)

As for factors external to an individual influencing daily mobility, research showed in particular the importance of age[22] (see chapter 3.1.3), of the built environment, as well as of the socio-cultural context (see chapter 3.3 on the territory's hosting potential). It is important to take into account the different elements of context. Daily mobility not only relies on individual decisions and conscious choices (Heisserer & Rau, 2017, pp. 581–582), but also on the "social network geography" of an individual, the places where his friends and relatives live and where his social activities take place (Axhausen, 2008). The "land-use transport approach" addresses the influence of the built environment on daily mobility practices, with the correlation between density and car

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[22] Age is considered an external factor because it cannot be influenced by an individual.

use, for example, being shown for metropolises in the whole world (Newman & Kenworthy, 1999). This relationship has been analysed by an important number of studies on different scales and other aspects have been added, such as centrality and mixed land use. It was found that residents of central, dense and mixed-use neighbourhoods move shorter distances and rely more on public transport, bicycles and walking and less on cars than residents of other urban areas (Beckmann et al., 2006; Gebhardt et al., 2005; Scheiner, 2006). These differences are confirmed by the Swiss and German mobility censuses (Follmer, 2018; OFS / ARE, 2017). A particular aspect of daily mobility and the built environment is addressed by the "barbecue effect", the hypothesis that residents of dense urban areas travel more than others for leisure in order to escape to nature and quiet zones. However, this hypothesis was rejected in a quantitative study on Geneva and Zurich (Munafò, 2017) as well as in a qualitative study conducted in Hamburg (Matthes, 2015).

A particular type of daily mobility relates to shopping. As shopping concerns everyone (at least for groceries) and includes carrying goods, it is of particular interest in a study on car-free households. Shopping represents 22% of trip purposes (share of total trips) in Switzerland in 2015 (OFS / ARE, 2017, p. 38) and 16% in Germany in 2017 (Follmer, 2018, p. 18) and the car plays, overall, a dominant role for these trips. Shopping-related mobility has undergone significant changes in Western Europe due to a restructuration of the retail sector (i.e. from small corner shops to shopping centres) and changing consumer behaviour, which have resulted in longer distances for shopping and a higher modal share of the car (Martin, 2012, p. 143). A more recent change relates to online shopping. The last "MiD" edition shows that in Germany, only 30% of the population never shop online and over 40% do so at least monthly, slightly more in cities than in rural areas. However, this does not seem to reduce other (shopping) trips (Follmer, 2018, p. 20). A study on residents of different neighbourhood types in Berlin found that the more central, dense and mixed-use a residential context is (including different types of shops), the shorter the shopping distances and the higher the share of walking and cycling are (Gebhardt et al., 2005, p. 280). Car-free households tend to use even more the nearest shopping facilities (Gebhardt et al., 2005, p. 284). An experiment in Finland on eleven households giving up a car found that almost all participants needed to change their shopping practices because of the central role the car had played before (Laakso, 2017, p. 139).

3.1.1.2. Residential choice

The other main type of mobility practices analysed in this thesis is residential relocations. Although they are less central in this thesis and therefore only briefly addressed in this section, many aspects relating to daily mobility can also be applied to study residential mobility. As is the case for daily mobility, different perspectives exist in the study of residential choice (Rérat, 2016b): deterministic vs. humanistic (emphasising the role of structures or context vs. conscious decisions made by actors having a certain freedom of choice) and macro- vs. micro-analytical perspectives (focus on aggregate residential phenomena explained by the context vs. focus on individuals and their decisions, aspirations, etc.). Five main theoretical approaches to study residential mobility exist (Rérat, 2016b):

– **Neo-classic approach** (based on rational choice, like the "homo economicus" mentioned above for daily mobility)
– **Behaviourist approach** (based on socio-psychological mechanisms in residential choice, sees individuals as needing to be satisfied with their choice, the perceived environment plays an important role)
– **Institutional approach** (highlights the role of managers and institutions, of housing market intermediaries such as real estate agents or local authorities influencing housing choice)

- **Structuralist approach** (emphasises the importance of economic or political structures' in residential choice by using (neo-)Marxist theories)
- **Humanistic approach** (based on humanist geography, places action (agency) at the centre of interest, as well as individual experiences and beliefs, values, etc.)

Following Rérat (2016b), we understand residential choice not only *"as the result of households' aspirations, but rather as a choice with constraints"*. This means that they make a choice based on their needs and preferences, but limited by their resources and restrictions as well as the opportunities and constraints of the housing market (van Ham, 2012). There are six dimensions through which to analyse residential choice (Rérat, 2016b):

- **Unit of analysis:** to understand an individual's housing choice, the whole household and entourage need to be considered; in couples, for example, it often includes trade-offs and compromises (Rérat, Gurtner, & Baehler, 2014).
- **Profile:** including position in life course, socio-economic characteristics, nationality as well as values.
- **Trajectory:** including former (and future plans for) residential locations and their characteristics, it also refers to the life course and biographical approaches (see section 3.1.3).
- **Selection criteria:** residential satisfaction, aspirations or motivations can be analysed; Clark and Onaka (1983) identify three different types of moves: forced (by the loss of the former dwelling e.g.), induced (by a change in the household e.g.) or adjustments (to improve quality of life through housing size, accessibility, etc.). Most households need to make trade-offs as they cannot satisfy all their aspirations. Often, the characteristics of the dwelling are the most important motivation (Gebhardt et al., 2005, p. 275) and constraints are accepted when the wish to live in a particular dwelling such as a "house in the countryside" is prevalent (Gebhardt, 2012b, p. 87).
- **Decision-making process:** two main ways of finding a new home are found: through the market (agencies, ads) and through networks (family, friends). Already living in the area has advantages in the sense that it includes knowledge of the context. The available time to find a new home also plays a role.
- **Spatial practices**: particularly daily mobility (see next section).

As daily mobility, residential mobility has seen some important evolutions in the last years. Whereas for a long time, families showed clear preferences for suburban or rural living locations, there is an increasing number of studies on families choosing urban residences (Karsten, 2007; Lagrell et al., 2018; McLaren, 2016; Thomas, 2013). Their motivations vary, but accessibility and practical organisation of everyday life often play important roles, as well as social networks in the city.

3.1.1.3. Daily mobility and residential choice

A particular focus of this thesis lies on the links between daily mobility and residential choice. The place of residence has a particular importance for everyday mobility as a majority of trips start and/or end at home, as was the case for 73% of trips in Switzerland in 2015 (OFS / ARE, 2017, p. 22). Furthermore, the location of the place of residence is, besides car ownership, the most important factor affecting modal choice and distances travelled (Bauer, Holz-Rau, & Scheiner, 2005). As car-free housing developments exclude one of the main transport modes—or at least its ownership—daily mobility is supposed to play a certain role, or at least be considered by the households in their residential choice. Generally, two types of relations between daily mobility and residential relocation exist: the influence of a residential relocation on daily mobility and the importance of daily mobility on residential choice.

Residential relocation can influence daily mobility because it generally implies changing accessibilities and opportunities to use different transport modes and reach places of everyday life. Scheiner (2007) points out two elements to consider when looking for changes: the difference (or not) of spatial structures between the former and the actual place of residence and the distance between the two. If the distance is short, relations at the former housing place, especially private contacts, are often maintained and influence mobility practices. An important number of studies found changes in daily mobility practices after a residential relocation (e.g. Baehler, 2013; Rérat, 2010; Scheiner & Holz-Rau, 2013b). Indeed, moving house represents an important "key event" when mobility practices are likely to be adapted (see section 3.1.3). Different "mobility cultures" (Klinger & Lanzendorf, 2015) existing in different places (including built environment, travel-related attitudes and urban-level transport policy, see chapter 3.3) can also explain this to some extent.

However, it is not clear if mobility practices are adapted because of the different spatial structures or if residential choice is influenced by the wish to be mobile in a certain way. This latter effect is called "residential self-selection". It implies that households choose a new residence based on their preferences and attitudes to transport modes. Several studies confirm that when preferences or attitudes are not considered, the role of built environment tends to be overestimated (Bagley & Mokhtarian, 2002; Handy, Cao, & Mokhtarian, 2005; Matthes, 2015; Van Wee, Holwerda, & Van Baren, 2002).

Still, many studies find that despite residential self-selection, built environment has impacts on the transport modes used, too (Bauer et al., 2005; Scheiner & Holz-Rau, 2013b). A literature review based on 38 empirical studies (mostly from the USA) confirms that both the built environment and self-selection impact travel behaviour (Cao, Mokhtarian, & Handy, 2009). The authors were not surprised by this finding of quantitative studies. Even if preferences are important in residential choice, when car-centred individuals move to an area where walking is attractive (and car use restricted), they will very probably also walk more. These findings indicate that car-free housing developments could have an important impact: by making living without a private car attractive, even former car users are likely to change their mobility practices. However, another, more recent, literature review shows that residential self-selection still is often ignored, despite its proven importance—particularly for carless households (Mitra & Saphores, 2017). As a possible explanation, these authors consider studies suggesting that socio-demographic variables reduce the residential self-selection bias.

There are also voices countering this position. Næss states that "*if households self-select into areas that meet their travel preferences, it seems self-evident that urban structure matters*". (2009, p. 293). Based on a qualitative study in the metropolitan areas of Copenhagen and Hangzhou, he finds that urban structure and residential location influence car ownership and transport attitudes. If they are treated as exogenous control variables, the impacts of residential location on travel tend to be underestimated (Næss, 2009). M. Flamm and Kaufmann (2006, p. 183) are sceptical, too, and state that "[…] *the location strategies of individuals and households are based only to a small extent on decisive travel mode preferences, and the daily mobility context is instead mainly the result of land-use planning and of opportunities and constraints related to the real estate market and/or job market*". Nonetheless, they admit that some individuals willing to use public transport consider this when looking for a new residence.

Even if it is contested, residential self-selection has the merit of linking to the importance of daily mobility in residential choice. But this link is not as new, as already in the 1960s, the economist William Alonso proposed a model of how households choose their residential location between transport costs (especially work-related) and land price (Rérat, 2010, p. 67). Later, the distance to work was shown to be less important. It is actually more often adapted to the place of residence

than vice versa (Scheiner, 2007, p. 168) and increasing (long-)distance commuting supports this, too (Vincent-Geslin & Ravalet, 2016). Instead of physical proximity, accessibility (to places of everyday life) is a major reason in choosing a new dwelling. However, work-related mobility is not as important anymore and leisure activities continue to play a structuring role (Rérat & Bierlaire, 2017).

In Switzerland, studies on residents of new-build housing developments in Zurich, Neuchâtel and Biel/Bienne found that proximity to the city centre and mobility aspects such as the access to public transport and the possibility to move on foot and bicycle were the most important motivations for residential choice (Rérat, Baehler, & Gurtner, 2013; Rérat & Lees, 2011).

In Germany, several studies highlighted the importance of public transport, too (Beckmann et al., 2006; Jarass & Heinrichs, 2014; Sandfuchs, 2009). A survey of a new-build inner-city development ("Alter Schlachthof") in Berlin showed that access to public transport was the most important characteristic for housing choice, followed by the central location and, even if most residents own a car, accessibility by car was much less important as well as parking (Jarass & Heinrichs, 2014). Another study on ten neighbourhoods in the German capital found different types of residential strategies, including more or less mobility aspects (Gebhardt et al., 2005). Dwelling-centred strategies do not consider short distances or proximity, whereas location- or neighbourhood-oriented strategies focus on the improvement of connections to the social network and preferences for qualities of the neighbourhood, so they *"do not always serve to decrease distances in everyday life. Very often, they focus more on the neighbourhood* as *space, its social or aesthetic qualities, than on the location* in *space."* (Gebhardt et al., 2005, p. 276). The last type of strategy found, instead, focuses on everyday distances and connectivity, and is adopted mainly by residents who had not lived in the city before. However, many residents of the inner city choose this location because they value proximity related to a diversity of infrastructures such as theatres or restaurants (Martin, 2012, p. 159).

Sandfuchs (2009) found some interesting additional elements in a study on new-build developments in Hanover, close to the city centre. New residents considered not only access to public transport, but also proximity to shops and medical infrastructure. For families, short distances were also mentioned as facilitating everyday life organisation. And even if more than half of the households regularly use a car, they find it highly important not to depend on it, for environmental reasons or also to allow children to move on their own. Proximity to the main railway station (an important hub in the German railway network) or a direct and fast connection to it were mentioned, too, for work but also for leisure, especially by car-free households.

Gentrification studies have shown the importance of car-independent daily mobility for housing choice, too. In Norway, research on households in Oslo, Trondheim and Bergen showed that *"Living in inner parts of the city is convenient for organising everyday activities. Being independent of the car and public transport gives an appreciated freedom. No time is wasted waiting around, looking for a place to park, standing in queues, and there are positive health effects from walking or cycling."* (Hjorthol & Bjørnskau, 2005, p. 363). Similar findings were reported in Canada (Caulfield, 1994; Danyluk & Ley, 2007).

However, this is not always the case. The importance of daily mobility in residential choice depends on the spatial context, the population and the type of residential choice (Rérat & Bierlaire, 2017). A French study on residents in the periurban area of Rennes showed for example that consequences on daily mobility were not always anticipated in residential choice because the wish to buy a detached house was predominant (Baudelle, Darris, Ollivro, & Pihan, 2004). This points to an important question: if so, when is modal choice considered during residential relocation? Based on qualitative interviews with recent movers in Bristol, Stanbridge (2007) develops a "residential relocation timeline". It shows that travel is considered at different stages of the process

of residential relocation: it can be at the origin of it, considered at the beginning or during the search process, just before choosing or after this stage, or even after moving. Stanbridge found that car-free households consider modal choice at the beginning of the process while car drivers do not all, but only a minority of the households never considered travel during the entire moving process.

Finally, many households do not choose to live in the suburbs or even further away from the city, but often move there because they cannot afford or find a dwelling corresponding better to their preferences (Bauer et al., 2005). Constraints can therefore, as mentioned before, have an important influence on residential choice.

3.1.2. Mobility capital

The distinction between an individual's potential mobility (or "mobility capital") and the effective movements enables us to consider the context in which they are situated. As Kellerman states: *"[…] from a scientific perspective, potential mobility is one side of the mobility coin, coupled with the other side of practiced mobility, so that the very study of mobility at large has to include an examination of potential mobilities as the preparatory phase eventually yielding practiced mobilities".* (2012, p. 171). An important mobility potential, however, does not necessarily translate into high effective mobility and vice versa (Kaufmann, Dubois, & Ravalet, 2018; Rau & Vega, 2012).

To address this potential mobility, different geographers and sociologists use the concept of capital (Canzler, 2016; Kaufmann, Bergman, & Joye, 2004; Lévy, 2003a; Rérat & Lees, 2011; Urry, 2007). It is based on the work of Pierre Bourdieu who proposed a *"significant theoretical inflexion"* (Lévy, 2003a, p. 124) by adding to what he calls "economic capital" two other types that are "cultural (or informational) capital" and "relational (or social) capital" (Bourdieu, 1983). Economic capital corresponds to an individual's income and other financial resources; cultural capital is education, knowledge but also the demonstration of values; and social capital consists of social networks and personal relations. Bourdieu has, thus, introduced the concept of "capital" outside the field of economics, giving it a different sense than a monetary value. He extended it to the field of inequalities and reproduction discourses, social relations and cultural resources, individual practices and preferences. He found that social classes were not helpful anymore to understand individuals, and, instead, different amounts of capitals defined their social position (Bourdieu, 1979).

The list of different capitals was not limited, other possible types are mentioned, for example "symbolic capital" (Kaufmann & Audikana, 2015, p. 185). But for Bourdieu, there was no capital related to space. Physical space was for him a projection of social space: *"In fact, social space is reflected in physical space, but always in a more or less* blurred *way: the power over space given by the possession of capital in its various types is manifested in the appropriate physical space in the form of a certain relationship between the spatial structure of the distribution of the agents and the spatial structure of the distribution of goods or services, private or public."*[23] (Bourdieu, 1993, p. 251). Moreover, physical space is a dimension of all types of capitals (Ripoll & Veschambre, 2005, p. 478). Therefore, some authors reject to use the term of "capital" in this context. They consider mobility as an effect of different forms of capital and not as a capital itself (Borja, Courty, & Ramadier, 2012; Dangschat, 2013). They criticise that it implies that actors

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[23] *"En fait, l'espace social se retraduit dans l'espace physique, mais toujours de manière plus ou moins* brouillée *: le pouvoir sur l'espace que donne la possession du capital sous ses diverses espèces se manifeste dans l'espace physique approprié sous la forme d'un certain rapport entre la structure spatiale de la distribution des agents et la structure spatiale de la distribution des biens ou des services, privés ou publics."* (Bourdieu, 1993, p. 251).

have a predetermined intention and that Bourdieu's other concepts related to capital are not used (Borja, Courty, & Ramadier, 2015, p. 204).

To justify the use of a separate capital in the sense of Bourdieu, Ripoll and Veschambre (2005, p. 480) show that two specific aspects exist: centrality, or the effects of a spatial organisation of positions relative to each other; and concrete places allowing activities to happen. Kaufmann and Audikana (2015) argue that due to its central importance in contemporary society, the ability to be mobile is not just a combination of other types of capitals, such as income (economic capital), education level (cultural capital) and social networks (social capital)—rather, it seems to allow the activation of other capitals. Thus, mobility constitutes a particular form of capital that can be converted into and exchanged with other capitals (Kaufmann et al., 2004). Finally, Kaufmann and Audikana (2015) argue that understanding mobility as a capital is the result of empirical studies. These studies follow Bourdieu's work to decline capital in order to measure and analyse it. They highlight mobility's increasingly important role to develop other capitals, such as moving to earn money, to be educated or to maintain a social network.

3.1.2.1. Concepts of mobility capital

On this basis, different concepts of space- or mobility-related capital have been proposed. The geographer Jacques Lévy was one of the first scholars relating capital to space by proposing the concept of "spatial capital" in his understanding of mobility as a system of potential movements, called "virtualities" (Lévy, 2000, p. 158). There are three "virtualities": mobility is possible because of an offer (accessibility), it is effective because of an individual's mobility competence and it "acquires sense" as it becomes part of his or her social capital (Lévy, 2000, p. 158). Today, spatial mobility implies making choices, thus, effective mobility is the result of an arbitration between different possible (non-)mobilities that can be interactive (personal or via telecommunication) or not (Lévy, 2000, p. 159). Levy defines "spatial capital" as the resources an actor has accumulated to take advantage—in accordance with his or her strategy—of using the spatial dimension of society (Lévy, 2003a, p. 124). As for Bourdieu's forms of capital, spatial capital can be exchanged, economic capital can for example help to achieve a high spatial capital and vice versa. The concept of "spatial capital" was also used by other scholars, for example in relation to gentrification, to combine daily mobility and residential choice (Rérat & Lees, 2011).

The most common concept of mobility capital is "motility". It was developed in the early 2000s by the sociologist Vincent Kaufmann in the context of the fluidification of society to understand how an individual uses the possibilities of movement provided by transport and communication systems. It represents *"The way in which an actor appropriates the field of possible action in the area of mobility, and uses it to develop personal projects"* (Kaufmann, 2002, p. 3). A later definition says: *"Motility can be defined as the capacity of entities (e.g. goods, information or persons) to be mobile in social and geographic space, or as the way in which entities access and appropriate the capacity for socio-spatial mobility according to their circumstances"* (Kaufmann et al., 2004, p. 750). Mobility, instead, represents movements across space. The main advantages of this concept are that *"Unlike cultural, social or economic assets, which refer to hierarchical position, motility refers to both the vertical and horizontal dimensions of social position, thus highlighting not only new forms of social inequality but also making it possible for us to distinguish between different lifestyles based on an individual's relationship to time and space."* (Kaufmann, 2011, p. 40).

The term "motility" originates in biology and medicine where it denotes an animal's, cell's or organ's capacity for movement—and is, therefore, refused by Kellerman (2012) who prefers "potential mobilities". However, motility had been used before, in 2000 by Bauman for example (Kellerman, 2012, p. 172) or even earlier by de Greef in 1904 or Merleau-Ponty in 1945 (Duchêne-Lacroix & Schad, 2013, p. 66).

Motility is composed of three dimensions, corresponding to and inspired by Lévy's three "virtualities" (Kaufmann, 2004, p. 33; Kaufmann et al., 2004, p. 750):

– **Access:** the different mobility options available at a certain place and time (e.g. place of residence), the conditions to use them (costs and other constraints)
– **Competences or skills:** the personal skills to use a mobility offer, of which there are three types (M. Flamm & Kaufmann, 2006):
  – **physical abilities** to move in a certain way
  – **acquired skills** such as a driving licence or knowledge of a region
  – **organisational skills** such as knowing how to plan and organise movements or where to find information related to spatial mobility
– **Appropriation or projects or plans** (Kaufmann et al., 2018): evaluation of the transport offer, considering their projects, strategies, values and habits, or: *"how agents consider, deem appropriate, and select specific options".* (Kaufmann et al., 2004, p. 750).

Different authors have tried to operationalise the concept of motility, in qualitative (M. Flamm & Kaufmann, 2006; Maksim, 2011) as well as in quantitative studies (Dubois & Ravalet, 2015; Kaufmann et al., 2018), but, as Kaufmann (2014, p. 72) notes, they remain exploratory and no standard methodology has been adopted. However, they have at least revealed abilities important for mobility and the differences existing between individuals and spaces (Kaufmann & Maksim, 2012). Maksim (2011) found in her thesis that people with a limited economic capital can develop specific motilities to compensate it. Based on another qualitative thesis (M. Flamm, 2004), M. Flamm and Kaufmann (2006) propose a list of elements related to the three dimensions of motility. They point out that to understand the "access" dimension in the context of new services such as car- or ridesharing, not only vehicle ownership has to be considered, but also what they call the "access rights portfolio": *"a generic term for all the instrumental resources which individuals get the right to use".* (M. Flamm & Kaufmann, 2006, p. 171), including also reserved parking places, public transport passes, membership of car clubs, etc. For skills, they emphasise the importance of past experiences and socialisation (see 3.1.3). Finally, for appropriation, which they highlight as the most difficult aspect to understand, a transport mode must suit functionnaly and symbollicaly, with reliability and safety playing important roles (M. Flamm & Kaufmann, 2006, p. 178).

Quantitative studies on motility have so far presented typologies. Based on a panel study on work-related mobility in Switzerland, Germany, Spain and France, Kaufmann, Dubois and Ravalet (2018) found six groups of individuals from "unmotile" to "very motile", but also more complex groups as "reluctant to be mobile", "willing to be mobile", "reversible" and "irreversible". They differ in access, skills and willingness to be mobile. The results show that the most motile individuals are not the most mobile and vice versa. However, a higher mobility capital makes it easier for people to adapt their mobility. The use of panel data also allowed to show that motility changed over time.

More recently, Kaufmann (2014, p. 69) questioned the initially proposed tri-partition of motility because the three dimensions overlap. For instance, specific projects or accesses can be the result of a competence. Furthermore, motility also depends on the potential of the spatial context (Kaufmann, 2015, p. 15). Empirical research showed that it strongly influences access and competences (Dubois & Ravalet, 2015). Therefore, the concept of a "territory's hosting potential" was introduced (see 3.3).

Other authors used similar concepts considering mobility as a capital. John Urry (2007), based on the same assumptions as Bourdieu and the observation that access to mobility has become central, proposes "network capital". It is *"the capacity to engender and sustain social relations with those people who are not necessarily proximate and which generates emotional, financial and*

practical benefit (although this will often entail various objects and technologies or the means of networking)". (Urry, 2007, p. 197). Thus, he wanted to insist on the social consequences of mobility that matter to form and stabilise social networks, because mobility itself has no use.

Other studies used similar concepts. Some French-speaking authors named "capital de mobilité" or "capital mobilitaire" concepts with elements relating mainly to the access and competences dimensions of motility but also to past experiences of mobility practices in some cases. These researchers adapt the idea of a mobility-related potential or competences, in case studies as different as exchange students (Murphy-Lejeune, 2001), Moroccan migrants in Southern Europe (Ceriani Sebregondi, 2007) and accessibility in the metropolitan area of Santiago de Chile (Delaunay & Fournier, 2014). In a large research project on multilocality, the more encompassing term of "space-related capacity to act" ("raumbezogenes Handlungsvermögen") was proposed (Duchêne-Lacroix & Schad, 2013).

In this thesis, I use the term "mobility capital" to address an individual's access and competences (or skills) to be mobile. I do not include the dimension of appropriation or projects in "mobility capital". Although these aspects are very important, in my view, they are on an overarching level and correspond to two different types. Firstly, individual values are part of the personal characteristics. Secondly, the motivations to select a transport mode are seen as the process between mobility capital, habits and routines, individual values, as well as the social and spatial context (or the "hosting potential of a territory"), on the one hand, and the effective mobility practices, on the other hand (see Figure 5).

Based on the assumption that most individuals do not seek to restrict their spatial mobility by living car-free and given the multiple existing alternatives to move (or not), considering the "mobility capital" of a person is essential to understand mobility practices. In fact, the absence of a private car is a strong predictor for modal choice as its presence appears to be the most important explanatory factor for modal choic (Preisendörfer & Rinn, 2003, p. 35)[24]. Thus, mobility capital is particularly significant to study car-free households because, as the title of an article by M. Flamm (2005) points out, this needs much know-how (*"Se passer de la voiture demande beaucoup de savoir-faire"*). Different guidebooks on how to live without a car also support this (autofrei leben! e.V., 2018; Knierim, 2016). The Finnish study, presented above, on households giving up cars found that, indeed, *"Some participants had to gain new skills and competences, and change their ways of thinking, to commit to the new practices. Many of them had only used cars in their everyday mobility for decades."* (Laakso, 2017, p. 139). As Canzler (2016, p. 172) highlights, the ability to be mobile is especially important for non-car drivers, because multi- and intermodal mobility practices are generally more demanding and complex than monomodal car use.

3.1.2.2. Mobility strategies

As Kaufmann and his colleagues (2015) note, the idea of mobility as a capital also allows us to address the individual strategies that are adopted to be mobile, or not. Indeed, a mobility practice can be the result of different, even opposed, strategies (Delaunay & Fournier, 2014, p. 132). Thus, this last section on mobility capital addresses mobility strategies.

Following Jouffe et al. (2015) and Lévy (2003b), strategies are understood as an actor's leeway: individuals are neither only directed by social structures, neither completely free in their choice of actions. This approach relies on the definition of strategy by Michel de Certeau (1988) who

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[24] *"In der Tat gibt es reichhaltige empirische Evidenzen dafür, dass der bloße Tatbestand des Autobesitzes der stärkste und erklärungsbedürftigste Prädikator der Verkehrsmittelwahl für verschiedene Zwecke ist [...]"* (Preisendörfer & Rinn, 2003, p. 35)

distinguishes strategies from tactics in "*The practice of everyday life*" where he treats the "arts of doing" daily practices: "*I call a* strategy *the calculation (or manipulation) of power relationships that becomes possible as soon as a subject with a will and power (a business, an army, a city, a scientific institution) can be isolated. It postulates a* place *that can be delimited as its* own *and serve as the base from which relations with an* exteriority *composed of targets or threats (customers or competitors, enemies, the country surrounding the city, objectives and objects of research, etc.) can be managed.*" (Certeau, 1988, pp. 35–36). Instead, for de Certeau, a tactic is "*a calculated action determined by the absence of a proper locus.* […] *The space of a tactic is the space of the other. Thus, it must play on and with a terrain imposed on it and organised by the law of a foreign power.* […] *It operates in isolated actions, blow by blow. It takes advantage of 'opportunities' and depends on them* […]" (Certeau, 1988, p. 37). For de Certeau, many daily practices such as moving are tactics. Unlike tactics which depend on the time of an action, strategies imply control or appropriation of space.

The concept of strategy originates from the vocabulary of war, it represents the means to realise the general objectives of a war (Lévy, 2003b, p. 874). By the end of the 20th century, it was adopted in the social sciences (in economics and politics especially) in the context of the concept of "actor" (Lévy, 2003b, p. 874). A strategy actually implies an actor with a strategic competence, i.e. a capacity to represent a desirable context and to link it to the means to achieve it (Lévy, 2003b, p. 873). It joins the idea that an actor has a certain possibility to do something and is not only dependent on structures, but interacts with other actors who have their own strategies (Lévy, 2003b, p. 874).

As de Certeau stated, strategies imply a control of space and time of actions. Hence, it is not surprising that the concept has been applied in geography. Lévy defined a "spatial strategy" as an explicit intentional and organised representation of an actor aiming to valorise his or her spatial capital (Lévy, 2003b, p. 873). The accessibility of the place of residence can represent an important spatial strategy, thus moving house can be analysed as a "residential strategy" (Bonvalet, Gotman, & Grafmeyer, 1999).

Tactics and strategies were used in a study on middle-class households' residential choice in Amsterdam and Copenhagen which also applied Bourdieu's concept of capital, seeing housing choice as not only influenced by economic capital: "*Following De Certeau I consider getting hold of a dwelling as a process that is sometimes strategical, in the sense of reflexive decision-making, and sometimes tactical in the sense that one has to intuitively react on constraints imposed by the market and institutional conditions.*" (Boterman, 2012, p. 325). This study showed the importance of social and particular forms of cultural capital for residential choice in highly regulated fields such as social housing. Where economic capital is not paramount, various strategies and tactics are applied to access housing—even if many residents perceive it as "coincidence" (Boterman, 2012). In Swiss core cities, the residential choice of gentrifiers was considered a "coping strategy" to be able to access different labour markets, especially in medium-sized cities and in the context of an uncertain professional life and the increasing requirement to be flexible (Rérat & Lees, 2011). Similarly, living without access to a private car requires adopting "coping strategies" including the alternative forms of mobility to be able to be mobile when needed.

Strategies have also been used in research on car-free households. In the qualitative study in Vienna presented above, it appears that to stay car-free when they have children, families apply communicative and organisational strategies "*to maintain a high degree of household elasticity and create a sense of togetherness*". (Rau & Sattlegger, 2018, p. 61), instead of buying a car as many other parents do to satisfy their need for potential mobility. A study based on interviews with eight households with young children in Gothenburg, Sweden proposes the concept of "accessibility strategies": "*the ways individuals overcome or adapt to existing time–space fixities and*

constraints when organising everyday life [...] *By* strategy *we refer to coordinated sets of decisions and practices that individuals engage in* [...]*"* (Lagrell et al., 2018, p. 220). To manage everyday life without a private car, these double-income households use various strategies beginning with a housing choice based on geographical proximity to be able to use active travel modes. Unlike car owners that rely on "accessibility by speed", living without a private car relies more on "accessibility by proximity". Other strategies to overcome existing constraints are for example virtual access enabled by information and communication technologies or access supported by social relations. The following types of practices are identified as elements of a "carless accessibility strategy" (Lagrell et al., 2018, p. 220):

- *choosing activities nearer home;*
- *seeking flexible opportunities (e.g. flexible work arrangements);*
- *spending less time on travel-based (i.e. out-of-home) activities or performing them less often;*
- *using altermobility (i.e. walking, biking, and public transport);*
- *employing travel/activity coordination and chaining (i.e. performing several activities during the same trip);*
- *redistributing trips and tasks between household members or seeking support from the social network;*
- *changing communication channels in favour of ICT use and virtual mobility;*
- *ceasing to participate in certain activities and engaging in new ones (e.g. spending more time close to home).*

Similar to these "carless accessibility strategies", I will identify strategies to live car-free that the residents adopt. They are mainly related to the two dimensions of mobility capital, access and competences, but more general strategies are also imaginable. They are often not explicit, once these mobility strategies are internalised by the individuals, they normally become habits or routines.

3.1.3. Mobility biographies

As mentioned in the introduction of this chapter, mobility capital and practices are not static. They usually change over the life course. Therefore, an individual's biography and his or her actual position in the life course is another important aspect to understand mobility practices (Döring, Albrecht, Scheiner, & Holz-Rau, 2014; Kaufmann et al., 2018). This finding led to the "mobility biographies" approach (Holz-Rau & Scheiner, 2015; Lanzendorf, 2003; Scheiner, 2007) that proposes "*to understand and explain everyday travel behaviour as a routine activity—changing due to key events such as residential relocation, the birth of a child or exogenous interventions.*" (Müggenburg, Busch-Geertsema, & Lanzendorf, 2015, p. 151). This approach allows not only to situate mobility practices throughout time but also in the context of the other domains of an individual's biography. It is part of a general paradigm shift towards a "life-oriented approach" in transport behaviour research (Zhang & Van Acker, 2017).

3.1.3.1. The life course approach

Even if the term "mobility biography" is widely used, this approach is more closely linked to life course research than to biographical research (Scheiner, 2018). The life course is understood as the sequence of events and role transitions in an individual's life, from birth to death (Elder, Kirkpatrick Johnson, & Crosnoe, 2006). Instead, in social sciences, a biography is conceived as an individual's meaningful actions in a lifetime, including self-reflection (Sackmann, 2007).

For a long time, studying the life of individuals was not common in social sciences. This changed only in the second half of the 20th century, influenced by rapid social change, the evolution of the

age structure of society and an increasing number of longitudinal studies, more quantitative in the USA and more qualitative in Europe (Elder et al., 2006, pp. 5–6). The influence of biographical aspects on social pathways, their development and the relation to personal and socio-historical conditions became research issues. Life course research, *"a theoretical orientation that guides research on human lives within context"* (Elder et al., 2006, p. 10), has been developed in the last decades of the 20th century. Different concepts were proposed to consider historical and biographical contexts, such as "social pathways" which are *"the trajectories of education and work, family and residences that are followed by individuals and groups through society"*. (Elder et al., 2006, p. 8). These pathways are influenced by history and often structured by social and cultural aspects (norms e.g.). Trajectories are characterised by "transitions" or changes of role or state, such as retirement or leaving the family home, and open the opportunity to change practices.

While approaches based on the life course have a long tradition in sociology and psychology (Elder et al., 2006), it was only recently that this perspective has been introduced in mobility research (Müggenburg et al., 2015, p. 152). The first longitudinal studies were realised in the 1980s, even if Hägerstrand's "time geography" already recognised the relevance of the "life path concept" for travel studies in the 1970s (Scheiner & Holz-Rau, 2013b, p. 432). At the beginning, the biographical approach was used to explain long-term mobility decisions such as residential relocation or migration (cf. overview by Mortimer & Shanahan, 2006; e.g. Mulder & Wagner, 1993). Later, short-term decisions, such as modal choice, have also been analysed under this approach (Scheiner & Holz-Rau, 2013a). Finally, since the 2000s the mobility biographies' approach has been developed by different scholars in the Dutch- and German-speaking world (Holz-Rau & Scheiner, 2015, p. 7). Two reasons are put forward to explain this: large insecurities on the cause-effect relation between mobilities and (apparent) determinants as well as changed practices after certain events or transitions in life course (Holz-Rau & Scheiner, 2015, pp. 4–5).

To establish mobility biographies, longitudinal data is necessary. Two types exist: panels and qualitative retrospective data (Lanzendorf, 2003). Pseudo-panels from time series data show only the evolution of practices of cohorts, not of the same persons. But they are easy to use because such data exists, unlike "real panels" where individuals answering surveys at different moments have to engage over a long time period. Retrospective methods allow to go beyond simple practices, but need to consider problems of memory.

3.1.3.2. The five key elements of a mobility biographies approach

While in the past decade, a multitude of empirical studies have adopted a life course-oriented perspective, there is a lack of theoretical background for mobility biographies (Scheiner, 2018). Drawing on different psychological and sociological concepts, Scheiner (2018) proposes, therefore, a theoretical framework with five key elements:

1. *"Factors that serve resistance to change"* (mainly the importance of habits to explain mobility practices)
2. *"Stages of behavioural change"* (the strong relations with other life-course domains)
3. *"Factors that trigger change"* (the importance of "key events")
4. *"The role of socialisation"* (the links with life courses of people in an individual's social environment)
5. *"Levels of change and stability"* (including the wider context such as the historical period)

First, the importance of habits and routines to explain mobility practices is a basic consensus of mobility studies, as mentioned above (Bamberg, 2003; Buhler, 2015; Gärling & Axhausen, 2003; Lanzendorf, 2003; Verplanken et al., 2008). As Müggenburg et al. (2015, p. 152) note, *"the mobility biographies approach was developed to investigate travel behaviour stability and change over time by acknowledging the importance of routines"*. Results from social and environmental psychology

show that practices of everyday life rely on habits, they work as *behavioural 'recipes' that can easily be applied in situations that are experienced as similar to other, previously experienced situations*. (Scheiner, 2018, p. 47). When the context changes, habits do not work anymore and need to be rebuilt by conscious decision-making (Klöckner, 2005). At this point, intentions can become important and changes are more probable. Verplanken et al. (2008, p. 125) propose a "habit discontinuity hypothesis" which *states that when context change disrupts individuals' habits, a window opens in which behaviour is more likely to be deliberately considered*.

Second, strong relations with other life-course domains are included in the mobility biographies approach. Lanzendorf (2003, p. 10), drawing on work by Salomon, proposes three domains: lifestyle, accessibility and mobility. Scheiner's (2007) model of "mobility biography" includes three "partial biographies": employment biography, household biography and residential biography. Rérat (2013) uses a similar tripartition with professional, socio-familiar and migratory trajectories. All authors insist on the interdependencies between the biographies or trajectories and on the need to place "key events" in their context.

Third, "key events" are defined as *triggers of behavioural change* (Müggenburg et al., 2015, p. 152) that result in significant changes of mobility practices (van der Waerden, Timmermans, & Borgers, 2003). These changes are followed by a period of relative stability until another relevant event occurs (Lanzendorf, 2003). While recently, a growing number of studies addressed different key events, only Lanzendorf (2003) and Scheiner (2007) considered them and their effects on mobility practices in a larger theoretical framework (Müggenburg et al., 2015). There is no clear definition of "key event" and different other scholars used similar concepts (Lanzendorf, 2003; Scheiner, 2007; van der Waerden et al., 2003): "turning points in life" (Beige & Axhausen, 2012); "trigger events" (Kent & Dowling, 2013); "life event" (Klöckner, 2005) or "situations of opportunity" (Thomsen & Löfström, 2011), for more see Müggenburg et al. (2015, p. 152). Van der Waerden et al. (2003) distinguish key events from "critical incidents", which they define as "*an event that has a major impact on one's attitude such as the involvement in an accident*", thus, events that usually occur unexpectedly, contrary to a key event. Other authors have a larger approach but all contain the idea that either the context changes after an event external to the individual, either the individual changes the context intentionally (Müggenburg et al., 2015, p. 152).

Based on a review of 25 studies, Müggenburg et al. (2015, p. 153) find three types of "key events" and add as a fourth element "*long-term processes in life, which are rather insidious processes that are not perceived as one special event*" including socialisation or age effects as well as the historical context (wars or technological progress e.g.):

1) **"Life-events"** are either aspects of the "private career" (changes in the number of household members, birth of a child, etc.) which are relatively well-known, or of the "professional career", which are less studied (entry into the labour market, retirement, etc.).

2) **"Adaptations of long-term mobility decisions"** such as vehicle ownership, a season ticket or residential relocation (probably the most researched) including, generally, acquisition costs and often triggered by life events or exogenous interventions, but they might also be due to other reasons. It is similar to the concept of "mobility milestones" (Rau & Manton, 2016) differentiating "mobility-related events" *that are predominantly shaped by prevailing transport- and mobility-related (infra)structural conditions (e.g. road and rail infrastructure, cycling policies, traffic laws, educational programmes for different mode users, and social norms regarding mobility)*" from other "life events" including residential relocation (Rau & Manton, 2016, p. 51), unlike Müggenburg et al. (2015, p. 153).

3) **"Exogenous interventions"** are either "*interventions designed for travel behaviour change*" (free public transport tickets e.g.) or "*non-targeted interventions*" ("critical incidents" in the

sense of van der Waerden et al. (2003), e.g. closure of a road, increased costs, extreme natural events, strikes).

Most research on the influence of key events on mobility was quantitative (Müggenburg et al., 2015; Scheiner, 2018), even if *"Qualitative data much better captures underlying and new, not hypothesised factors and helps in understanding the complexity of multiple factors, whereas quantitative approaches often simplify such interrelations."* (Müggenburg et al., 2015, p. 160). Hence, a qualitative and deeper approach would allow to understand more than statistical interactions between some (predefined) past experiences and actual mobility practices (Miles, Moore, & Muir, 2013). Therefore, Miles et al. suggest a self-reflective, qualitative-hermeneutic understanding of individual biographical narratives.

Similarly, Sattlegger and Rau (2016) claim a reconstructive-interpretative approach to mobility biographies and emphasise that the individual's memories should be used as oral history shaping present action. They point out four major challenges of the past, quantitative, mobility biographies research: the strong focus on discrete life events tends to ignore slow, long-term changes; analysing the individual level excludes the social nature of mobility practices; often largely arbitrary hypotheses limit theory development; and, finally, the priority on analysing reported behaviour results mainly in not paying attention to changes in meaning and perception of mobility (Sattlegger & Rau, 2016, p. 23).

These authors reviewed the existing qualitative approaches to mobility biographies and found two waves. In a first wave, linear-realist conceptions of the life courses were adopted. They supposed that past events lead to behaviour change and can be recalled in the present (Miles et al., 2013, p. 176). These studies were mainly theory-driven and used to prepare quantitative methods. A second wave, since 2012, used new narrative approaches. Open and interpretative research strategies often included inductive and longitudinal methods. They can further be separated into two types: those using a text-reducing or comparative approach to data analysis and those, as the authors themselves, adopting a reconstructive-biographical approach. This allows to overcome several shortcomings of the former method by identifying latent structures of meaning, including influences of society, and specific worldviews of groups and milieus. The advantages of this approach are seen in its potential to examine the relationship between meaning and action and in the opportunity to find complex relational, processual and non-linear biographical trajectories, overlooked by other approaches. Moreover, it can also be used to differentiate between biographical changes of the individual and transformations of the society (Sattlegger & Rau, 2016, pp. 23–25). Their results highlight the need to understand mobility biographies not individually but in the context of the family or household, as others have pointed out, too (Manderscheid, 2014a).

Research on car-free living showed the importance of key events to become car-free or the importance of the position in life course on car ownership (Deleuil et al., 2017; Rigal, 2018; Thomsen & Löfström, 2011). Deleuil et al. (2017) identify some "key events" to become car-free: moving house, a professional reorientation, retirement, departure of the last child from the family household, or a good opportunity to sell the car. The arrival of new transport services such as carsharing was also mentioned as a trigger factor (Deleuil et al., 2017). Thomsen and Löfström (2011, p. 970) found specific "situations of opportunities" when especially certain groups of people may choose a car-free life: young adults or students starting to live without their parents; families open to sharing and environmental issues; and elderly people, especially after retirement. They emphasise the role of trying out: *"positive experiences with living in a car-free environment may also influence residents' view on this question"*. (Thomsen & Löfström, 2011, p. 969). Rigal (2018) found that giving up a car is often a process with different steps leading to a tipping point where the switch happens, mainly as part of a larger shift in values and leading to a more satisfying life.

The fourth key element of a theoretical framework of mobility biographies is socialisation. As stated before, an individual's life course cannot be analysed independently from other people's life courses and the social structures in which someone is embedded (family, friendship, neighbourhood). This is called "linked lives" in sociology and psychology, emphasising the links between individuals (Elder et al., 2006). Socialisation, instead, *"refers to the integration of individuals in society over the course of their lives by means of learning from significant others who work as socialisation agents".* (Scheiner, 2018, p. 52). These agents are typically parents, the family, peer groups, school or media, but also organisations. Even if childhood and youth are the most formative stages of socialisation, this process continues during the whole life course. Socialisation makes mobility a norm and therefore *"might be understood as sort of a 'habit on the aggregate (or system) level' ".* (Scheiner, 2018, p. 52). Recent studies showed the importance of socialisation agents (Döring et al., 2014; M. Flamm & Kaufmann, 2006; Müggenburg & Lanzendorf, 2015). M. Flamm and Kaufmann (2006, p. 177) conclude that *"the failure to acquire certain aptitudes, because of a lack of experience of a given travel mode in one's youth, has a much greater impact on their behaviour in adulthood".* A German study on three generations (students, their parents and grandparents) found significant differences in transport modes used for the stages of school, education and work (Müggenburg & Lanzendorf, 2015). Changes within a stage were, instead, less present, but between generations they were significant, also related to change of workplace, residential relocation and everyday mobility. Furthermore, it is important to distinguish two perspectives on socialisation: there can be socialisation *to* the practice of different transport modes and socialisation *through* the practice of certain transport modes (Greene & Rau, 2018).

Finally, the last key element for a biographical approach to mobility is the wider context of an individual, beyond the personal social environment. It has to be considered because *"There cannot be communities or organisations without individuals, but, on the other hand, individual action cannot be adequately understood without taking into account the organisation of individuals in social groups and economic, administrative and political institutions. This can best be described as a reciprocal relationship (Giddens 1984) […]"* (Scheiner, 2018, p. 46). This is especially the case in the context of car-free households living in a car-centred society. The wider context or "upper 'system' level of society" (Scheiner, 2018, p. 54) also tends to support stability, as the chapter on the system of automobility showed.

3.2.   A frame concept to understand residents: lifestyle

This chapter introduces "lifestyle", the concept which was chosen as a frame to understand the residents in car-free housing developments, instead of similar approaches such as "way of life" ("style de vie" in French). First, its history and different approaches of lifestyles are presented. Then, I focus on values, one dimension of the lifestyle definition adopted in this thesis, and more in detail on the role of environmental values. Finally, the links between lifestyles and daily mobility as well as residential choice are presented.

3.2.1.   History of the concept of lifestyles

Lifestyle research emerged in the 1970s in sociological research related to inequalities (Rössel & Otte, 2011, pp. 7–9). It was proposed in response to vertical stratification models that had become impertinent, in the context of pluralisation theories (Hradil, 1987) and growing individualisation, freeing individuals from the social organisation of the industrial society (Beck, 1986). Societies are seen to be less characterised by social classes, but more by new, horizontal inequalities *"jenseits von Klasse und Schicht"* (Beck, 1986, p. 121) that classical structural indicators such as income, age, gender or education cannot explain anymore. Instead, diversified practices and values can be explained by social "milieus", different ways of life or lifestyles.

The concept of lifestyle, however, is much older. Two major perspectives appeared at the beginning of the 20th century (Pattaroni, 2013). The first relates lifestyle closely to a specific living environment, it reflects psychological traits, and relations to others and the built environment. The second perspective, inspired by Marxism, connected lifestyles to the economic and social position of individuals. Bourdieu's work, mainly "La Distinction" (1979), also falls within this latter perspective. He rediscovered in the 1970s the concept of lifestyle and has strongly influenced its further development (Rössel & Otte, 2011, p. 9). Bourdieu differentiates economic and cultural capital to identify different lifestyles within social classes and, thereby, lays the basis for the future use of this concept. He estimates that lifestyles are mainly constructed by the life conditions during the early stages of socialisation and remain stable during the life course (creating what he calls "habitus").

Since the 1980s, particularly German sociologists have shown a great interest for lifestyles (Rössel & Otte, 2011, p. 7; Scheiner & Kasper, 2003, p. 319). Their studies are based on a global concept integrating all types of an individual's activities, but are mainly descriptive. Instead, Anglo-Saxon approaches often reduced lifestyles to cultural capital. They have nonetheless the benefit of linking lifestyles more strongly to issues of social inequality and reproduction (Rössel & Otte, 2011, pp. 10–11). While these latter studies have a stronger interest in particular aspects of cultural tastes and practices, the German studies also addressed the impacts of lifestyles, for instance on sustainable development for instance (Pattaroni, 2013). Today, lifestyles are widely used to address particular groups in politics, marketing or market research (Götz, Deffner, & Stieß, 2011, p. 87; Jansen, 2011, p. 181).

3.2.2. Approaches of lifestyles

Two broad perspectives exist in lifestyle research: lifestyles as types of activities and time-use patterns and lifestyles as orientations (i.e. values, attitudes and preferences) motivating practices (Van Acker, 2015, p. 79). The different definitions found in the literature can be classified into five different approaches (Jansen, 2014, p. 257):

1. Definitions based on practices
2. Definitions based on values or attitudes (latent variables)
3. Definitions based on both practices and values or attitudes
4. Definitions combining a series of socio-demographic characteristics
5. Definitions combining socio-demographic characteristics and other variables

The first three approaches are probably the most used. While some authors use the term lifestyle for typologies based only on values, opinions or attitudes (Jansen, 2014), different sociologists, including Bourdieu, especially in the area of mobility, used a lifestyle approach based on practices (Pattaroni, 2013; Thomas, 2013). For Kaufmann (2000, p. 38), for example, the lifestyle is an individual's leeway to organise everyday life, to put emphasis on certain spheres or develop activities in a certain way. This "room for manoeuvre" is not the same for all individuals, it can be restricted or even inexistent for some.

Similar to the one adopted in this thesis, many definitions link practices and values, attitudes or opinions (Katz-Gerro, 2007; Kemper, Kulke, & Schulz, 2012; Rössel & Otte, 2011; N. Schneider & Spellerberg, 1999). The Blackwell Encyclopedia of Sociology gives the following definition: *"Lifestyle involves the typical features of everyday life of an individual or a group. These features pertain to interests, opinions, behaviors, and behavioral orientations."* (Katz-Gerro, 2007). For N. Schneider and Spellerberg (1999), lifestyles are a sociostructural category that allows to differentiate homogeneous groups of adults sharing the same practices and values. Age, education and gender mainly influence lifestyles. This approach of lifestyles was chosen in this thesis as the most relevant, as it combines the two main research questions which are to understand why

(linking to values) and how (linking to practices) residents of car-free housing developments live without a private car.

The importance of lifestyles for practices is to structure and relieve everyday life through routines, and, in doing so, ensure identity and allow social distinction (N. Schneider & Spellerberg, 1999, p. 28)[25]. The role of lifestyles for social differentiation and the importance of different universal values across different lifestyle groups is also emphasised by other authors (Götz et al., 2011; Jansen, 2014). Götz et al. (2011, p. 89) add that "lifestyle orientations" are also part of a complex "context of action" ("Handlungskontext") in which factors of social structure and of "hard" context (such as infrastructures) play a role (this is addressed in this thesis with the concept of "a territory's hosting potential", see chapter 3.3).

Furthermore, lifestyles are not stable but are transformed during the life course (Pattaroni, 2013). On the individual level, changes often happen after what is called "life events" in mobility biographies research (see above): e.g. the birth of a child or changes in socio-demographic variables such as income. These aspects influence an individual's everyday life, social position and purchasing power, but the effects on lifestyles are not immediate, young parents can, for example, as seen above, also continue to live without a car after the birth of their first child. Today, we face a growing diversity of lifestyles, new ones are emerging but not replacing old ones (Thomas & Pattaroni, 2012).

Lifestyle research can be divided into two types: either, lifestyle is used as explanatory variable, either as dependent variable, i.e. to be explained (Hartmann, 2011, p. 65). As in biographical research, in lifestyle research—and in (qualitative) social research in general—there is a tradition to generate typologies by grouping individuals based on similarities in defined characteristics (Kuckartz, 2016, p. 144). Type formation ("Typenbildung") represents a "*'natural' strategy of generalisation*" in qualitative research (Kuckartz, 2006). But it is also widely used in quantitative lifestyle research, representing individuals in a space of two (or more) dimensions or classifying them in a defined number of classes (Hartmann, 2011, p. 67). Qualitative methods, instead, are used exploratively at the beginning of a research, or, as in this thesis, to interpret, validate or visualise types of lifestyles at a later stage (Hartmann, 2011, p. 69).

3.2.3. Values

This section addresses values, one dimension of the lifestyle approach adopted in this thesis. Values are the expression of motivations that serve to achieve specific goals (Schwartz, 1992). Based on a synthesis of the multiple definitions of values in social sciences, the social psychologist Shalom Schwartz (1996, p. 2) defines "*values as desirable, transsituational goals, varying in importance, that serve as guiding principles in people's lives* […] *The crucial content aspect that distinguishes among values is the type of motivational goal they express.*" After preliminary work in social psychology at the beginning of the 20th century, Rokeach, another social psychologist, has first formalised and experimentally demonstrated the structuration of values in a system of twice 18 values (Rokeach, 1973). Rokeach stated that values are abstract ideals, guiding principles, durable, central, organised in a system, on the individual or societal level.

Based on these principles, Schwartz (1992) proposes a new theory on the universality of values. He argues that their structure is the same for all individuals but the priority accorded to different values varies. His theoretically founded typology of values was modified after studies in different

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[25] "*Lebensstilen kommen die Funktionen zu, durch tägliche Routine und Systematisierung den Alltag zu entlasten und zu strukturieren, auf diese Weise Identität zu sichern und auch soziale Abgrenzungen und Distinktionen zu ermöglichen.*" (N. Schneider & Spellerberg, 1999, p. 28)

countries based on the "Schwartz Value Survey (SVS)" in which respondents are asked to evaluate 56 values "as a guiding principle in my life" (Schwartz, 1992, p. 17). There are ten types of universal values (Schwartz, 1992, 1996, p. 3):

1. Power (social status and prestige, control or dominance over people and resources)
2. Achievement (personal success through demonstrating competence according to social standards)
3. Hedonism (pleasure and sensuous gratification for oneself)
4. Stimulation (excitement, novelty and challenge in life)
5. Self-direction (independent thought and action-choosing, creating, exploring)
6. Universalism (understanding, appreciation, tolerance and protection for the welfare of all people and for nature)
7. Benevolence (preservation and enhancement of the welfare of people with whom one is in frequent personal contact)
8. Tradition (respect, commitment and acceptance of the customs and ideas that traditional culture or religion provide)
9. Conformity (restraint of actions, inclinations and impulses likely to upset or harm others and violate social expectations or norms)
10. Security (safety, harmony and stability of society, relationships and oneself)

Schwartz states that *"It may well be useful to add values of special relevance when studying a particular topic, but the ten value types probably cover most, if not all, the broad types of motivation that are relevant."* (Schwartz, 1996, p. 21). Furthermore, they are not specific to a certain culture, religion or language, as studies in 20, 44 and finally 66 countries in the whole world demonstrated (Schwartz, 1992, 1994, 2007). The different types of values form a system with four dimensions (see Figure 6): openness to change, self-transcendence, conservation and self-enhancement (Schwartz, 1992).

Figure 6: The prototypical structure of value systems and dimensions of values (outside the circle) proposed by Schwartz (Source: Schwartz, 1996, p. 5)

Schwartz has developed his approach in opposition to research using "single values" which he criticises: single values have a low reliability, the risk to forget an equally (or even more) significant value is high and, most importantly: *"these single-value approaches ignore the widely shared assumption that attitudes and behavior are guided not by the priority given to a single value but*

by tradeoffs among competing values that are implicated simultaneously in a behavior or attitude (Rokeach, 1973; Schwartz, 1992; Tetlock, 1986). Indeed, values may play a little role in behavior except when there is value conflict […] In the absence of value conflict, values may draw no attention. Instead, habitual, scripted responses may suffice." (Schwartz, 1996, pp. 1–2).

On the opposite, different studies in which Schwartz used the types of values demonstrated that they provide a *"consistent, theory-based prediction of behavior"* (Schwartz, 1996, p. 21). The advantage of using types rather than single values consists in their reliability based on their nature of *"multiple-item indicators"* and *"sets of value items that share a core of meaning across individuals and cultures, their shared variance is a more valid measure of specifiable motivational goals"*. (Schwartz, 1996, p. 21). These benefits are widely recognised and Schwartz's approach and his survey have been used in various contexts (Chataigné, 2014, p. 25).

A Swedish study on sustainable lifestyles showed, for example, how underlying values influence sustainable practices: it found that the most environmentally engaged people are those according most importance to the values in the "self-transcendence" segment (Ilstedt, Eriksson, & Hesselgren, 2017). Furthermore, people classified in the "openness to change" segment are also somewhat sustainable, especially technology-focused. Those in "self-enhancement" are even more and the ones in "conservation" less sustainable, if not by traditionally saving resources and repairing things.

Values differ from attitudes (and social norms) especially in their generality or abstraction and in their hierarchical order of relative importance (Schwartz, 1992, p. 4). This means that values are transcendent and independent of specific situations, whereas social norms or attitudes are directly related to them (Chataigné, 2014, p. 53; Schwartz, 2001). Rokeach adds that values are more personal and internal while norms are more consensual and external to a person and relate to specific behaviours in specific situations (Rokeach, 1973, p. 19), whereas attitudes indicate a preference between several options (Rokeach, 1968, p. 112).

3.2.4. Environmental values and mobilities

As in social sciences values are considered a central criterion in an individual's choice and justification of practices (Rokeach, 1973; Schwartz, 1992), they were also used in mobility studies. However, in the field of housing choice research, up to now, only a few—and mostly quantitative—studies have made use of values (Coolen, Boelhouwer, & van Driel, 2002; Coolen & Hoekstra, 2001; Jansen, 2014; Rössel & Hoelscher, 2012). They showed that values can improve the understanding of residential choice in comparison to socio-demographic characteristics, for example to explain tenure choice (Coolen et al., 2002) or preferences for certain dwelling or neighbourhood characteristics (Jansen, 2014).

The role of environmental values is of particular interest in this thesis. According to Hunecke (2015, p. 24), even if values have the smallest impact on mobility practices of all psychological variables, it ist not negligible. If ecological values are important to an individual, the probability of developing ecological norms and attitudes and corresponding mobility practices are higher. Different studies on residential and daily mobility have tested this. A study on employees of a small English university showed *"that context change can activate ecological values and beliefs, which thus guide the process of (re)negotiating pro-environmental behaviors"*. (Verplanken et al., 2008, p. 125). Employees who moved recently and were environmentally concerned had a lower car use for commuting to work than the other groups. A Belgian study also showed that residential choice is influenced by mobility features and *"a pro-environment travel attitude"*, therefore the idea of "travel-related self-selection" in residential choice is raised (Van Acker, Mokhtarian, & Witlox, 2014).

For daily mobility, Hunecke and colleagues (2007) found that mobility-related attitudes predict travel mode choice better than values and can influence modal choice for daily mobility towards more sustainable practices. Instead, for holiday travel, environmental values have less impact (Becken, 2007; Hunecke et al., 2007). Vincent-Geslin (2014) investigated whether ecological values determine sustainable daily mobility practices for commuters using alternative transport modes to a private car in five cities in France. She found that practices of what she calls "altermobilities" are not necessarily based on ecological values, and these, conversely, are not sufficient to lead to sustainable mobility practices. But they can enable to change to "altermobilities" when habits are reconsidered due to other changes. Furthermore, sustainable mobility practices can even lead to the development of ecological values to justify and legitimate modal change. M. Flamm and Kaufmann (2006, p. 174) address the importance of values for car ownership: "*Whether a person places more value on the social status conferred by vehicle ownership, or on personal travel independence, or on adapting his or her behaviour to a certain environmental ideal will condition a tendency towards (multiple) motorisation or, on the contrary, towards giving up ownership of a private vehicle.*"

3.2.5. Lifestyles and spatial mobility

Since the 1990s, the concept of lifestyle has been integrated in sociological and geographical research on socio-spatial processes due to similar reasons that led to its general development (Blasius & Friedrichs, 2011; Rössel & Hoelscher, 2012; N. Schneider & Spellerberg, 1999). It appeared, for example, that different social groups were less separated in space and that new, socially mixed urban developments replace typical areas with dwellings related to social milieus (Beck, 1986, p. 137). Before, lifestyles were linked to types of territories. Cities were for a long time places of openness, density, heterogeneity, whereas the countryside was stable, homogeneous and related to traditions. However, sub- and peri-urbanisation since the 1960s together with social and economic change, the decline of agriculture, mass motorisation, media, etc. have more and more erased these differences and diffused "urban lifestyles" everywhere. With reurbanisation, these differences could, however, emphasise again (Spellerberg, 2011, pp. 319–320).

Even if research has shown links between lifestyles and spatial types, an important diversity of lifestyles co-exist in most places (Spellerberg, 2011, pp. 320–322). Spellerberg's analysis of leisure data highlights that even if certain activities vary between urban and rural areas (in the city people more often go to the theatre and the opera, for example) and lifestyles influence leisure practices, socio-structural variables explain more. Thus, the spatial structure influences human practices, but humans also shape space through their practices and preferences, making lifestyles important for the production of space (Spellerberg, 2011, p. 317). Space is also important to stabilise lifestyles (N. Schneider & Spellerberg, 1999, p. 28)[26]. Finally, as mentioned above, lifestyles are changing. While the dominance of suburbanites—families with children living in detached houses—decreases, new and more urban lifestyles become more important (Kemper et al., 2012, p. 9).

In this context, research on spatial mobilities began to use lifestyles to better explain and understand modal or residential choice. The concept already appeared between the 1960s and the 1980s, but developed only since the beginning of this century. Today, lifestyles are relevant to explain different travel patterns within homogeneous population groups and areas with similar spatial characteristics (Van Acker, 2015) and to differentiate and complement demographic and social structures by considering subjective aspects of the individuals (Beckmann et al., 2006).

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[26] "*Das Territorium, in dem sich der Mensch bewegt, ist dabei ein wesentlicher Bestandteil zur Verfestigung von Lebensstilen.*" (N. Schneider & Spellerberg, 1999, p. 28)

3.2.5.1. Daily mobility and lifestyles—mobility styles

Different studies using quantitative methods confirm that lifestyles (based on values and practices) can explain, to a certain extent, daily mobility practices (Bagley & Mokhtarian, 2002; Beckmann et al., 2006; Kemper et al., 2012; Van Acker, 2015) or can at least represent an additional source of information for mobility practices in domains where preferences play a role (Hunecke, 2015, p. 62). However, the question of whether lifestyles can explain mobility more than conventional socio-demographic criteria remains open (Beckmann et al., 2006). Lifestyles also influence the mobility capital of an individual, such as car availability, in the sense that travel-related attitudes influence car availability, but the reverse interaction appears, too (Van Acker et al., 2014).

Empirical research as well as theory argue that partial lifestyles related to certain activities are more significant than global lifestyles including all practices of an individual (Götz et al., 2011, pp. 96–97; Hartmann, 2011, p. 65). When lifestyles are applied to daily mobility, for example, their explanatory power can be higher. The concept of "mobility styles" draws on this and includes mobility orientations, lifestyle characteristics and mobility practices (Hunecke, 2015, p. 63). This approach was established in Germany in the 1990s to create typologies in order to better predict mobility practices (Scheiner, 2009, p. 28). It was also developed in response to the weaknesses of mobility research in the social sciences between micro models based on actors and macro models addressing the structure of society. Mobility styles represent a meso-scale model, between psychological approaches based on the individual and rational choice approaches, and, as a typology, they avoid an excessive individualisation (Götz, 2007, p. 769). In practice, these mobility styles are useful to create and plan specific measures for different target groups, especially related to the image of transport modes, as mobility styles are based on attitudes and values (Gather et al., 2008, p. 180).

The concept has been developed in the research project "CITY:*mobil*" in the cities of Schwerin and Freiburg im Breisgau by Götz, Jahn and Schultz (1998). In this project, attitudes were used for the first time to create a typology of mobility practices. In Freiburg, five types were found, based on attitudes and values of the individuals, including *"traditional homely"* persons oriented towards family and security, *"risk-oriented car fans", "status-oriented automobile", "traditional nature-oriented"* and *"ecologically decided"* having strong convictions guiding their mobility practices (Götz et al., 1998, pp. 81–105). The correlation between the attitudes and practices of these groups was much stronger than expected and questioned the widespread assumption that environmental convictions and practices are separated (Götz, 2007, p. 772).

After this first study, the concept has been used and adapted by a series of German studies, mainly on leisure-related mobilities (Götz, 2007, pp. 773–779). In a Swiss context, we proposed a typology in a study on a new-build development in the centre of Biel/Bienne (Baehler, 2013; Rérat et al., 2013). Five types of residents reflected the diversity of practices and attitudes we found: *"with strong ecological convictions", "avoiding the car if possible", "economically sensitive", "using mainly the car"* and *"not very mobile by constraint".*

An English study proposing mobility styles for daily mobility and holiday travel practices found that individual ecological attitudes had a significant impact on modal choice for daily mobility, but only limited or no influence on tourist travel behaviour (Prillwitz & Barr, 2011). Several similar approaches exist, such as mobility types based on attitudes (Hunecke, 2015, p. 65) or Kaufmann's (2003, pp. 50–51) typology based on modal choices and representations of the car and public transport.

3.2.5.2. Residential choice and lifestyles

As explained above, values and tastes influence residential choice. Lifestyles are therefore used as intermediates between socio-demographic variables and preferences: "*Socio-demographic variables may determine what is attainable and what is needed and lifestyle variables (e.g. values or emotions) may determine taste.*" (Jansen, 2011, p. 178). Explaining residential choice by lifestyles can also be based on Bourdieu's theory of capitals: for upper classes, it is a question of cultural capital mainly, for middle classes a mix between cultural and economic capital, whereas for lower classes that often have no real choice, lifestyle is not helpful (Blasius & Friedrichs, 2011, p. 418).

However, empirical research on the importance of lifestyles for housing choice is divided (Rössel & Hoelscher, 2012, p. 320). While some authors argue that lifestyles explain well residential choice (Kemper et al., 2012; N. Schneider & Spellerberg, 1999; Thomas, Pattaroni, & Kaufmann, 2013), others find that lifestyles are not satisfactory or add only little explanation compared to traditional socio-demographic variables (Beckmann et al., 2006; Blasius & Friedrichs, 2011; Rössel & Hoelscher, 2012). Jansen (2011, p. 186) found that different studies showed that lifestyles can explain specific aspects of housing preferences even if their influence is rather limited compared to traditional variables, including in her own research in the Netherlands (Jansen, 2014, p. 256). N. Schneider and Spellerberg (1999), who conducted in the late 1990s the first German study on residential mobility considering lifestyles, concluded that they enrich the analysis of the housing choices of different population groups, based on the principle that a dwelling responds to the specific needs of a household. These needs are influenced by the lifestyle as much as by socio-structural characteristics such as family context and economic resources (N. Schneider & Spellerberg, 1999, p. 76). It also appears that lifestyles can better explain gentrification processes than suburbanisation or segregation (Blasius & Friedrichs, 2011, p. 414).

An important study on the relations between daily and residential mobility in the region of Cologne found five groups of lifestyles (Beckmann et al., 2006, p. 57): "*experience-oriented*" *(Erlebnisorientierte), "culture enthusiasts" (Kultur-Interessierte), "distanced" (Distanzierte), "out-of-home socials" (Ausserhäuslich-Gesellige)* and *"traditional" (Traditionelle)*. They are present in all studied neighbourhoods, ranging from dense areas in the city centre to peri-urban areas with detached houses. Unlike for daily mobility, lifestyles only add a small added value to explain residential mobility compared to socio-demographics, particularly residents" age. The two youngest lifestyles ("Erlebnisorientierte" and "Ausserhäuslich-Gesellige") are, for example, also the most mobile regarding housing mobility. The above-mentioned study of ten neighbourhoods in Berlin showed similar results but insists on the unequal distribution of the lifestyles between old building areas and the other neighbourhoods (Gebhardt, 2012a, p. 43). While in general, residential area and location are secondary for housing choice, compared to the dwelling's characteristics, the inner-city residents' attach more importance to the neighbourhood (Gebhardt, 2012b, p. 82).

In Switzerland, a thesis on residential choice of families in the agglomerations of Bern and Lausanne addressed daily mobility and lifestyles (Thomas, 2013). Based on the central place of mobility in family life, due to the multiple activity spheres of its members and their spatial breakup, two essential resources were found: residential location and car use. The former plays an important role in the organisation of everyday life due to accessibilities and services available at the place of residence. This is even more important for dual-income couples who choose mostly homes in the city centre to combine career, family and cultural activities in order not to lose too much time between the different activities' places. Even if 90% of the surveyed families owned at least one car, accessibility by public transport was a (very) important factor for housing choice for 80% of the families to allow their children to travel independently. Their autonomy was highly valued by the parents. This study showed that different "residential lifestyles" are organised around certain travel modes which influence residential location and vice versa.

The importance of lifestyles in residential choice points at the role of residential self-selection mentioned above. If lifestyles, and thus values and attitudes or preferences related to daily mobility, influence residential choice, there must be a certain self-selection—and vice versa. Thus, residential and travel attitudes appear to have an important influence on residential choice: *"Attitudes about the mobility characteristics of a residential neighbourhood and a general pro-environment travel attitude are associated with residing in a traditional or urban neighbourhood. For example, the preferences to have sidewalks and bike paths within the residence's vicinity and to have access to public transport seem to underlie the decision to reside in a high-density neighbourhood."* (Van Acker et al., 2014, p. 98). So, different territories with their characteristics related to transport modes and opportunities offer different potentials for the various lifestyles (Thomas, 2013, p. 87). This aspect will be addressed further in the next chapter.

3.3. The social and spatial context: a territory's hosting potential

To deal with the social and spatial context in which practices are embedded I use the concept of "a territory's hosting potential". It is defined as a territory's *specific ability to accommodate the projects of either individual or collective actors"*. (Kaufmann, 2012) or, more recently, under the term "hospitality potential" as *"a range of possibilities in terms of mobility"* (Kaufmann et al., 2018, p. 200). As mentioned above, Kaufmann developed it in the context of research on mobility as a capital that stressed the importance of the (socio-spatial) context for mobility practices. Similarly, Doherty (2015), proposed the concept of "viscosity": *"the degree of resistance or enabling offered by structures to mobility projects"* to *"distinguish settings and systems that enable and support mobility (low viscosity) from those that make it difficult or impossible (high viscosity), and express relational degrees between them* […]" (Doherty, 2015, p. 254).

A territory's hosting potential is composed of five different elements (Kaufmann, 2012; Kaufmann et al., 2018, p. 200). On the one hand, there are "material artefacts": spatial and technological aspects. There are two types of objects that allow to host individuals' projects in space, but also influence them:

– The available networks (of transport modes and telecommunication especially), their development, performance and access conditions
– The built environment and the available functions and institutions

On the other hand, immaterial aspects—the social, cultural, political and economic contexts— also play an important role, including three elements:

– The labour market (training and job opportunities)
– The institutions and laws that influence human activities (e.g. family, housing or migration policies)
– The cultural and social dimensions of a territory's society. This corresponds to the social and cultural contexts which Kellerman (2012, p. 175) adds at the same level as access and skills in his model of "potential mobilities" (including laws, regulations, but also religious and cultural norms). They reflect for example different mobility-related social norms and values or "mobility cultures" (Döring et al., 2014; Kellerman, 2012; Klinger, Kenworthy, & Lanzendorf, 2013).

In other words, the perceptible, the functional, the social as well as the cultural and institutional environments need to be considered (Thomas, 2013, p. 87). This underlines the importance of analysing different scales to understand a territory's hospitality, from the (inter)national to the neighbourhood level. Functional, social and perceptible aspects are important mainly at the local scale, while institutional and cultural elements are commonly related to a higher level.

The importance of the spatial and social context is more and more emphasised, especially in geography, but also in other social sciences interested in spatial mobility (Beckmann et al., 2006, pp. 27–28). As previous chapters have shown, the spatial and social context defines in which room of manoeuvre mobility practices can be realised, daily mobility as well as residential choice. Klinger et al. (2013) use the concept of "urban mobility cultures" to highlight that not only infrastructure but also mobility-related discourses and political strategies influence mode choice: "*In this perspective, urban form and transport infrastructure are conceptualised as the materialised extension of cultural priorities. This cultural setting can be interpreted as a complex configuration of different preferences and lifestyles represented by a city's population, which even might develop common conventions and habits.*" (Klinger et al., 2013, p. 20). Different studies have shown the links between built environment and daily mobility practices, e.g. the relation between dense, mixed urban areas and high shares of short-distance trips relying less on the car (Naess, 2005; Newman & Kenworthy, 1999; Scheiner & Holz-Rau, 2013b).

The hosting potential of a territory also has a strong influence on a household's residential choice, related to its mobility capital or desired lifestyle (Scheiner & Kasper, 2003; Thomas, 2013; Van Wee et al., 2002). Or, as Kaufmann (2011, p. 69) states: "*Residential choice is without question intrinsically linked to the search for an environment that is receptive in specific ways. The opportunities for movement and mobility offered by a given context attract individuals whose motilities are coherent with it.*" Nonetheless, the contemporary city proposes a hosting potential open to many lifestyles (Kaufmann, 2014, p. 103).

3.3.1. The hosting potential for car-free housing and living

As presented above (see 2.2.1), after the Second World War, in Europe, a hospitality potential for car-based mobility was developed, not only on a spatial level with motorways and parking facilities, but also through laws, social norms and cultural aspects. In many territories where other mobility and spatial practices had become impossible, e.g. due to long distances, "automobile dependence" resulted from this evolution. However, as shown in a previous chapter (2.2.4), the negative effects of cars led, particularly in cities, to adapt their hosting potential in order to facilitate car-free living.

This is also reflected by the introduction of a requirement to provide "travel plans" for new developments in Western countries since the 1990s (de Gruyter, Rose, Currie, Rye, & van de Graaff, 2017). Travel plans represent a mechanism to manage car use and encourage the use of more sustainable mobility modes at a particular site by delivering a bundle of transport measures (Enoch, 2012). In the context of an integrated transportation policy they are also called "mobility management plans". The approach of "mobility management" was introduced in the 1990s as part of an answer or reaction to the deficits of past transport policy, aiming at a more efficient, ecologically and socially sustainable transport (U. Reutter & Kemming, 2012).

While travel plans are very common for offices, their use in the context of residential developments in continental Europe is more recent (de Gruyter et al., 2017). In different European countries including Germany, an EU-funded project called "*ADD HOME: Mobility Management for housing areas—from car dependency to free choice*" provided an early analysis of the topic, highlighting that in most countries, only few laws and regulations favouring alternatives to car use exist, and therefore, mobility management needs to be developed (Bäumer & Reutter, 2008). In Switzerland, projects have been developed in the last years to apply mobility management and travel plans to the housing sector and new developments (Schweizer, Bernhard, & Baehler, 2014), in order to promote the provision of a hosting potential for car-free living.

As Kaufmann states, "*The possibility of living without a car because public transportation services exist makes this lifestyle more attractive, and thus more adoptable.*" (Kaufmann, 2011, p. 59). In-

deed, several studies show that excellent public transport is an important "material artefact" to live car-free and for car-free housing developments (Baier et al., 2004; Blechschmidt, 2016; Dittrich & Klewe, 1996; P. Moser & Stocker, 2008; Scheurer, 2001b). However, these authors also showed that successful car-free housing developments necessitate more than just public transport. Safe and direct infrastructure for cycling and walking is essential, too. Thus, location plays a central role mainly in terms of accessibility. Carsharing should also be available in the development or nearby, whereas mobility services play only a minor role and can be developed later (Blechschmidt, 2016). Another important element are infrastructures of everyday life in the neighbourhood, mainly shops for daily needs and basic services, which should be located within the development or at a short walking distance. As mentioned in section 3.1.1.1, proximity of shopping facilities plays an important role for car-free households (Gebhardt et al., 2005, p. 286). The accessibility of recreation areas or other leisure infrastructures is mentioned, too, as facilitating a car-free lifestyle.

Various authors have addressed car-free living in the context of what can be considered a territory's hospitality potential. Sheller and Urry consider carless living as a form of inequality produced by automobility (gender being another one). They differentiate between the "carless urban poor" that are restricted by not having a car and those who chose it: *"Living without a car has become a significant lifestyle choice for both environmentalists and for a small cosmopolitan elite able to live in expensively gentrified city-centres."* (Sheller & Urry, 2000, p. 749). The situation was slightly different from today when they wrote their paper in 2000: *"The choice of an alternative lifestyle with voluntary limitations on car use is most feasible in medium-sized regional towns where a mix of cycling, walking and public transport can develop (as in Cambridge, UK). Nevertheless, such towns remain clogged with both moving and stationary cars apart from those small 'pedestrian zones' of civility left to the walker. Attempts to introduce pedal rickshaws and more bike lanes are still constrained by the imperatives of the car-driver matrix against which they must compete."* (Sheller & Urry, 2000, p. 749). Similarly, Scheiner (2009, p. 183) addresses car-free living in the context of the system of automobility and states that it needs a certain spatial context present only in the central districts of big cities[27]. However, this view seems somehow outdated nowadays. As detailed above, the situation has changed, in the meantime, and is different, especially in the Swiss and even the German urban areas analysed in this thesis. Nonetheless, social norms are changing only slowly and automobility is still dominating even in these urban areas.

Practice theory approaches also consider the importance of space. Shove et al. (2012, p. 135) use the example of automobility: a consequence of the dominance of the practice of car-driving is that spaces for other practices such as cycling were increasingly reduced. In other words: *"In cities planned around the car, it is often difficult to move around in other ways"* (Shove et al., 2012, p. 69). Thus, places are not seen only as contexts or settings, but permit and favour some practices rather than others (Shove et al., 2012, p. 124). To perform practices, a "viable practice space" (Shove et al., 2012, p. 131) is needed which also depends on the individual and his or her resources, in a similar fashion to mobility capital. Similarly, the importance of "access" to material elements necessary for practices is highlighted: *"the design and operation of infrastructures, mains [sic] water systems, cities and transportation networks reflect and structure inequalities of access and hence the social distribution of different practices".* (2012, p. 47).

Finally, the supposed importance of information and communication technologies for car-free living is not mentioned by the reviewed literature. Delivery services or smartphone applications for

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[27] *"Nur noch die Grossstädte, und dort vor allem die Innenbezirke, erlauben in einer hochmotorisierten Gesellschaft ein Leben ohne Auto. [...] Dies führt sehr grob gesprochen dazu, dass in der Verkehrsmittelnutzung vor allem zwei räumliche Strukturen unterscheidbar sind: die Innenbezirke der Grossstädte und der 'Rest'."* (Scheiner, 2009, p. 183).

public transport or carsharing, for example, are strongly context-dependent as they are not available everywhere. Therefore, even if they may develop more and more, they should also be considered as elements of a territory's hosting potential.

3.4. Conclusion and operationalisation

This part has presented the theoretical framework and a literature review related to the concepts used in this thesis. Figure 7 shows how they are linked, around the two main objectives, which are to understand why and how residents are living (in a) car-free (housing development). Therefore, the residents represent one central dimension (purple circle in the figure). They are characterised by their profiles (socio-demographic and socio-economic characteristics) as well as by their lifestyles, understood as a combination of values and practices. To understand mobility practices, the residents' mobility capital, consisting of accesses and competences, is studied. Furthermore, a biographical approach is adopted, meaning that the residents' actual practices are analysed in view of their past life course and its other dimensions. The other central dimension of my theoretical framework is the social and spatial context in which the residents are situated (green circle in the figure). It is analysed using the concept of "a territory's hosting potential" which includes "material artefacts" of the spatial context as well as immaterial aspects related to culture and society. These different concepts and their operationalisation in this thesis are presented in the following paragraphs.
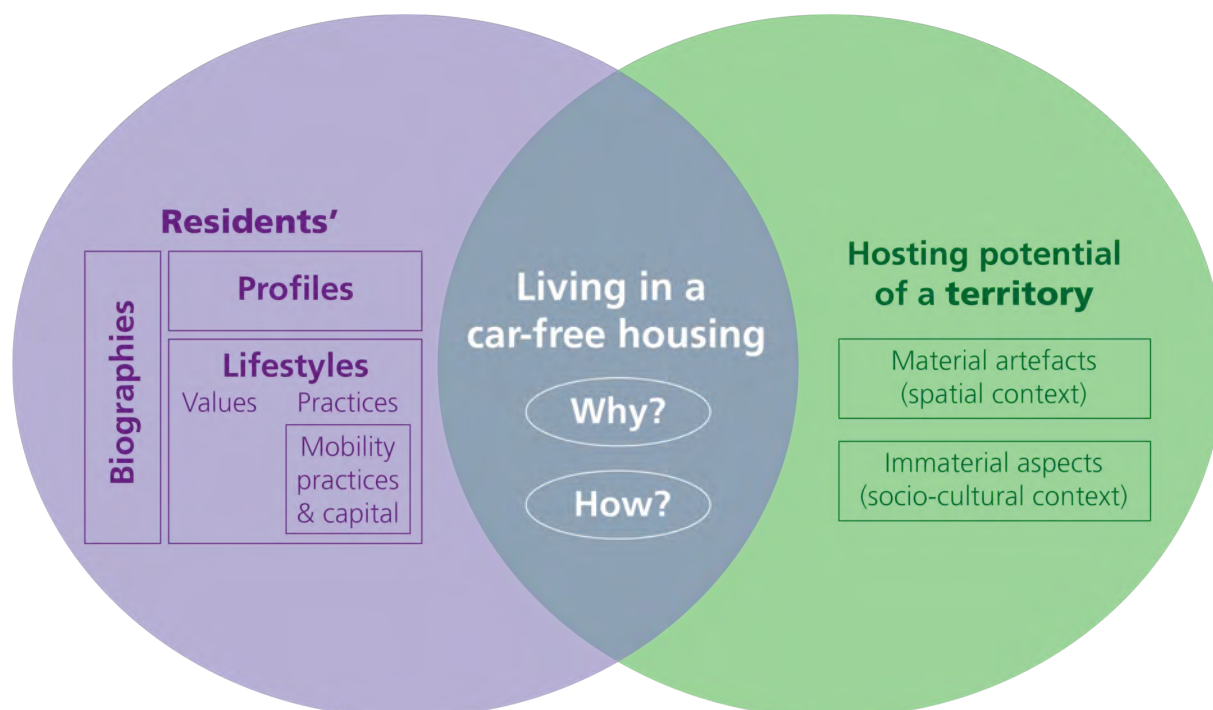
Figure 7: Theoretical framework of the thesis

Daily and residential mobility practices—realised spatial movements—are understood as the outcome of a motivation which is based on an individuals' potential mobility (mobility capital), habits and routines, individual values, as well as his or her life course (past and present) and the socio-spatial context (the "hosting potential of a territory").

The term "mobility practices" is used instead of "mobility behaviour" to highlight an open approach, not based on behaviourism but, among others, inspired by some elements of "practice theories". This approach defines practices as routinised types of behaviour, reproduced and changed through daily enactment by "practitioners" and consisting of the interconnection of three elements: material, competences and meaning (norms and values in society) (Shove et al., 2012).

Key principles of this approach which I adopted include the fact that they overcome the classical distinctions of other theories, such as objectivism vs. subjectivism, micro vs. macro or explain practices through structures vs. through personal factors (or agency). The individual has an active role, in contrast with approaches where people are autonomous and self-interested or constrained by a system (Heisserer & Rau, 2017, p. 585). An approach based on social practice theories allows, thus, to understand mobility practices as more than utilitarian and individualist movements, but as embedded in everyday life and a wider social and material context (Heisserer & Rau, 2017). This is particularly important for the issue of this thesis, as moving to a car-free housing development implies a bundle of (car-free mobility) practices representing a "dominant project" which structures social life (Shove et al., 2012, p. 74).

However, without questioning the relevance of Shove's (2010) approach placing practices at the centre of interest and attributing a secondary role to the individuals, this thesis mainly focuses on car-free housing residents, their profiles and motivations. They play an important role in my study on early adopters of a new phenomenon.

Another implication of defining mobility practices as social activities is to consider an individual's social network. Therefore, the unit of analysis to understand everyday mobility needs to be shifted from the individual to the family or household level (Manderscheid, 2014a; Rau & Sattlegger, 2018). Thus, this thesis considers the households living in car-free housing developments. The different household members will be addressed in both methods used, although there is normally only one person responding.

Two forms of spatial mobility are mainly studied in this thesis: daily and residential mobility, both taking place within a living area, the first within short and the latter within long temporalities (Kaufmann, 2011, p. 25). Social science research on daily mobility has shown that daily mobility practices cannot be explained only by a rational choice based on time and costs. Even if daily mobility is shaped by habits or routines, it appears that values, attitudes, norms as well as perceptions, preferences and convictions play a role for modal choice, too. Therefore, an open approach was chosen to analyse the mobility practices of the individuals and households. This means that all different factors mentioned are considered in order to understand what was important in the choice to live without a private car and how daily mobility needs are satisfied. This is similar for residential mobility which is understood, although based on a household's aspirations, as a choice with constraints (Rérat, 2016b). The different elements of residential choice mentioned by Rérat will all be included. For the selection criteria, motivations (revealed preferences) are addressed as I analyse a residential choice that has been realised. They also allow to address the decision process and practices (Rérat, 2010, p. 57). The relations between daily mobility and residential choice are particularly important in the context of car-free housing. Research showed that daily mobility preferences can influence housing choice ("residential self-selection") even though the extent of this influence remains unclear and although the built environment also influences individuals to change daily mobility after residential relocation. Thus, it will be analysed whether residential self-selection happened or not.

The other side of the coin of mobility practices realised in space is the mobility potential of an individual, which is addressed by the concept of mobility capital. It includes an individual's access to the various transport modes as well as competences and skills necessary to use them and be mobile. Access includes the different transport modes available (for car-free residents mainly bicycles and other two-wheelers, public transport, but also shared or rental cars). Competences encompass physical abilities to use different means of transport but also knowledge and organisational skills related to spatial mobility such as orientation in space or use of the internet to plan a journey or even order goods to be delivered. These dimensions of mobility capital link to the three elements of practices mentioned above. Access is similar to material (and the territory's

hosting potential, too) and competences even have the same name. The third dimension of practices, meaning, includes norms and values in society and will be addressed as part of the territory's hosting potential.

To operationalise mobility capital, access to all different modes of transport and a series of competences and skills will be integrated to understand on which transport modes an individual can rely for his or her daily mobility practices as well as residential choice. Furthermore, I will analyse which strategies households apply, for both daily mobility and residential choice, to cope with the absence of a private car. Mobility strategies, understood as intentional and reflexive decisions, can be applied to mobility capital (leading, or not, to mobility practices) while tactics, intuitive reactions to situations or constraints, are more linked to individual mobility practices. In the context of the "*hegemony of the car in everyday mobility culture*" (Sattlegger & Rau, 2016, p. 22), committing to living without a private car represents a strong choice, as I assume that most residents do not intend to deliberately limit their spatial mobility.

Research has also shown the importance of a biographical approach to understand present mobility practices, as they are relatively stable and habitual and normally only change due to "key events". Furthermore, socialisation as well as other life-course domains need to be considered as they all are crucial for spatial mobility practices. As reported above, qualitative or mixed-methods research on mobility practices adopting a biographical approach is still rare. To understand car-free households, it is crucial to consider time by adopting a life-oriented approach, integrating the other social practices and the context in which an individual lives and lived before. It will show whether car-free living is a characteristic acquired at birth or which "key events" or slower processes lead to living without a private car. As the analysed housing developments are mostly very recent, residential relocation constitutes an important "key event". Its consequences on mobility practices can, thus, be analysed, as the new home includes a restriction in mobility access by excluding car ownership. A biographical approach can also help to understand the extent of "residential self-selection" in the housing choice and the importance of a preference for car-free mobility in choosing an adapted built environment (Holz-Rau & Scheiner, 2015, p. 5). Therefore, retrospective questions will be integrated in both methods used. However, as the biographical dimension was not the only aim of this thesis, more sophisticated procedures such as "life-course calendars" (Beige & Axhausen, 2012; Rau & Manton, 2016; Schoenduwe, Mueller, Peters, & Lanzendorf, 2015) or more practice-theoretically informed qualitative analyses (Sattlegger & Rau, 2016) have not been applied.

The biographical approach integrates well into the frame concept of lifestyles used to analyse the residents of car-free housing developments in general. They are used since the 1970s in social sciences to explain differences between individuals of similar social status in a society where classes have lost their fundamental importance. Applying lifestyles in studies of daily or residential mobility is a rather new and therefore limited research field. Up to now, mainly quantitative studies have included items related to lifestyles based on values or attitudes to measure their importance in transport mode or housing choice. Their results are contradictory. While some find they explain well mobility-related practices, for others, they add none or only few explanations. In this thesis, lifestyles are defined as a combination of practices and values. This approach is criticised because attitudes and behaviour are not distinguished (Rössel & Otte, 2011, p. 12). In my opinion, however, this problem can be overcome by clearly addressing values and practices *within* the concept of lifestyles and by using lifestyle as a (dependent) variable, to be explained, and not an (independent) explanatory variable. Both practices and values can influence and explain each other, especially mobility practices by certain values and other practices. Furthermore, lifestyles will not be computed quantitatively, but used in a qualitative analysis, as a way to summarise and visualise the residents' individual values and practices in a typology of lifestyles present in car-free housing developments. This approach was preferred to other types of typolo-

gies such as "mobility styles" (Götz, 2007) as it allows to integrate the different aspects relating to the two main research of objectives which are how (addressed through practices) and why (values) residents live car-free.

Values are the guiding principles for an individual's life and therefore also significant to understanding mobility practices. The benefits of studying them are widely recognised in social sciences and Schwartz's approach with ten types of universal human values has been used in various contexts (Chataigné, 2014, p. 25). The "Schwartz Values Survey (SVS)" was criticised for being too complicated for certain people due to the abstraction and the absence of a context to the values. Therefore, Schwartz and colleagues developed a "Portrait Values Questionnaire (PVQ)" in which respondents evaluate how similar a described person is to themselves (Schwartz et al., 2001). Based on the PVQ, a list of 21 items was established for the "European Social Survey (ESS)" (Schwartz, 2001) which was adapted in the survey of this thesis. Even if a particular focus lies on the importance of environmental values for residents of car-free housing developments, a comprehensive approach based on Schwartz's human values was chosen to consider all possible values equally.

Finally, as mentioned at the beginning of this chapter, besides the mainly individual aspects presented until now, mobility research in the social sciences has also recognised the importance of the socio-spatial environment. Thus, the last aspect of the theoretical framework of this thesis is the concept of "a territory's hosting potential" (Kaufmann, 2012). It emphasises that not all territories offer the same hospitality to daily and residential mobility practices. It includes two aspects: first, "material artefacts" which relate to the spatial context, including transport and all other infrastructures, and, second, immaterial aspects, i.e. the social and cultural context (laws, norms, etc.). This hospitality is not the same for every individual but depends on personal competences or even values—a certain context to live car-free can be suitable for a person with ecological convictions whereas a more practise-oriented individual would come to a different conclusion. Car-free living in particular needs a certain spatial context to be possible and successful without restrictions. This includes the possibility to move by alternative transport modes in everyday life, and accessible infrastructures and places such as shops for daily needs. Both aspects of the hosting potential will be integrated in the empirical work of this thesis. The different material artefacts found in the literature (mainly mobility infrastructure, location/access and neighbourhood characteristics) will be directly addressed, while the socio-cultural aspects will primarily be part of the qualitative analyses. Lastly, I adopt an open approach in order to find any additional characteristics that permit or enable car-free housing and living without a private car, such as digital technologies.

4. Research questions and methodology

After the review of the literature and the presentation of the theoretical framework of this thesis, this part addresses, first, the research questions and, second, the methods used to answer them.

4.1. Research questions

The main objective of this thesis is to better understand households living—deliberately—without a private car in a car-free housing development. The characteristics of these developments are important as well and therefore presented in chapter 5.

As shown in the literature review (chapter 2), there is an important lack of evidence on both the residents and this particular housing type. Therefore, this thesis proposes to answer the following research questions.

1. Who are the residents of car-free housing developments?

To start the investigation of residents of car-free housing developments, this first question addresses their profiles, at the household and the individual level. As no overview over residents of car-free housing exists, this research question aims to show who these residents are. It includes socio-demographic and socio-economic variables, but also values important for them. Furthermore, some features of their dwellings will also be asked for. The similarities and differences between the nine housing developments will be investigated in order to understand what is general to car-free housing residents and what is related to a particular development. The residents' profiles represent the base for the understanding of the other research questions.

2. Why live (in a) car-free (housing development)?

This two-fold question contains, on the one hand, the general motivations to live without a private car. On the other hand, the motivations to move to and live in a car-free housing development—representing a long-term engagement to live without the possibility to own a car—are raised.

For the motivations to live car-free, the different types of reasons found in the literature will be addressed, based on the assumption that different aspects play a role and living car-free is (at least not only) a question of affordability. The importance of environmental values in these choices will particularly be analysed as the literature on this issue is not very conclusive. Furthermore, the voluntariness of living car-free will be addressed in order to understand if residents of car-free housing developments really chose to live without a private car or if it was due to constraints.

For residential choice, a similar, open approach needs to be adopted to understand the various reasons that influence housing choice and, particularly, a specific choice leading to live in a development where ownership of the most common transport mode is excluded. Car-freeness will in particular be addressed to understand its weight for residential choice.

Residential mobility will also be analysed in a biographical perspective, the previous place of residence as well as the whole residential trajectories are considered to understand where car-free housing residents grew up and lived before.

3. How to live without a (private) car?

The second main research question aims to understand how the residents of car-free housing developments live and particularly how they are mobile without a private car. To understand mobility practices, a two-fold approach is adopted, including both mobility practices, i.e. realised spatial movements, and mobility capital, to understand the residents' potential mobility. This

includes the accesses and skills they have at the personal and the household level. For practices, the focus lies primarily on (daily) mobility, including also the use of cars. Additionally, three other types of practices are addressed: shopping, leisure and holiday travels. They all imply personal mobility at least to a certain extent (even if for shopping it can consist only of others being mobile in the case of delivery). These practices also allow to gain a broader understanding of residents beyond transport-related aspects. The mobility practices as well as the capital will also be addressed in a biographical perspective in order to understand if a resident has always lived car-free or owned (and used) a car earlier in his or her life course.

Finally, this research question includes the strategies—as well in terms of mobility capital as related to mobility practices—that car-free households use to cope with the absence of a private, always-available car. They may not necessarily be explicit, but the idea of strategies allows to group and illustrate different intentions related to mobility.

4.   What are the types of lifestyles of car-free housing residents?

To summarise the different results of the former research questions, a typology of lifestyles of residents of car-free housing developments is established. Lifestyles are understood as the combination of values and practices. Therefore, the different motivations—supposed to be based on individual values—but also values and attitudes directly mentioned as well as the practices, especially daily mobility, will be combined to create ideal types of residents. Their profiles will be added to see if they vary or if these characteristics are independent from values and practices and all types of profiles present in all lifestyle types.

5.   What is a territory's hosting potential needed to live car-free?

Finally, the other central dimension to understand car-free living is addressed in the last research question: the social and spatial context needed to live car-free. It is analysed with the focus to test and develop which built environment and which infrastructures are needed to allow individuals to live successfully car-free without being restricted in everyday life. Thus, the three dimensions mentioned above are considered: mobility infrastructure, access and location as well as the infrastructures present in the residential surroundings, including shops and services but also recreation areas e.g. Furthermore, the social context will also be taken into account, even if it may seem not very different in the two countries analysed, the work on "mobility cultures" has shown that it differs between cities.

4.2.   Methodology

This chapter gives an overview over the methods used to answer the research questions just presented. I adopted a mixed methods approach and will first explain what this means and why I did so. Then, the two main methods, a survey realised in 2016 and qualitative interviews conducted in 2017, are presented. Finally, the different complementary methods are reported.

Even if it was not planned as such from the beginning, this thesis includes several elements of a transdisciplinary research approach which is defined as follows: *"Transdisciplinarity is a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge."* (D. J. Lang et al., 2012, p. 26). This thesis addresses a real-world problem which emerged from my own work outside academia (thus, it can be considered as a "project initiation from society" (Luthe, 2017)) and was defined after discussions with experts from both science and practice. Furthermore, it aims at *"creating knowledge that is solution-oriented, socially robust* […]*, and transferable to both the scientific and societal practice".* (D. J. Lang et al., 2012, p. 27). Not all aspects of a transdiscipli-

nary research process apply, partly due to the fact that this is an individual researcher's study and not part of a research project realised by a team, but its aims are shared.

4.2.1. Mixed methods

Mixed methods can be defined as *"a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone."* (Creswell & Plano Clark, 2007, p. 5). In other words, it is *"a research strategy that combines data collection strategies of different levels (more or less structure, variables/cases) and combines and triangulates different data types (text and numbers, nominal/ordinal/interval) in order to create better descriptive and explanatory inferences"*. (Stolz, 2015, p. 7).

Mixed methods are called the *"third methodological movement"* (Tashakkori & Teddlie, 2003) which highlights that it is not simply an addition of quantitative and qualitative methods, but a new dimension of research (Creswell, 2014, p. 13). More and more research in social sciences adopts a mixed methods approach to overcome the different strengths and weaknesses of quantitative and qualitative methods by combining them in one study (Bergman, 2008; Creswell & Plano Clark, 2007; Stolz, 2015). This can increase the validity of a study's results which is defined as the *"correctness or credibility of a description, conclusion, explanation, interpretation, or other sort of account"*. (Maxwell, 2005, p. 106). The advantage of mixed methods *"lies in the fact that it allows eliminating validity threats given in just one but not the other methodological tradition, leading to more valid inferences (Kelle 2007: 227ff.)"* (Stolz, 2015, p. 8).

The typical weaknesses of quantitative-only research are that real mechanisms are often not observable and variables are chosen to reflect them, which is difficult, models can never accurately reflect the complex reality. The perception and underlying factors of human actions remain unclear. Qualitative research is often stronger in these domains, but it does not allow to know general distributions of types and collect representative or statistically significant data or distinguish central from weaker causalities and tendencies (Stolz, 2015, pp. 8–9). In other words, quantitative research permits to get an overview over a phenomenon but is often too simplistic especially when it comes to complex social practices such as mobility, while qualitative methods allow a deep understanding of a phenomenon, but lead to results that cannot be generalised and are not necessarily representative. Furthermore, quantitative methods are more grounded on theoretical background but, thus, less open to new and unknown findings.

Mixed methods can either relate to a certain paradigm (many authors view "pragmatism" as most adapted) or be used in research based on different paradigms (Creswell & Plano Clark, 2007). There is, actually, an important discussion relating to the development of mixed methods and philosophical foundations (Kuckartz, 2014). However, there are also more practical reasons for using mixed methods. I chose this approach to answer at best my research questions. Mixing quantitative and qualitative methods seems the only way to better understand motivations and practices of car-free households as this thesis aims to. It allows, on the one hand, to quantify certain aspects and get an overview over this unresearched topic, and, on the other hand, also to understand more in detail the mechanisms and underlying attitudes of practices and choices that are made. As a German study with a similar approach (Kemper et al., 2012) argued, only the

combination of a large quantitative study with an in-depth qualitative analysis provides results with a high explanatory value.[28]

The combination of both methods can take place at the end of the research process or already in earlier stages (Kuckartz, 2014, p. 33). In this thesis, an approach based on the "explanatory design" (Creswell & Plano Clark, 2007) is adopted. This is a two-phase, mixed methods design with the objective that qualitative data helps to explain or builds upon initial quantitative results. It is called the "*most straightforward of the mixed methods designs*" (Creswell & Plano Clark, 2007, p. 74) as the two methods are used in separate periods, hence it is feasible for a single researcher. Two variants exist: in the "follow-up explanations model" qualitative data are used to explain or expand the quantitative results and in the "participant selection model" groups are created out of the quantitative results or a sample of participants based on them that is analysed with qualitative methods. Both of these variants will be combined in this research. Kuckartz (2014) calls this approach "*Sequenzielles Vertiefungsdesign*", highlighting that the two methods are used one after the other. In this thesis, first, a mainly quantitative questionnaire survey was realised (albeit with some open questions) and, then, qualitative interviews were conducted. They allowed to detail and illustrate the results of the survey, explore questions that appeared in its results, but also contained other relevant aspects that did not appear or could not be addressed in the survey. However, unlike most studies based on an explanatory design, even with such a sequential design, both types of findings are given the same weight in this thesis. Furthermore, using mixed methods means not only to use two types of methods to collect data, but also combining both results after a separate analysis of quantitative and qualitative data.

Figure 8 shows how the two main methods were combined and which elements of the research questions were addressed by which method(s).

	Survey	Survey & Interviews	Interviews
Profiles	- Socio-demographic - Socio-economic - Dwelling characteristics - Values		- Household biography
Motivations	- Former residence	- Car-free living - Residential choice	- Meaning of the car - Residential biography
Practices		- Mobility capital - Daily mobility practices - Leisure - Holidays	- Mobility biography - Shopping
Territory	- Suitability of car-free housing development	- Important characteristics to live car-free	- Evaluation of the car-free housing development

Figure 8: Overview of methods used for the different research questions and their dimensions

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[28] "*Im Vordergrund der methodischen Komponente stand die Annahme, dass nur die Kombination von einer großen quantitativen Stichprobe mit einer vertiefenden qualitativen Analyse adäquate Ergebnisse mit hohem Erklärungswert liefern kann.*" (Kemper, Kulke, & Schulz, 2012, p. 12)

4.2.2. Survey

The first method used to collect data on the households living in the nine car-free developments was a questionnaire survey. The four cornerstones of survey research—coverage, sampling, response and measurement—are all potential error sources (Hox, de Leeuw, & Dillman, 2008). In our case, sampling and coverage do not apply because we are not looking for a sample of the population but studying a clearly defined group, that is all the inhabitants of nine car-free housing developments (the whole population). Non-response and measurement errors will be controlled for and taken into account in the analysis.

From the wide range of types of surveys, a "self-administered questionnaire" was chosen. *"It's essence is that there is no interviewer to administer the survey, pose the questions, and record the answers."* (de Leeuw & Hox, 2008, p. 239). Given that there are over 1,000 households in the analysed housing developments, this choice was made for financial and logistical reasons, but also due to the supposed high engagement of many residents that seemed to assure an important response rate despite the absence of an interviewer that generally increases it. Moreover, it limits complex and open questions and increases the importance of a clear (visual) questionnaire design to attain a high data quality, as the cover letter and the questionnaire form are the main interface between the researcher and the respondent (de Leeuw & Hox, 2008, pp. 240–243). Instead, self-administered questionnaires are seen as less intrusive, the absence of an interviewer allows for more privacy and reduces socially desirable answers. Furthermore, it can be answered when and where the respondent wants (de Leeuw & Hox, 2008, p. 244).

The questionnaire developed in summer 2016 included five parts (see Appendix 1):

- **Your household and your housing choice:** questions on the respondent's household (type, number of persons), the dwelling (size, year of move-in and occupancy status) and the housing choice reasons (with a comment field).
- **Your life without a private car:** questions on the presence of a car (to filter out the few car-owning households in Giesserei and Stellwerk60—they were asked why they owned one, if (and why or not) they planned to give up their car), former car ownership, the reasons not to own a car (first an open, later a closed question), difficulties related to car-free living, the presence of two-wheeled vehicles in the household, the characteristics of a housing development important for car-free living and the suitability of the present development (the two latter with comment fields).
- **Your mobility:** a series of items relating to mobility capital with a six-point-scale ranging from "not at all" to "completely agree", questions on the use of different transport modes, motives for car use, differences in use of cars, bicycles and public transport after residential relocation, and the number of holiday trips including the transport modes used for.
- **Your daily life:** a question on the frequency of different leisure activities, one on basic human values, adapted from the European Social Survey (Schwartz, 2001), and the voting intentions ("Sonntagsfrage").
- **The members of your household:** including data for every household member on age, sex, nationalities, driving licence, public transport passes, employment or education (including place and mobility modes used to reach it), highest level of education, former place of residence, a question to know if the person grew up in a car-free household and finally a question on household income.

On the last page, a large space was left for comments and the respondents could leave their name, address and phone number if they were interested to get results and/or willing to participate in an interview in 2017. Two variants of the questionnaire were necessary due to some small differences between Germany and Switzerland, such as the different political parties or education levels.

Before sending it to the residents, the questionnaire was tested because *"Testing is the only way of assuring that the survey questions written do indeed communicate to respondents as intended."* (Campanelli, 2008, p. 176). Different test methods were used, inspired by the propositions of Campanelli (2008, p. 198). First, a few experts were asked to read the questionnaire and comment it (among others it was my supervisor prof. Patrick Rérat; prof. Ulrike Reutter, member of my thesis committee; Samuel Bernhard, an expert on car-free housing in Switzerland; and contact persons in some of the nine housing developments). Second, the questionnaire was tested by a group of diverse persons from my social network that could have been part of the studied population. They were observed completing the survey to see whether mistakes were made and asked to "think aloud" while answering the survey. As many persons did not say much, the subsequent "respondent debriefing" with short interviews was important *"to ask them probing questions about how they experienced certain aspects of the questionnaire"*. (Dillman, Christian, & Smyth, 2014, p. 247) and *"to uncover respondents' thought processes in answering a survey question, covering the four cognitive steps of comprehension, recall, judgment and response"*. (Campanelli, 2008, p. 191). The questionnaire was adapted based on these tests and then the final version was printed as a booklet in size DIN-A5.

The survey was inspired by the "Tailored Design Method (TDM)" (Dillman et al., 2014). It *"refers to customizing survey procedures for each survey situation based upon knowledge about the topic and sponsor of the survey, the types of people who will be asked to complete the survey, the resources available, and the time frame for reporting results"*. (Dillman et al., 2014, p. 16). The TDM is based on a social exchange perspective which explains human behaviour motivated by supposed returns it brings. Rewards are compared to anticipated costs (not only in a monetary sense, but also feelings e.g.) and trust is necessary to assure that rewards will outweigh costs. Therefore, in a survey, benefits need to be maximised, costs minimised and trust established. Rewards can be material (a monetary incentive may increase the response rate) or psychological (such as value the person's contribution, show how the results will be useful, ask interesting questions, or propose a summary of the results). As for costs, effort and time need to be as small as possible (thus, length and complexity reduced and visual design used to make it easier to complete a questionnaire) and no monetary costs should be necessary. Finally, trust has to be established, for example by assuring confidentiality and by using an official letterhead of the University which is considered a legitimate authority. The TDM emphasises the role of a follow-up system with up to three reminders of different forms. Several guidelines regarding construction and implementation of the survey were adapted, as the TDM has been successfully applied to mail surveys all over the world (de Leeuw & Hox, 2008, p. 246).

The two main types of self-administered questionnaires, postal or paper mail and internet surveys were combined (de Leeuw & Hox, 2008, p. 239). As all postal addresses were known but not the e-mail, a paper version was first distributed to all residents. Except in Burgunder, FAB-A and Oberfeld (where they were sent by post), I posted them myself in the mailboxes in October 2016 accompanied by a letter explaining the study and the importance to answer it (see Appendix 2). After two weeks (or a bit later in cities with school holidays at that period), a reminder was sent to all residents having not already returned their questionnaire (see Appendix 3). In this simple letter, the possibility to answer the questionnaire online was also proposed, and the printed questionnaire was not distributed a second time. Furthermore, the links to the online versions of the survey were also sent to all e-mail addresses in the developments where they were available, either by the housing administration or in some cases to members of the housing association or their mailing lists. The reason to use the two methods, paper and web, consecutively relies on the TDM guideline to *"Avoid offering a simultaneous choice of response modes"* (Dillman et al., 2014, p. 427). It is based on a meta-analysis of 19 surveys showing that response rates are lower (on average 3.8 percentage points) when the two modes are offered at the same time as

when mail is the only mode offered (Medway & Fulton, 2012). Both letters were personalised, so that every resident got a named envelope. This was also found to have a positive effect on response to mail surveys (Dillman et al., 2014, p. 367). For the same reason, a pre-franked envelope to send the questionnaire back was distributed, too.

The overall response rate is 46% (see Table 11). The lowest rate is 28% in Weißenburg, the highest 80% in FAB-A[29]. Three other projects have a very high response rate: Oberfeld (78%), Burgunder (68%) and Klein Borstel (66%). The others are situated around the overall response rate. In total, 571 households answered the questionnaire including 1,433 persons.

These high response rates contribute to limit nonresponse error, even if they do not guarantee it (Dillman, Christian, & Smyth, 2014, p. 6). Nonetheless, the important differences between the housing developments need to be considered. It appears that in collaborative housing, the response rates are much higher than in the rather conventional developments and especially in those including subsidised housing. In these two housing types, residents who are less interested in or happy with car-free housing may heve less answered the survey as well as those with a lower education or migrants with language barriers. Therefore, in some developments the results may reflect only a part of the population. However, the other methods used in this thesis will contribute to complete the image of the different housing developments and, thus, help to limit nonresponse errors in the survey results.

		Responses:				
Housing development	**Distributed**	**Mail**	**Online**	**Total (households)**	**Total (persons)**	**Response rate**
Burgunder, Bern	80	44	10	54	138	68%
FAB-A, Biel/Bienne	20	13	3	16	49	80%
Giesserei, Winterthur	145	67	2	69	148	48%
Oberfeld, Ostermundigen	94	68	5	73	188	78%
Sihlbogen, Zurich	140	44	7	51	113	36%
Klein Borstel, Hamburg	62	35	6	41	125	66%
Saarlandstraße, Hamburg	141	57	10	67	141	48%
Stellwerk60, Cologne	426	138	24	162	427	38%
Weißenburg, Münster	136	31	7	38	104	28%
TOTAL	**1,244**	**497**	**74**	**571**	**1,433**	**46%**

Table 11: Response rate of the survey

The answers were recorded, helped by two student assistants, and then analysed with SPSS using mainly crosstabs to break down the results to the different housing developments. I did not go further than descriptive statistics, due to the relatively small sample sizes, overall and especially of each housing development, even more as only 487 of the 571 households are car-free and these were mainly used for the analyses. However, the descriptive comparison gives a good impression of the differences between the developments. Furthermore, the focus on a broader understanding, giving the same weight to the qualitative method used, led to this decision.

To test the representativeness of the respondents, the total shares of the dwelling sizes were compared to those of the survey respondents (see Figure 9). It appears that, overall, the shares are rather similar. The bigger differences in Saarlandstraße could be due to the absence of data on the dwelling sizes for one third of this development. In Klein Borstel and Stellwerk60, no exact

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[29] Even if it reaches the highest response rate, due to its small size, FAB-A has a very small number of answers (16). One household represents 6.3%, this must be considered when analysing the results.

data on the room numbers per dwelling are available for the whole development and therefore no comparison possible.
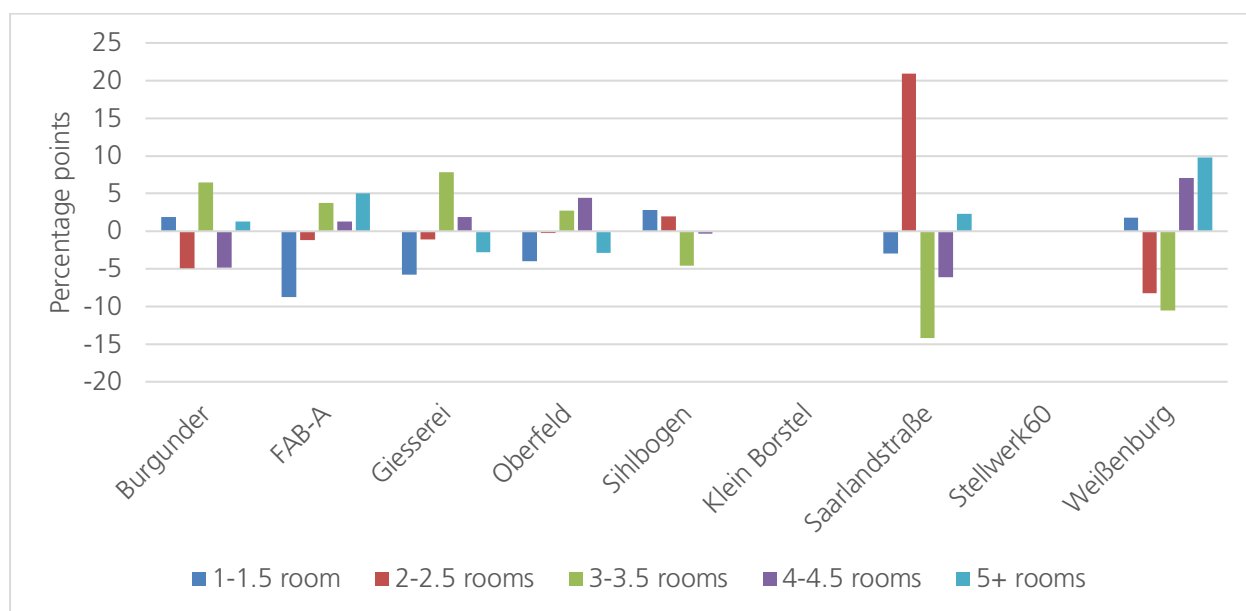
Figure 9: Difference between the total of dwellings in a development and the dwellings of the households answering the survey (negative = underrepresented, positive = overrepresented)

4.2.3. Interviews

In the second half of the year 2017, I conducted interviews with residents. A "nested sample" (Stolz, 2015, p. 14) of survey respondents was mainly used, relying on the persons having left their contact details in the questionnaire. Due to the presence of car-owning households, the two car-reduced developments of Giesserei and Stellwerk60 (see chapter 5 for details) were left out for the interviews, as well as the very small project of FAB-A. In the remaining six housing developments, 50 households were interviewed. Normally, I talked to one person, but I also met four couples. In three cases the husband of the interviewed person participated for a short moment, at the beginning or the end, and in two interviews, children were present at the end of the interview. The interviewees reflect the diversity of residents present in terms of occupancy status, type of household and age (see Table 12 and Appendix 4 for a table with details on every respondent). Most residents were interviewed in their home, some in the community halls present in most developments or at a café. The interviews lasted approximately one hour. The shortest was 45 minutes, the longest over two hours (with a couple), including often an open discussion at the end.

Development		Occupancy status		Type of household		Sex		Age (years)	
Burgunder	8	Tenant	26	Person living alone	15	Women	30	<30	1
Oberfeld	8	Cooperative member	17	Childless couple	13	Men	24	30–39	8
Sihlbogen	5			Couple with child(ren)	21			40–49	12
Klein Borstel	9	Owner	11	Single-parent family	4			50–59	17
Saarlandstraße	12			Flat share	1			60–69	8
Weißenburg	12							70+	8

Table 12: Characteristics of the interviewed residents (N=54)

Five aspects were addressed during the interviews (see interview guide in Appendix 5). To start, the respondents were asked to draw a short portrait of their household. Then, the housing choice

was discussed, including motivations and also the respondents' residential biography as well as potential future plans to move. Another aspect treated was car-free living, with the significance attributed to a car and to car-free living by the respondent, the motivations and the car-free (or car-related) biography, too. An important topic were the different practices of car-free living, the alternatives used, the problems or strategies, including car use. Daily mobility as well as holidays were addressed, leisure activities and shopping taken as specific examples applying to all respondents and for which a car is often used. Finally, the spatial context to live without a private car was asked for, starting with the present housing development and its suitability for car-free living and extending to broader territories to understand what is really important to live without a private car and what is rather "nice to have".

Afterwards, the interviews were transcribed using the software f5. As the content and not the linguistic details were important for the analysis, the transcription of the interviews was based on the simple transcription rules proposed by Dresing and Pehl (2015), including for example the translation of Swiss German dialects into High German.

To analyse the interviews, I used the software MAXQDA and conducted a *"qualitative content analysis (qualitative Inhaltsanalyse)"*, a frequently used method, especially by German-speaking researchers. It is based on Philipp Mayring's approach centred on creating categories, who was the first author developing this type of analysis in the 1980s. Philipp Mayring published the first method book entitled *"Qualitative Inhaltsanalyse"* in 1983, about thirty years after a text of Siegfried Kracauer arguing already in 1952 to develop a qualitative content analysis in contrast to the existing quantitative content analysis (Kracauer, 1952). Mayring (2015) and Kuckartz (2016) highlight the hermeneutic foundations of the approach, but also the systematic procedure and the orientation on methodological criteria. However, many different and even inconsistent definitions and approaches exist.

Following Kuckartz (2016)and Schreier (2014), I understand it as an interpretative form of analysis attributing codes based on interpretations, classifications and evaluations; and as a procedure which consists of creating a system of categories based on relevant text meanings and, then, assigning text passages to these categories[30]. Schreier and Kuckartz characterise qualitative content analysis as category-oriented, there is a systematic and rule-guided coding procedure based on categories. It is an interactive and interpretative procedure including also latent meanings classifying and categorising the whole data and not just a part of it. The analysis is oriented both on reliability and validity criteria, notably with the aim of concordance between coders (Kuckartz, 2016, p. 26; Schreier, 2014, para. 4). Other authors, such as Mayring (2015), put a stronger emphasis on a theory-led procedure, while Schreier and Kuckartz both highlight the importance to develop codes (also) out of the analysed material. This is a crucial point in my research design, the qualitative analysis should also allow to find new elements and not hide them by pre-defined coding categories.

More precisely, I used different methods of the "tool box for qualitative content analysis" (Schreier, 2014), based on the "structured qualitative content analysis (strukturierte qualitative Inhaltsanalyse)" in the sense of Schreier (2014) and Kuckartz (2016). The advantage of this approach is to reduce qualitative material by summarising it into thematic categories (codes), relying on theory as well as creating codes emerging from the empirical material (inductive and de-

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[30] *"Eine interpretative Form der Auswertung […], hier werden Codierungen aufgrund von Interpretationen, Klassifikation und Bewertung vorgenommen."* (Kuckartz, 2016, p. 27). *"Ein Verfahren zur Beschreibung ausgewählter Textbedeutungen […]. Diese Beschreibung erfolgt, indem relevante Bedeutungen als Kategorien eines inhaltsanalytischen Kategoriensystems expliziert und anschließend Textstellen den Kategorien dieses Kategoriensystems zugeordnet werden."* (Schreier, 2014, para. 4).

ductive codes)—or, as Kuckartz (2016) states, the method is characterised by openness towards the material. He also insists on writing "memos" (notes) to sum up the different cases (persons interviewed) and to point out interesting statements.

Based on my theoretical framework, on the first analysis of the survey results as well as on the interview guide, a basic code system, especially with main categories corresponding to the different research questions, was established (see Table 13). A first set of subcodes was also proposed, mainly to structure the responses. Then, a first set of interviews was coded and based on this, further codes were added and used for all interviews. Some general codes were only detailed in a second step, once all interviews were coded. Furthermore, a case summary was written for each interview.

Main categories	Subcodes
Development characteristics	-
Household/respondent profile	Values
Reasons to live car-free	Meaning of the car Deliberate choice Convictions Practical reasons Financial reasons Age/health reasons
Reasons for car-free housing choice	Dwelling characteristics Development characteristics Location/mobility Residents in the development
Residential biography	Residential trajectories Future housing
Mobility capital	Mobility skills Mobility access and equipment Mobility capital changes
Mobility practices	Daily mobility practices Car use Shopping practices Leisure activities Holiday travels Mobility practices biography Mobility-related problems Strategies to live car-free
Hosting potential for car-free housing	Satisfaction with car-free housing development Infrastructure/surroundings Development Mobility

Table 13: Basic code structure at the beginning of the qualitative content analysis

Two other types of qualitative content analysis were used for additional analyses. First, a subtype of the structured qualitative content analysis method was applied for the satisfaction of the residents with their housing development: "evaluating qualitative content analysis" (Kuckartz, 2016, p. 123). This means that the responses were evaluated in categories representing an ordinal scale: very satisfied, satisfied, unsatisfied and a category for cases which could not be classified. Second, while the methods mentioned previously were useful for a variable-oriented analysis, and therefore to respond the two main research questions, a typological approach was used for a case-

oriented analysis, to answer the research question on lifestyles present in car-free housing developments. It is another subtype of the structured qualitative content analysis, using categories to create a typology of individuals (Schreier, 2014).

In general, typologies aim to group elements based on a chosen set of at least two different characteristic values in order to create groups of cases that are similar and differentiate from those in other groups (Kuckartz, 2016, p. 146). There are two main forms of typological approaches: the first is based on types with homogeneous characteristics ("merkmalshomogene Typen" or "monothetic types") where types are created based on categories defined in advance, the basic model contains two characteristics with two forms each, resulting in four theoretical types. The other approach is called "natural typology" because, unlike the first approach, types are created inductively, out of the material. Individuals are grouped in order to create types internally as homogeneous as possible and as heterogeneous as possible compared to the others.

I adopted this latter approach to create types of lifestyles of car-free housing residents. Based on Kuckartz (2016, p. 151) I first defined the relevant characteristics: values (and motivations to live car-free) as well as mobility practices. Then, I read the corresponding answers and the case summary of each respondent according to these characteristics and created types of lifestyles. The importance of ecological motivations appeared as important for the values—ranging from a guiding principle to rather unimportant for mobility practices—and for the latter, different practices of cycling, public transport and car use distinguished individuals. While first, a version with nine types was imagined, it turned out that six types of lifestyles were sufficient. Then I chose names that sum up the specificities of the lifestyles and assigned all respondents to a type. Finally, the types could be described in terms of profiles and characteristics and their distribution in the different housing developments analysed.

4.2.4. Complementary methods

In addition to the two methods to collect data on the households, some complementary methods were used mainly at the beginning of the research process and to collect data on the spatial and historical context of the analysed housing developments.

Exploratory factual interviews were conducted in 2015 with the following experts to discuss car-free housing in general and the relevance of my thesis project:

– Prof. Dr.-Ing. Ulrike Reutter, Bergische Universität Wuppertal
– Prof. Dr.-Ing. Oscar Reutter, Wuppertal Institut für Klima, Umwelt, Energie GmbH
– Samuel Bernhard, consultant working on car-free housing developments in Switzerland, coordinator of the "Plattform autofrei/autoarm Wohnen"

Dr. Steve Melia from the University of the West of England in Bristol was contacted by e-mail to discuss some questions. All these contacts provided useful comments on my thesis project and information about car-free housing, the different open questions of interest as well for science as for practice. Furthermore, my own previous practice as co-director of a platform on car-free and car-reduced housing (see 1.2) also provided me some knowledge, documents and experience with car-free housing developments.

To choose the case studies (see next chapter), I visited different housing developments I was not already familiar with in spring 2016. I conducted factual interviews with representatives of the housing cooperative, the owner community, the residents' association or the housing management. These interviews focused on the characteristics and the history of the housing development including the role car-freeness played. They also addressed the actual management, mobility issues, the surrounding neighbourhood and city district as well as some general questions about the residents (interview guide see Appendix 6).

During these visits, I also analysed the developments and their territorial context. I did this later in the other developments, for example when I went there to distribute the survey questionnaires or for the interviews. The "hosting potential of the territory" in the housing development but also the surrounding neighbourhood and the whole city was analysed, taking photographs and notes of and drawing on maps, the forms and functions observed. For the observation, I adapted the evaluation grid (see Table 14) developed in a project on mobility management in housing developments (Schweizer et al., 2014) for which I worked before, too. Furthermore, albeit only during short periods, I could also gain some insights on the practices of the residents in the car-free housing developments through observation.

Context	Localisation
	Urban morphology
	Functions
	Environmental quality
Walking	Quality of walking infrastructures
Cycling	Distances and topography
	Bicycle parking
	Bicycle services
	Bikesharing
Public transport	Quality of service
	Nearest train station
	Connection to main station and public transport hub
	Tram/subway
	Bus
Motorised traffic	Traffic regime
	Car parking
	Carsharing
Other observations	…

Table 14: Evaluation grid adapted from Schweizer et al. (2014)

Finally, in an attempt of a transdisciplinary research approach (see above), I presented the results of my analysis in all housing developments (except Sihlbogen where the absence of a common room and an association of the residents did not allow a presentation, and Oberfeld where no date was proposed before August 2019) in spring 2019 and discussed my conclusions with the residents, in order to include their feedback in the analyses and conclusions of my thesis.

5. Case studies

This part presents the car-free housing developments analysed in this thesis. To choose the case studies, I evaluated the existing car-free housing developments corresponding to my definition (see 2.3.3), considering the research already existing as well as practical reasons (i.e. linguistic context and location). To reduce the number of countries (with different cultural and political contexts), I laid the focus on Switzerland and Germany, where most developments are situated anyway. In Germany, of seven known car-free housing sites, Grünenstraße in Bremen and the different car-free housing cooperatives in Munich were excluded due to their very small sizes and, in Munich, the integration in a larger new-build neighbourhood (Messestadt Riem) or their rather car-reduced character (Kolumbusplatz). In Switzerland, all seven housing developments known in 2015 appeared appropriate to be studied[31]. Even if one is also very small (FAB-A with 20 flats), including all existing car-free housing in the country at that time prevailed. Hence, I contacted these twelve housing developments in early 2016.

The five projects identified in Germany had all been interested. Therefore, I visited them in the end of March and the beginning of April 2016, talked to a representative (see last chapter for details) and, except in Klein Borstel (the interview was at an office outside the development and I visited it on my own), had a guided visit in the following housing developments:

– Stellwerk60 in Cologne-Nippes
– Weißenburg in Münster (Westphalia)
– Saarlandstraße in Hamburg-Barmbek
– Klein Borstel in Hamburg-Ohlsdorf
– Christophstraße in Kassel-Unterneustadt

The last one appeared to be a failed car-free housing development, even if there was no parking for the residents of the 64 dwellings at the edge of the city centre. During my visit, I learned that despite the lease including a car-free clause that residents signed, many of them actually owned a car which they parked in the neighbourhood. Thus, this development was deleted from my list.

As I was familiar with the Swiss developments due to my prior work and had visited most of them, no additional visit was needed before choosing these case studies. However, two of the existing car-free developments refused to participate because they already had conducted or planned too many other surveys: Kalkbreite and "mehr als wohnen", both located in Zurich[32]. The important research interest on these two developments is also related to their specific characteristics. Kalkbreite is located on top of a tram depot in a central urban district of Zurich. It is a cooperative with 97 housing units and offices, a hotel, a cinema, shops and services. "mehr als wohnen" is a car-reduced neighbourhood built by housing cooperatives and the municipality in the suburban district of Leutschenbach with over 370 dwellings and 111 parking spaces (88 for residents). Both developments include several other innovative aspects such as cluster flats or ecological energy supply and technologies (Plattform autofrei/autoarm Wohnen, 2019a).

Nine housing developments have finally been chosen as case studies for this thesis (see Table 15). In all of them, the residents commit to living without a private car. However, two developments are not completely car-free but car-reduced, meaning that a small minority of residents can have access to car parking (in Giesserei, parking is provided for 20% of the dwellings and in Stellwerk60 for 18% of them).

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[31] Avellana in Zurich was not known at that time and could, therefore, not be included in my study.

[32] For the published studies, see Genossenschaft Kalkbreite (2019) and mehr als wohnen (2019).

	City (country)	Population of the city[33]	Motorisation (cars/1,000 inhabitants)	Location	Type of residents	Year of first completion	Number of dwellings
Burgunder	Bern (CH)	133,798	381	Suburban district	Renters	2011	80
FAB-A	Biel/Bienne (CH)	54,640	390	Central urban district	Cooperative members	2014	20
Giesserei (car-reduced)	Winterthur (CH)	110,912	405	Outskirts of the city	Cooperative members	2013	145
Oberfeld	Ostermundigen / Bern (CH)	17,546	401	Outskirts of the sub-urban mu-nicipality	Cooperative members	2014	94
Sihlbogen	Zurich (CH)	409,241	343	Outskirts of the city	Renters	2013	140
Klein Borstel	Hamburg-Ohlsdorf (DE)	1,810,438	426	Outskirts of the city	Owners; cooperative members	2008	62
Saarland-straße	Hamburg-Barmbek (DE)	1,810,438	426	Central urban district	Renters; owners; cooperative members	2000	141
Stellwerk60 (car-reduced)	Cologne-Nippes (DE)	1,075,935	437	Central urban district	Renters; owners	2006	426
Weißenburg	Münster / Westphalia (DE)	311,846	452	Central urban district	Renters	2001	136
TOTAL							**1,244**

Table 15: Overview of the case studies and characteristics of the cities in which they are located[34]

Furthermore, the analysed car-free housing developments represent an interesting mix of different sizes, years of completion, locations within the cities and types of urban areas they are located in (see Map 1). They vary not only in size, but different "mobility cultures" (based on infrastructure, travel behaviour and perceptions of transport modes) are present: the German cities include a "cycling city", Münster, as well as two "transit metropolises", Cologne and Hamburg (Klinger et al., 2013). The Swiss cities could probably also be attributed to "transit metropolises" due to the central place of public transport, even if in Biel/Bienne and Winterthur, cycling is slightly more important than in Bern and especially in Zurich[35]. Finally, the motorisation rates in the different

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[33] Unlike the German cities including their periphery, the Swiss municipalities are the centres of bigger agglomerations (except Ostermundigen, a suburban municipality), Bern e.g. of an urban region with about 400,000 residents. Zurich is the biggest city of Switzerland, Bern the fifth, Winterthur the sixth and Biel/Bienne the 10th (Source: Federal Statistical Office). Hamburg is the second largest city of Germany, Cologne the fourth and Münster the 20th (Source: Destatis).

[34] Data from 2017 (Sources: Federal Statistical Office, Destatis and Kraftfahrt-Bundesamt).

[35] The share of stages (monomodal parts of a trip) done by bicycle in the relative urban region was 9.2% in Winterthur, 7% in Biel/Bienne, 5.5% in Bern and 3.4% in Zurich in 2010 (Wälti & Schlosser, 2015).

cities also vary, but are clearly lower than the national averages of 555 cars per 1,000 inhabitants in Germany and 537 in Switzerland (Eurostat, 2018).

Number of dwellings 426 145 20

Giesserei Winterthur
Sihlbogen Zurich
FAB-A Biel/Bienne
Burgunder **Oberfeld**
Bern Ostermundigen

km
0 25 50

Saarlandstraße **Klein Borstel**
Hamburg Hamburg

Weißenburg Münster

Stellwerk60 Cologne

km
0 50 100
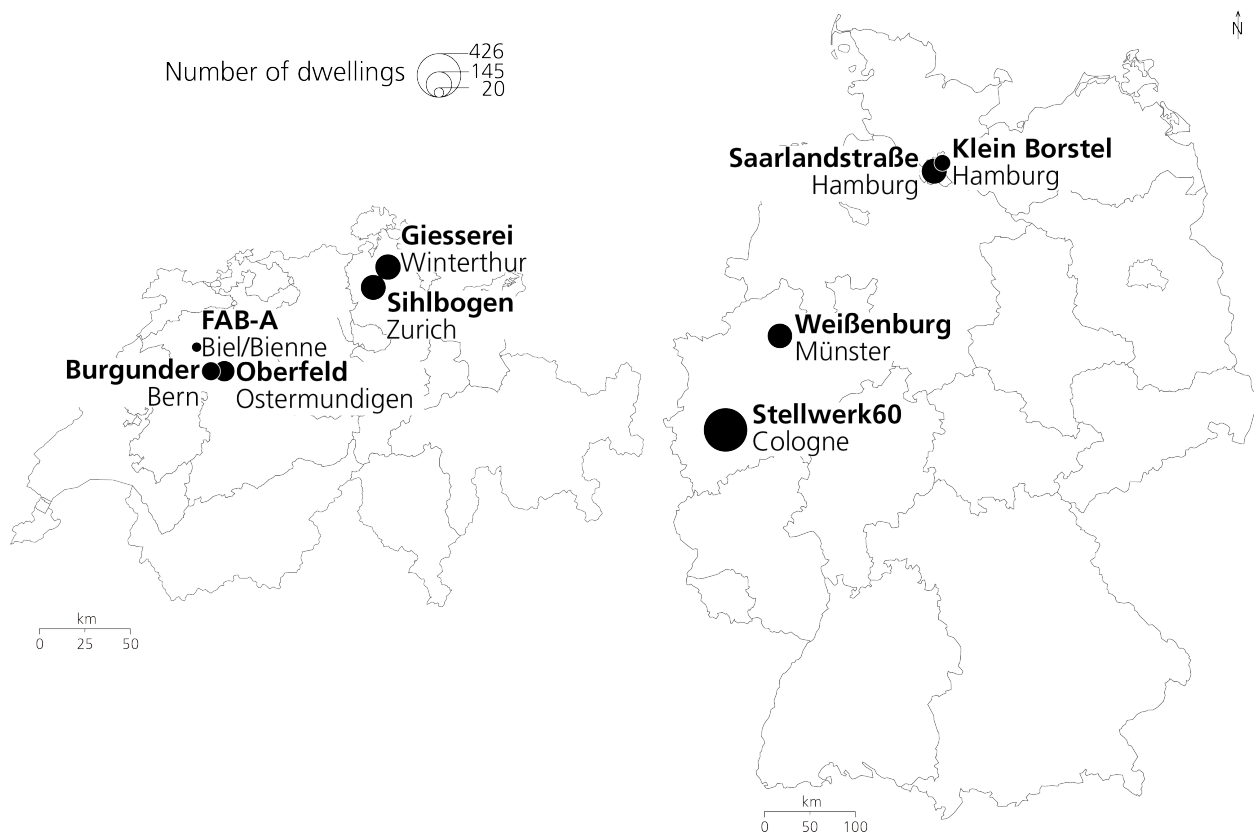
Map 1: Location of the case studies in Switzerland (left) and Germany (right)

In Switzerland all developments are either entirely rental flats (Burgunder and Sihlbogen) or housing cooperatives (FAB-A, Giesserei, Oberfeld). In Germany, with the exception of Weißenburg (renters), there are mixed models (renters and owners in Stellwerk60, owners and cooperative members in Klein Borstel, all three in Saarlandstraße). Thus, five of the nine developments are part of the "alternative" collaborative housing sector and contribute to its re-emergence observed in Europe since the beginning of the 21st century (R. Lang et al., 2018; Tummers, 2016).

Cooperative housing is different from conventional rental or ownership housing models. To get a dwelling, residents need to become members which includes buying shares of the cooperative. Furthermore, most housing cooperatives imply self-management and -organisation, including administration but also maintenance of the development—although both can also be delegated to external persons. Often, participation starts already in the planning process, including future residents in the development and construction of their housing. Social as well as ecological aspects often play an important role and community infrastructures are generally provided. A major difference to other housing types is that the cooperative members keep control over their dwellings and are not dependent on external owners.

There are various models of "housing cooperatives" ("Wohnbaugenossenschaften" or "coopérative d'habitant·e·s"): residents either own their dwellings or rent them from the cooperative which is often created by residents of just one development. This is the case in "housing projects" ("Wohnprojekte") which represent a particular form of collaborative housing in Germany, but they can also be organised in another legal form than a cooperative (Frohn, 2018). They are normally developed bottom-up by a small group of future residents sharing an ideal how to live together, but in different dwellings—the ideal size is supposed to be about 30 households—even though special forms such as shared or cluster flats can be realised (Frohn, 2018). Besides social

motivations, influencing the design of the development and the realisation of common spaces, persons engaged in "housing projects" usually also share environmental convictions (Frohn, 2018). Klein Borstel and Saarlandstraße have been developed under this term, FAB-A, Giesserei and Oberfeld can also be considered as such, even if this term is not common in Switzerland.

These alternative housing forms allow residents generally to live at lower costs as their dwellings do not need to generate profit for an investor. There is another type of cooperative housing for which this is the case, the "building cooperative" ("Baugenossenschaft" or "coopérative d'habitation"). Similar to housing cooperatives, they are non-profit and pursue social and often also ecological goals. They generally own an important number of dwellings and rent them similarly to more conventional flats. This is the case in the development of Sihlbogen in Zurich.

Even if, overall, cooperative housing represents a very small part of the housing market, in Switzerland, housing policy is increasingly supporting non-profit housing ("gemeinnütziger Wohnungsbau") at the federal level, in some cantons and particularly in the big municipalities, also in response to different popular initiatives aiming at more support of affordable housing (BWO, 2019). A similar evolution is observed in Germany: the number of "Wohnungsgenossenschaften" is increasing and policy on all three levels (federal, land and municipality) highlights their role to provide affordable housing (Fuks, 2018).

The municipalities also play an important role for planning car-free housing developments, particularly because they are the granting authorities. The nine case studies include the whole range of support, from projects started by a municipal plan or objective to create car-free housing to developments realised despite planning and construction authorities and regulations initially not supporting housing without parking.

Another particular housing type is present in all German developments: subsidised housing (Weißenburg is even entirely social housing, except the most recent part, completed after my research). This means that residents need to have a "Wohnberechtigungsschein", a certificate of eligibility to rent subsidised dwellings. To get this from the municipality, they need to fulfil certain criteria, particularly not exceed a certain income (Berliner Mietfibel, 2019).

In the remainder of this chapter follows a presentation of the different case studies in Switzerland and in Germany. First, their history and general characteristics are presented including how car-freeness is regulated. Then, the spatial context (their hosting potential) is analysed: their location within the city, the access by public transport and bicycle, and the mobility infrastructure in the development. Finally, the surrounding neighbourhood's characteristics are addressed, including shops and services for everyday needs and recreation areas.

5.1. Swiss case studies[36]

5.1.1. Burgunder, Bern-Bümpliz

Inaugurated in August 2011, Burgunder was the first car-free housing development in Switzerland. It was developed by two private companies (npg AG and wok Burgunder AG) as a sustainable housing estate including social, economic and ecological aspects (e.g. Minergie-P or Minergie-

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[36] The descriptions of the Swiss case studies are based on visits and discussions in the developments as well as on "Plattform autofrei/autoarm Wohnen" (2019a), a project I co-developed until 2014.

P-ECO building standard[37] and certified 2000-Watt Site[38]). The courtyard with a renovated half-timbered house (see Photo 2) is surrounded by three new buildings with three floors (two smaller ones built by npg AG, see Photo 3, and the biggest one, called "Laubenhaus", by wok Burgunder AG, see Photo 4 and Map 2). There is a nursery in the development and a common room. On Wednesday evenings, an organic farmer sells fresh groceries at a market stand for two hours. Burgunder is partly self-administrated by the residents organised in two residents' associations corresponding to the two owners of the development ("Hausverein Burgunder" and "Laubenhausverein") with different working groups. The residents are for example responsible to maintain the outdoor spaces, including snow clearing. There is also a mailing list allowing to send messages to all residents. The 80 rented flats range from 2.5 up to five and more rooms. Renters sign a special agreement, an appendix to their lease, to guarantee the car-freeness, including not to park a vehicle in the development or in a certain perimeter around it.

Photo 2: Half-timbered house with nursery, common room and dwellings in Burgunder

Photo 3: npg buildings in Burgunder

Photo 4: Laubenhaus in Burgunder

Photo 5: View of Burgunder from the southwest

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[37] Minergie is a Swiss label for low energy-consumption buildings. Minergie-P corresponds to a lowest-energy or "passive house" ("Passivhaus") and ECO is a supplement for an ecological and healthy construction (MINERGIE, 2018).

[38] 2000-Watt Site refers to the goal of the 2000-Watt Society, which is based on the amount of primary energy available for every person on earth to ensure a sustainable and socially just society. The certificate for 2000-Watt Sites is issued for a limited time period and based on an integrative evaluation of a site and not only the individual buildings, including also mobility (2000-Watt Site, 2019).

Owner/developer	Laubenhaus: Wok Burgunder AG, other buildings: npg ag (stock companies with strong sustainable objectives)
Number of dwellings	80
Type of residents	Renters
Year of completion	2011
Regulation of car-freeness	Appendix to the lease stating that no car can be parked within the development and in a defined perimeter around it.
Number of car parking spaces	13
Carsharing	1 car in the development, 3 within 300m
Car parking spaces/dwelling	0.18
Number of bicycle parking spaces	200 (mainly covered but not closed)
Public transport	S-Bahn station at 150m (4 trains/hour to the city centre)
Amenities	Nursery, common room, playground, market stand from an organic farmer once a week
Building standard	Minergie-P (Laubenhaus), Minergie-P-ECO (other buildings), 2000-Watt Site
Particularities	Partly self-administrated by the residents' association

Table 16: Characteristics of Burgunder
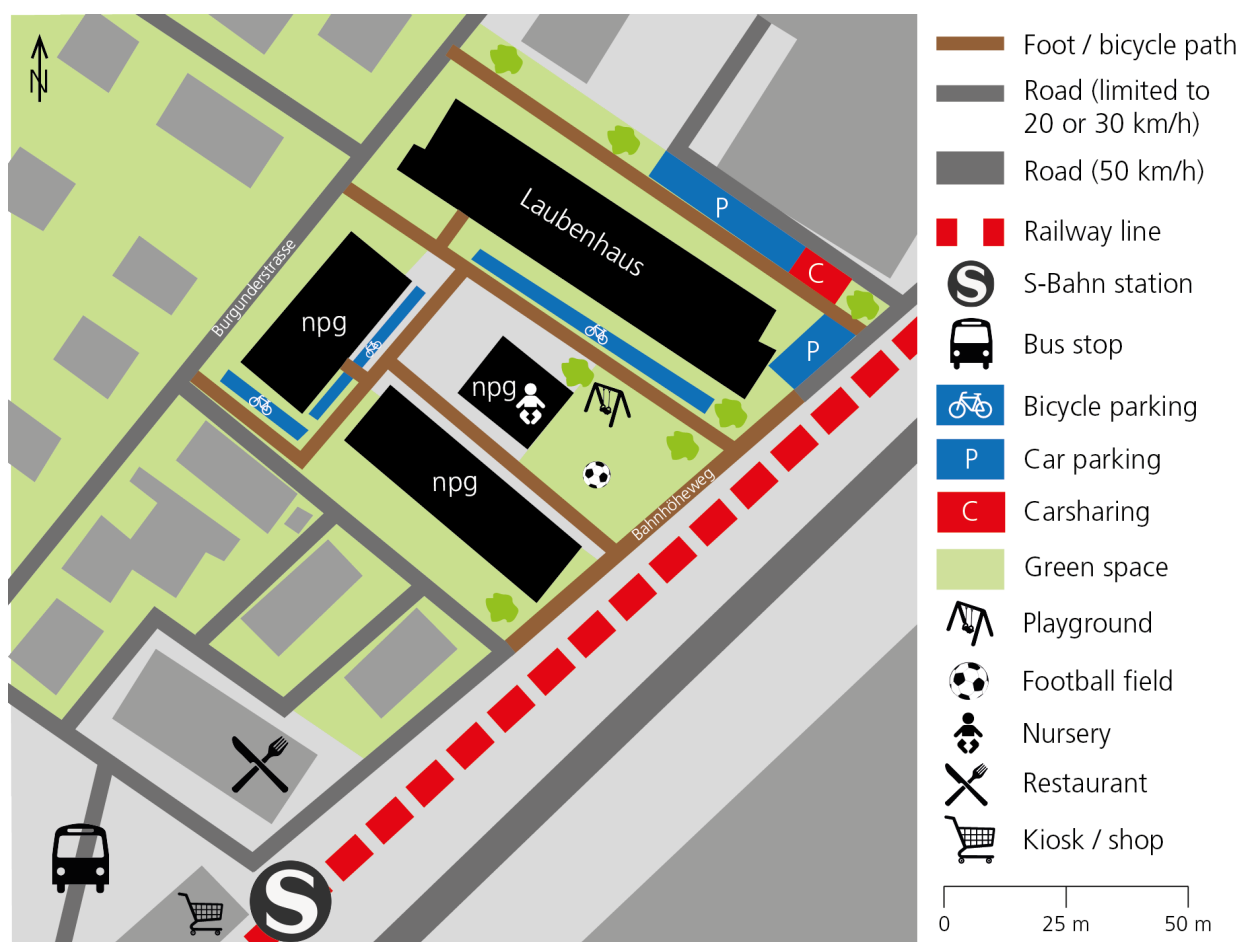
Map 2: Map of Burgunder

Burgunder is located in Bern-Bümpliz, in the West of the city of Bern, at about 3.5 km as the crow flies from the city centre (see Map 3). On the south, a railway line borders the development (see Photo 5), to the east there are businesses and to the north and west an older residential area.

13 car parking spaces are available for visitors. For carsharing[39], there is one car in the development and two other carsharing locations with three cars within a radius of 300m. About 200 bicycle parking spaces are available for residents, mainly covered in front of the buildings (see Photo 6). To reach the city centre, bicycle paths and lanes are available although there are some critical parts, or detours necessary to avoid them. The train station "Bern Bümpliz Süd" is about 150 metres away from the development and trains take eight minutes to reach Bern central station. Several tram stations are also within a 500m distance from Burgunder. Local supply is located at about 500m from Burgunder, in the district centre of Bümpliz, including different supermarkets and other shops and services such as a post office and a library. Schools are within the same distance and a forest (Könizbergwald) can be reached after a 350-metres-walk.

– – – Railway line	Green space	★ Burgunder	School
– – – Tram line	Water surfaces	Bus/Tram stop	Supermarket
⋯⋯ Bus line	City centre	Ⓢ S-Bahn station	Church
—— Motorway	District centre	Main station	Football field
		Post office	Swimming pool
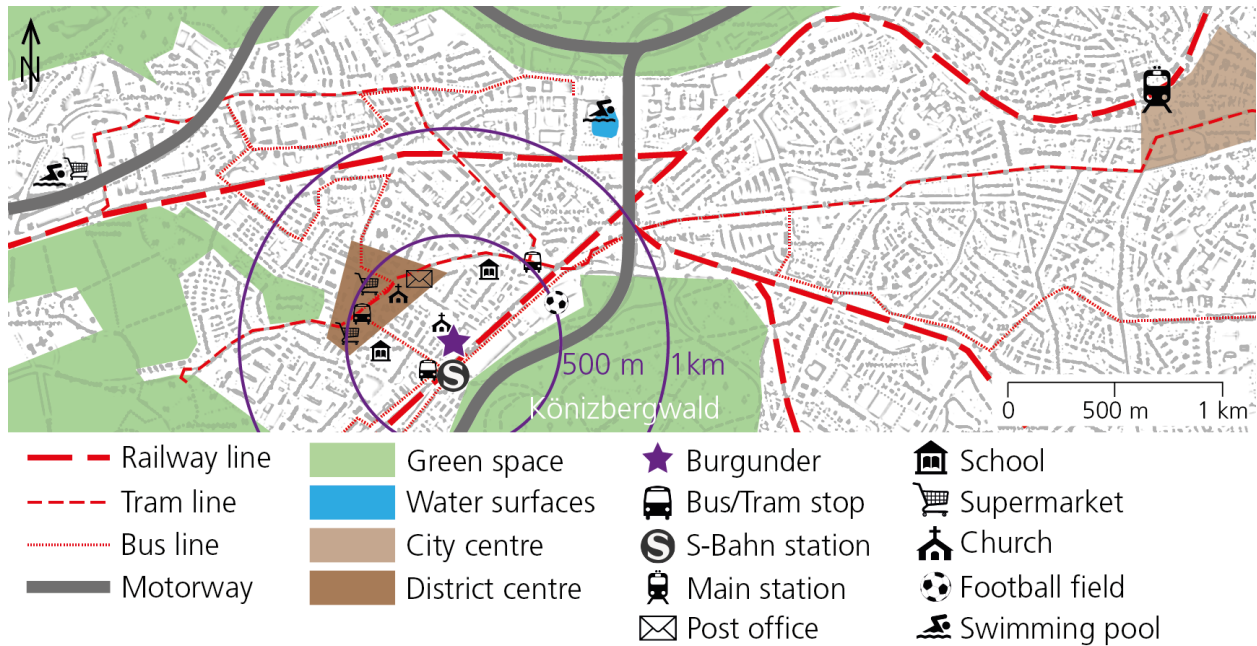
Map 3: Location of Burgunder (Source of map background: Open Street Map)

Photo 6: Covered bicycle parking in front of the Laubenhaus in Burgunder

[39] In Switzerland, there is a particular situation because there is only one carsharing provider, "Mobility", providing over 3,300 cars at more than 1,400 stations, and not only a dense network of different types of cars in urban regions, but also at railway stations all over the country. Furthermore, Mobility is a cooperative and members do not pay an annual fee. However, there is also the possibility of an annual subscription without being member or even of using cars at higher rates without any subscription (Mobility, 2019).

5.1.2. FAB-A, Biel/Bienne

FAB-A is the smallest case study with only 20 dwellings, inhabited since August 2014. It is located in Biel/Bienne, a 55,000-residents-town (10th city of Switzerland), 25 km northwest of Bern. It was developed by the cooperative FAB-A, consisting of future residents. They participated in the planning and construction process. An energy-efficient (Minergie-P standard) L-shaped building of three floors (see Photo 7, Photo 8 and Map 4) contains the dwellings, a common room with a kitchen on the ground floor where during the week residents cook and eat lunch together (see Photo 9) and a guest room that can be rented for residents' guests. The laundry is located on the third floor, just beside the shared rooftop terrace (see Photo 10). Moreover, all outdoor spaces are shared. On the ground floor, there are three live-in ateliers located along the street and five row houses with five and a half rooms at the interior of the site. On the upper floors, there are 12 flats with 2.5 to 4.5 rooms. The cooperative members sign a commitment to live car-free, and it is also part of the cooperative's statutes.

Owner/developer	Genossenschaft FAB-A (housing cooperative)
Number of dwellings	20
Type of residents	Cooperative members (renters)
Year of completion	2014
Regulation of car-freeness	Renters sign a commitment to not own or keep motorised vehicles, and it is part of the cooperative's statutes. Justified exceptions are detailed in the renting regulations.
Number of car parking spaces	0
Carsharing	0 in the development, 1 car within 300m
Car parking spaces/dwelling	0
Number of bicycle parking spaces	100 (in a particular bicycle parking building)
Public transport	Bus stop at 200m (4 buses/hour), train station at 500m
Amenities	Common room, rooftop terrace, laundry, guest room
Building standard	Minergie-P
Particularities	Participation of the future residents in planning and construction, self-administration

Table 17: Characteristics of FAB-A

Map 4: Map of FAB-A

Photo 7: FAB-A building with guest room and row houses within the development

Photo 8: FAB-A seen from the outside, with live-in studios on the ground floor

Photo 9: Common room with a kitchen on the ground floor in FAB-A

Photo 10: Common rooftop terrace with laundry (in the back) in FAB-A

FAB-A is an infill development located in the city centre of the bilingual city of Biel/Bienne (see Map 5). There is no car parking in the development. One carsharing car is located at 300 metres and three sites with five cars within a radius of 500m. In the courtyard, there is a wooden building with 100 bicycle parking spaces (see Photo 11). The city centre with many traffic-calmed streets is rather well adapted for cycling. FAB-A is at only 500 metres from Biel/Bienne train station, and different bus stops are situated at less than 200 metres. The city centre of Biel/Bienne with a large offer of shops and services is at a distance of 300 to 500 metres as well as all types of schools. For recreation, the lake and the forest on the hillside next to the city can be reached in less than one kilometre.

Map 5: Location of FAB-A (Source of map background: Open Street Map)
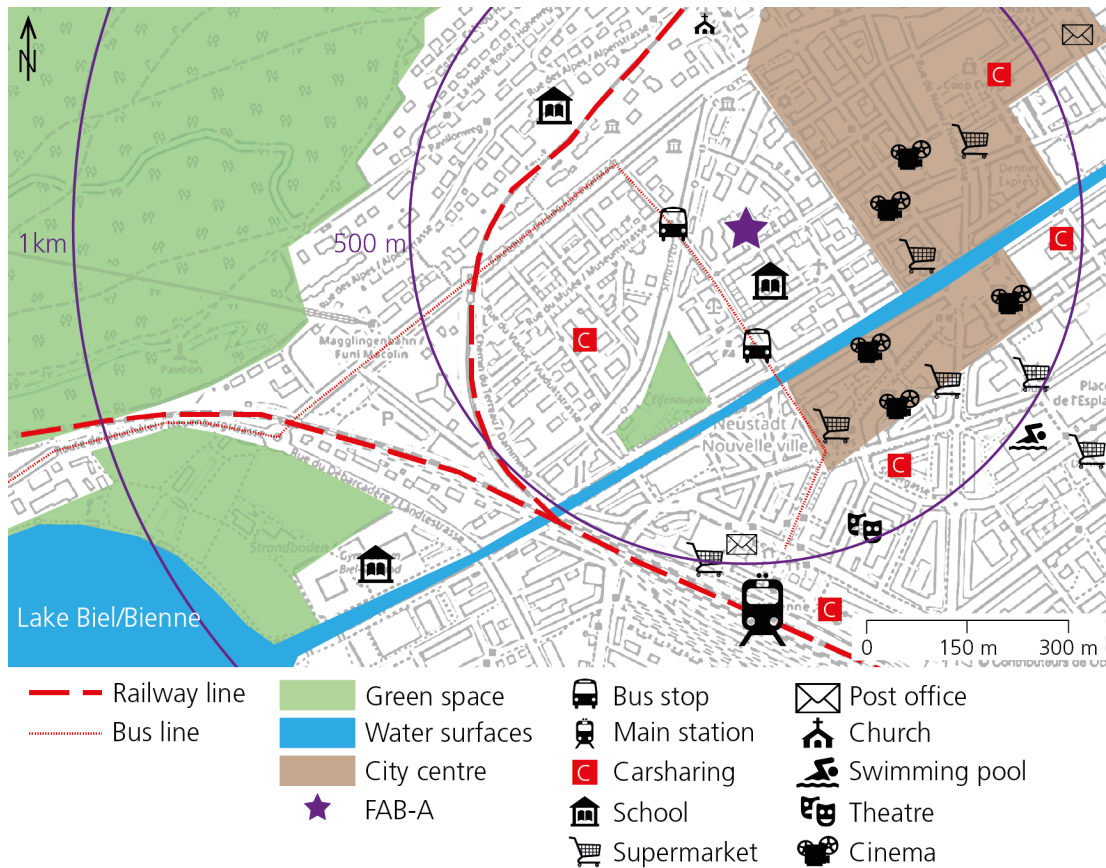
Photo 11: Bicycle parking building in FAB-A

5.1.3. Giesserei, Winterthur

Giesserei is a multi-generational house ("Mehrgenerationenhaus") developed by a group of future residents under the umbrella of the cooperative Gesewo in Winterthur (6th city of Switzerland), twenty kilometres northeast of Zurich. At completion in 2013, it was the largest timber construction in Switzerland and achieved Minergie-P-ECO standard. The 150 flats with one to nine rooms are arranged in a five-storey rectangular building around an inner courtyard with a calm area, a playground and a meeting place with tables and chairs (see Photo 12 and Map 6). The ground floor was planned mainly for cultural and commercial uses and includes the district library, a restaurant (see Photo 13), a bicycle shop, a nursery as well as surgeries, institutions for disabled people and studios. The development is self-administrated, every adult resident is supposed to work 33 hours a year for the community. There are numerous community facilities: an info desk (administration room), a big hall with a stage (180 places with concert seating), a common room with a kitchen for about 20 to 30 persons, a common room with a rooftop terrace, guest rooms (with two to three beds available for residents' guests), workshops and exercise rooms as well as "wash bars"—laundries configured as meeting places for other activities than only washing (see Photo 14). Giesserei is a car-reduced development. There is a mobility concept, but the residents do not sign any commitment. At the moment, the parking with 31 spaces for residents is sufficient, the cooperative administration makes sure to attract enough car-free residents.

Owner/developer	Wohnbaugenossenschaft Gesewo (housing cooperative)
Number of dwellings	145
Type of residents	Cooperative members (renters)
Year of completion	2013
Regulation of car-freeness	No formal regulation (car-reduced development)
Number of car parking spaces	31 for residents, 18 for visitors
Carsharing	1 car in the development, 2 within 200m
Car parking spaces/dwelling	0.32
Number of bicycle parking spaces	480 (390 in the basement accessible by a drivable ramp, 90 at the entrances)
Public transport	Bus stop at 200m (4 buses/hour), S-Bahn stations at 400m and 600m
Amenities	Internal: info desk, big hall with stage, common room with kitchen, common room with rooftop terrace, guest rooms, workshops, exercise rooms, wash bars (laundries and meeting places), playground; Public: restaurant, district library, bicycle shop, nursery, surgeries, institutions for disabled people, studios
Building standard	Minergie-P-ECO
Particularities	Car-reduced, self-administrated, developed by a group of future residents as a multi-generational house

Table 18: Characteristics of Giesserei

Photo 12: Inner courtyard of Giesserei

Photo 13: Restaurant "Ida-Beiz" in Giesserei

Photo 14: "Wash bar" in Giesserei

Photo 15: Giesserei seen from the Eulachpark

Map 6: Map of Giesserei (Source of map background: Open Street Map)

Legend:
- Foot / bicycle path
- Road (limited to 20 km/h)
- Access to underground bicycle parking
- Bicycle parking
- Access to underground car parking
- Carsharing
- Green space
- Playground
- Bicycle shop
- Nursery
- Restaurant
- Library
- Studios
- Surgeries

0   25 m   50 m

The development is located in a former industrial area[40], at the outskirts of the city in Winterthur-Hegi, about three kilometres from the city centre (see Map 7). It is surrounded by a new district park (Eulachpark, see Photo 15), a new-build public school and other new-build housing developments. In the underground car park, there are 31 places for residents and 18 for visitors as well as one Mobility carsharing car. Two more carsharing cars are situated at a distance of 200m. Furthermore, many privately owned cars are also shared. At every staircase, there is a "mobility room" for bicycle trailers, children's two-wheelers or pushchairs. For bicycles, there are 390 parking places in the basement of the building, accessible by a drivable ramp, including delimited parking spaces that can be rented (see Photo 16), and another 90 places at the entrances of the building. Winterthur is perceived as a cycling city, the main station can be reached by bike in ten minutes on calm streets, separated from traffic. A bus stop is located at about 200 metres from Giesserei, but it is served by only one line running every 15 minutes and taking 15 minutes to reach Winterthur main station. Two S-Bahn railway stations are at a distance of 400 metres (Hegi) and 600 metres (Oberwinterthur). Finally, the nearest shops and supermarkets are at a distance of 500 metres. The next recreation area, except the park beside the development, is a forest at a bit more than half a kilometre away.
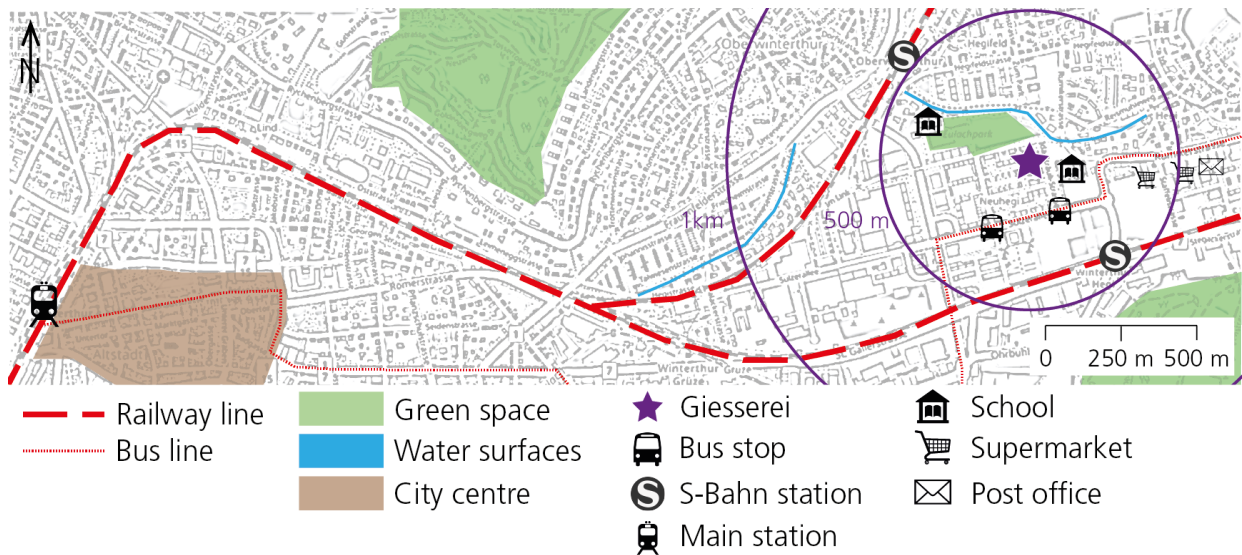
Map 7: Location of Giesserei (Source of map background: Open Street Map)

Photo 16: Underground bicycle parking and drivable access ramp in Giesserei

Photo 17: Bicycle parking spaces that can be rented in Giesserei

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[40] The name "Giesserei" means foundry and remembers the former industrial activity of the company Sulzer located on this site before.

5.1.4. Oberfeld, Ostermundigen/Bern

The development of Oberfeld is located in Ostermundigen, a suburban municipality of 18,000 inhabitants, east of the city of Bern. It was completed in 2014 after a long period of planning by a housing cooperative (Wohnbaugenossenschaft Oberfeld) created with the intention to build a car-free housing development in the urban area of Bern. The 100 flats with 1.5 to 5.5 rooms are situated in three ecological timber constructions, certified Minergie-P, with three floors (see Photo 18, Photo 19 and Map 8). All residents are cooperative members, some are renters while others own their dwelling. There are numerous community facilities: a workshop, a bicycle workshop, a common room with a kitchen on the ground floor (see Photo 20), a common room that can be used as a guest room with a rooftop terrace (called "skylounge"), a sauna, a community garden (see Photo 21) as well as laundries on the ground floor designed as social meeting points. Moreover, there is a small organic grocery store in the development and on Friday evening, similar to Burgunder, there is a market stand from an organic farmer. Oberfeld is self-administrated, different working groups organise specific common activities and facilities. There is also a "children's council" where the children discuss and decide topics relevant for them. The regulations of the cooperative include the car-freeness, residents are not allowed to park a motor vehicle more than two nights per month within the development and in a perimeter of 500m around it.

Owner/developer	Wohnbaugenossenschaft Oberfeld (housing cooperative)
Number of dwellings	94
Type of residents	Cooperative members (renters and owners)
Year of completion	2014
Regulation of car-freeness	Cooperative regulations include that residents are not allowed to park a motor vehicle more than two nights per month in a perimeter of 500m around the development.
Number of car parking spaces	9
Carsharing	1 car in the development, 3 within 400m
Car parking spaces/dwelling	0.1
Number of bicycle parking spaces	approx. 500 (300 in the basement, easily accessible without ramps, 200 covered at the building entrances)
Public transport	Bus stop at 200m (4–20 buses per hour)
Amenities	Workshop, bicycle workshop, common room with kitchen, common room/guest room with rooftop terrace, sauna, community garden, laundries, playgrounds, organic grocery shop, market stand from an organic farmer once a week
Building standard	Minergie-P
Particularities	Self-administrated, participation of future residents in the planning process

Table 19: Characteristics of Oberfeld

Photo 18: View of the eastern part of Oberfeld

Photo 19: View of Oberfeld from the south

Photo 20: Common room with a kitchen and terrace in Oberfeld

Photo 21: Community garden and sauna (at the back) in Oberfeld

Map 8: Map of Oberfeld (Source of map background: Open Street Map)

The cooperative is located at a distance of 4.5km from the city centre of Bern (see Map 9). It is part of a larger new-build residential area located at the outskirts of Ostermundigen with older neighbourhoods to the north and south and just beside a forest on a hill (see Map 10). Ten car parking spaces are available for visitors, including one for a Mobility carsharing car. Three other cars are available at two carsharing sites within 400m from Oberfeld. In the development, there are two bicycle parkings for about 300 bicycles in the basement of the U-shaped building (see Photo 22) and there are about 200 covered bicycle parking spaces at every house entrance (see Photo 23). The city centre of Bern can be reached by bicycle on more or less adapted bicycle lanes and paths after a ride of about 6 km, including some altitude differences (Oberfeld ist located about 30 metres higher). As for public transport, a bus stop is located at 200m with a bus line running every three minutes during peak hours and at least every 10–15 minutes. It takes 18 minutes to reach Bern central station. Within a radius of 300 metres, several shops (including two supermarkets) and services are accessible as well as different schools. A forest (Ostermundigenberg) ist located at about 300 metres, too.
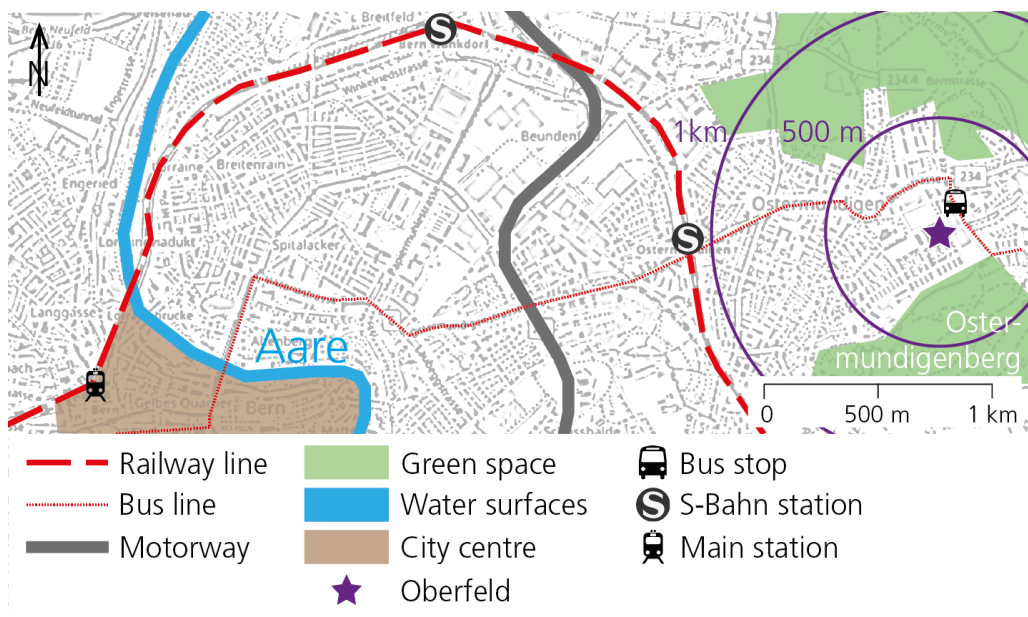
Map 9: Location of Oberfeld within the city region (Source of map background: Open Street Map)

Map 10: Location of Oberfeld (Source of map background: Open Street Map)

Photo 22: Underground bicycle parking in Oberfeld

Photo 23: Bicycle parking at a house entrance in Oberfeld

5.1.5. Sihlbogen, Zurich-Leimbach

The first residents moved to Sihlbogen in 2013. The building cooperative Zurlinden (which is, unlike housing cooperatives, renting flats to everyone, but not profit-oriented) developed 220 flats including a car-free part with 140 rented dwellings of one, 3.5 or 4.5 rooms in two six-storey buildings (see Photo 24 and Map 11). It was built following the standards of "2000-Watt Society". Except the outdoor spaces (without any facility but a playground, see Photo 25), there are no common spaces, every dwelling even has its washing machine and dryer. This absence highlights the different character of Sihlbogen compared to the other developments where community plays an important role. Nonetheless, the construction cooperative developed a smartphone app for residents to communicate and there is a (private) Facebook group for the same purpose. A supermarket, a bakery, a post office, a nursery and a medical practice are present in the newer part of the development where cars are allowed. As in other developments, renters sign an appendix to their lease, to certify they do not park a motor vehicle in the development or a perimeter of 300m around it. In return, they get every year public transport vouchers of a value of 800 CHF (corresponding to the price of an annual regional public transport pass).

Owner/developer	Baugenossenschaft Zurlinden (building cooperative)
Number of dwellings	140 (220 including the adjacent and more recent building where parking is available for residents)
Type of residents	Renters
Year of completion	2013
Regulation of car-freeness	Appendix to the lease stating that no car can be parked within the development or a perimeter of 300m around it.
Number of car parking spaces	64 for visitors and residents of the adjacent part
Carsharing	2 cars in the development + 1 electric car for residents
Car parking spaces/dwelling	0.29 (including the non-car-free dwellings)
Number of bicycle parking spaces	400 (partly in closed rooms, partly uncovered outside)
Public transport	S-Bahn station just besides (3–6 trains/hour)
Amenities	Supermarket, bakery, post office, nursery, surgery, playground
Building standard	2000-Watt Site
Particularities	Public transport vouchers CHF 800 CHF / year in return to certify car-freeness; "MySihlbogen" smartphone app (communication between neighbours, only for residents)

Table 20: Characteristics of Sihlbogen

Photo 24: The two buildings of Sihlbogen

Photo 25: Playground between the buildings and the river Sihl
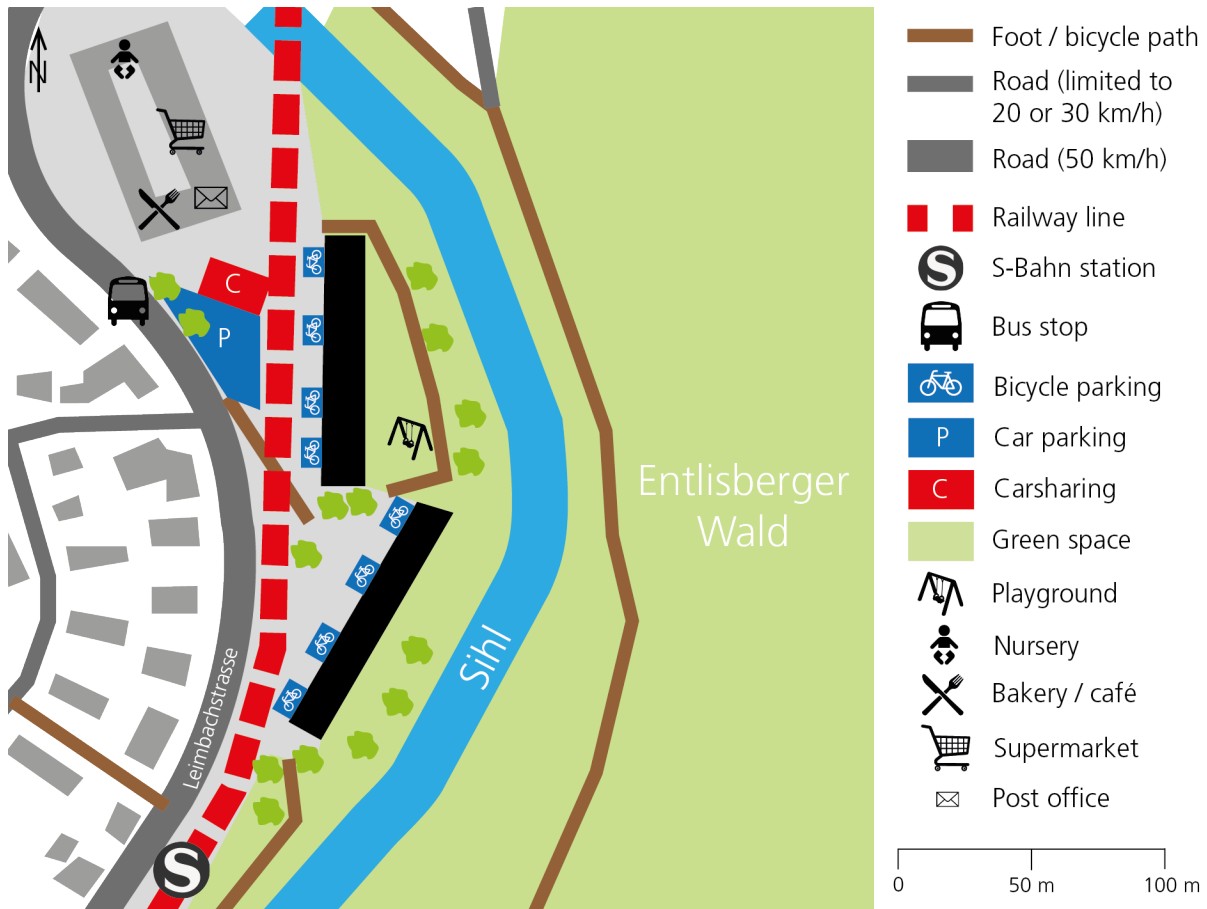
Map 11: Map of Sihlbogen (Source of map background: Open Street Map)

Sihlbogen is located at the outskirts of Zurich in the district of Leimbach, at about 4.5km from the city centre, in a loop of the river Sihl (see Map 12). While there is no parking for residents of the car-free part, 64 parking spaces are available for visitors and the residents of the other 80 flats. There are two Mobility carsharing cars in the development, and an electric car rented to the residents by the building cooperative. About 400 bicycle parking spaces are available, partly in closed rooms inside the buildings, partly uncovered in front of the entrances (see Photo 26). The city centre can be reached by a bike path at the beginning but in the centre, the infrastructure is less developed. An S-Bahn railway separate the car-free and the other part of the development (see Photo 27). The next station (Leimbach) is just besides, trains run every 10 or 20 minutes to Zurich's main station which is 12 minutes away. A bus stop is also in front of the development, connecting the development to a tram line to the city centre. Besides the shops and services in

the development, three train stops away there is a big shopping and leisure centre (Sihlcity). Schools are located within 400 metres from the development and a recreation area including the river Sihl and a forest (Entlisberger Wald) lies just beside the development.
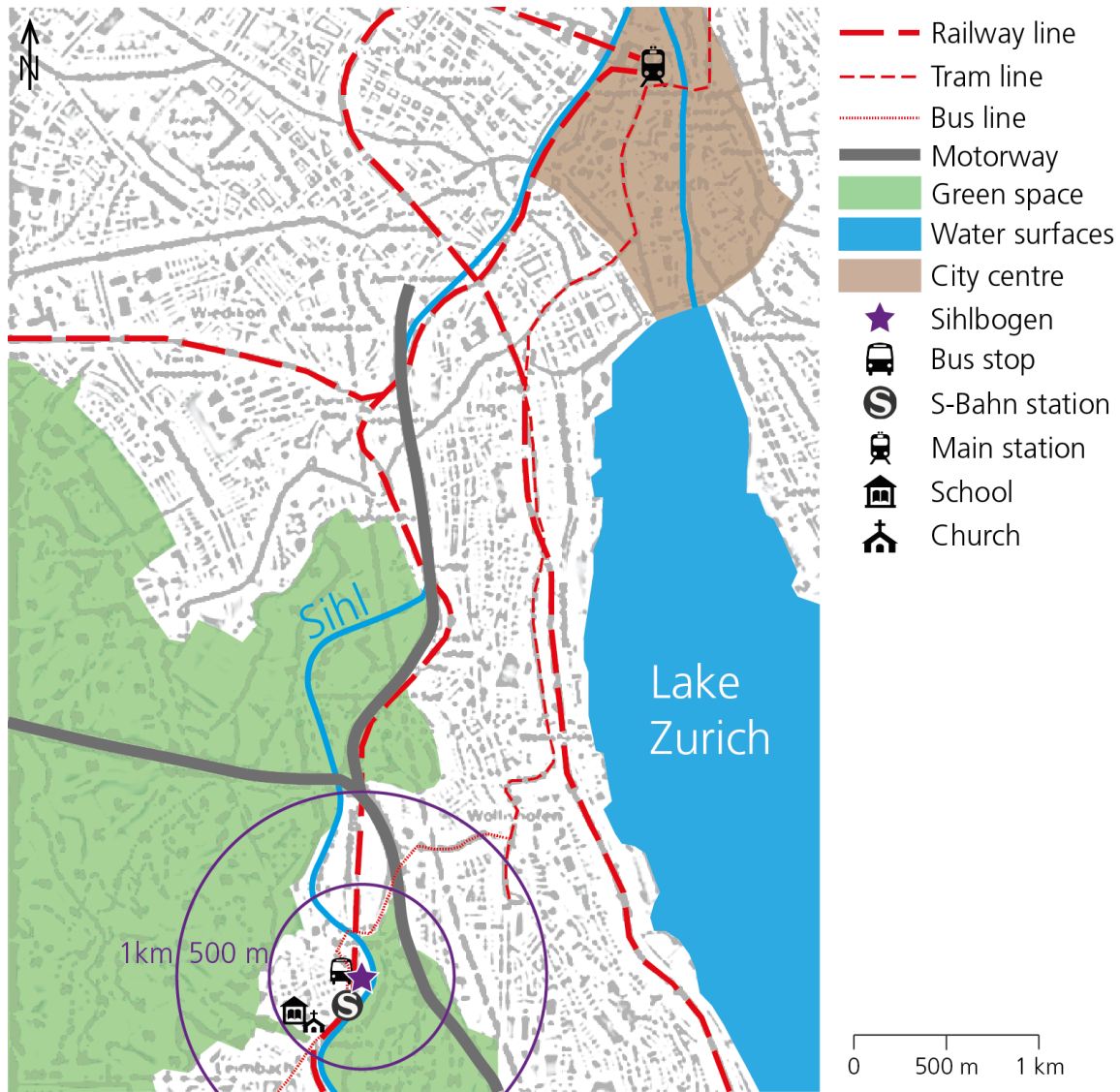
Map 12: Location of Sihlbogen (Source of map background: Open Street Map)

Photo 26: Bicycle parking spaces in front of the entrances in Sihlbogen

Photo 27: Subway between the car-free part of Sihlbogen and the shopping area

5.2. German case studies[41]

5.2.1. Klein Borstel, Hamburg-Ohlsdorf

The car-free housing development Klein Borstel exists since 2008. It was planned and developed as a "housing project" ("Wohnprojekt") by a group of future residents and supported by the municipality of Hamburg's strategy to encourage cooperative projects. There are two parts: 30 dwellings (row houses and flats) of a community of individual owners (see Photo 28 and Photo 29) and 32 subsidised rented row houses and flats of an existing housing cooperative (Wohnungsverein Hamburg von 1902 eG, see Photo 30 and Photo 31). The three-storey buildings are passive houses and built around a green community courtyard with playgrounds (see Map 13). Today, the renters are organised in an association within the cooperative, with self-administration rights, and the owner community is self-administrated, too. They form one development together, sharing community facilities such as a common room with a kitchen where different activities take place (e.g. yoga lessons) and where guests can sleep. Furthermore, there is a bicycle workshop but also an online project blog to communicate, for example, events. The residents also created a food cooperative—they get every week a delivery from an organic farm and every month from an organic wholesaler. The owners as well as the renters committed to live car-free, but today, in Hamburg there is no regulation anymore to provide parking when constructing housing.

Owner/developer	Wohnungsverein Hamburg von 1902 eG (housing cooperative) and individual owners organised as a co-housing project
Number of dwellings	62
Type of residents	Owners (30 dwellings); cooperative members (32)
Year of completion	2008
Regulation of car-freeness	Commitment to car-free living
Number of car parking spaces	2
Carsharing	1 car in the development (Greenwheels)
Car parking spaces/dwelling	0.05
Bicycle parking	Four bicycle sheds, uncovered bicycle parking spaces in front of most buildings
Public transport	S-Bahn station at 350m (3 to 12 trains/hour)
Amenities	Common room with kitchen (also used as a guest room), bicycle workshop, organic food cooperative, project blog, community garden, playgrounds, shared cargo bike and bicycle trailer
Building standard	Passivhaus
Particularities	Developed by future residents, self-administrated

Table 21: Characteristics of Klein Borstel

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[41] The descriptions of the German case studies are based on my visits and discussions in the developments as well as the mentioned literature.
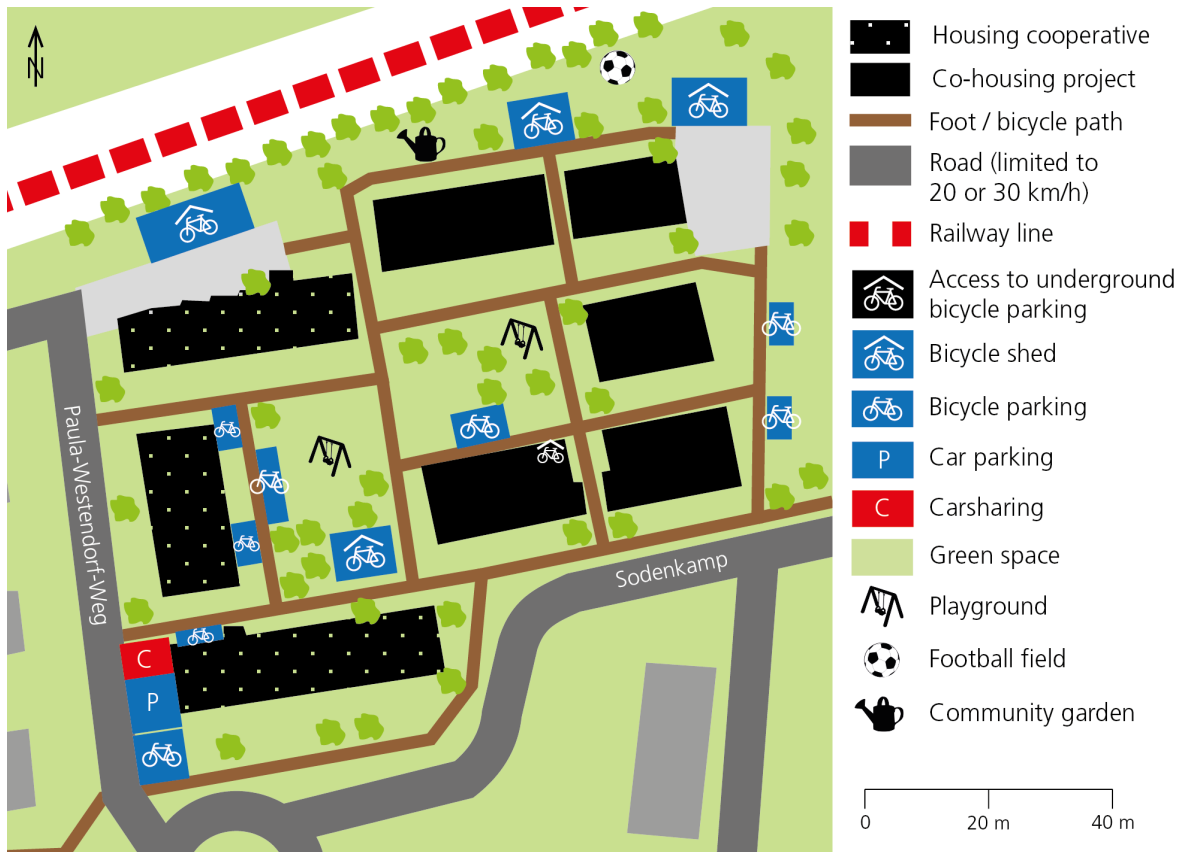
Map 13: Map of Klein Borstel

The map legend:
- Housing cooperative
- Co-housing project
- Foot / bicycle path
- Road (limited to 20 or 30 km/h)
- Railway line
- Access to underground bicycle parking
- Bicycle shed
- Bicycle parking
- P Car parking
- C Carsharing
- Green space
- Playground
- Football field
- Community garden

Paula-Westendorf-Weg

Sodenkamp

0   20 m   40 m

Photo 28: Owner part of Klein Borstel

Photo 29: Owner part of Klein Borstel seen from the outside of the development

Photo 30: Cooperative part of Klein Borstel

Photo 31: Row houses with flats on top in the cooperative part of Klein Borstel

Klein Borstel is located in the suburban part of the district of Hamburg-Nord, at about 10 km as the crow flies from the city centre (see Map 14 and Map 15). It is part of a larger new-build residential area between the old centre (or village, as it is called) of Klein Borstel and the Ohlsdorf cemetery, the biggest garden cemetery in the world with its 389 hectares ('Ohlsdorf', 2018).

The development is completely car-free, there is only a parking space for a carsharing car (Greenwheels) and two for visitors. There is more visitor parking in the street between the car-free development and the adjacent cooperative housing project. There are four bicycle sheds in the development and also uncovered bicycle parking spaces in front of most buildings (see Photo 32 and Photo 33). A cargo bike and a bicycle trailer can be used by all residents, other two-wheelers are shared informally. There is a comparatively extended cycling network and some rather good and separated bicycle lanes or even paths to reach the centre of Hamburg (the main station is located at about 11 km) or other districts. The S-Bahn station "Kornweg (Klein Borstel)" is located at 350 metres on foot, trains run every 5 to 10 minutes (20 minutes at night during the weekend) and it takes 25 minutes to reach Hamburg main station and the city centre. Around the station, in the centre of Klein Borstel, there are different shops and services such as a small supermarket, a bakery, a bookstore, a restaurant or a post office. A nursery is located at a distance of 200m and an elementary school at 500m from the development. Besides the garden cemetery in the south, there is also the recreation area and natural reserve of Alstertal at about 500m north of Klein Borstel.
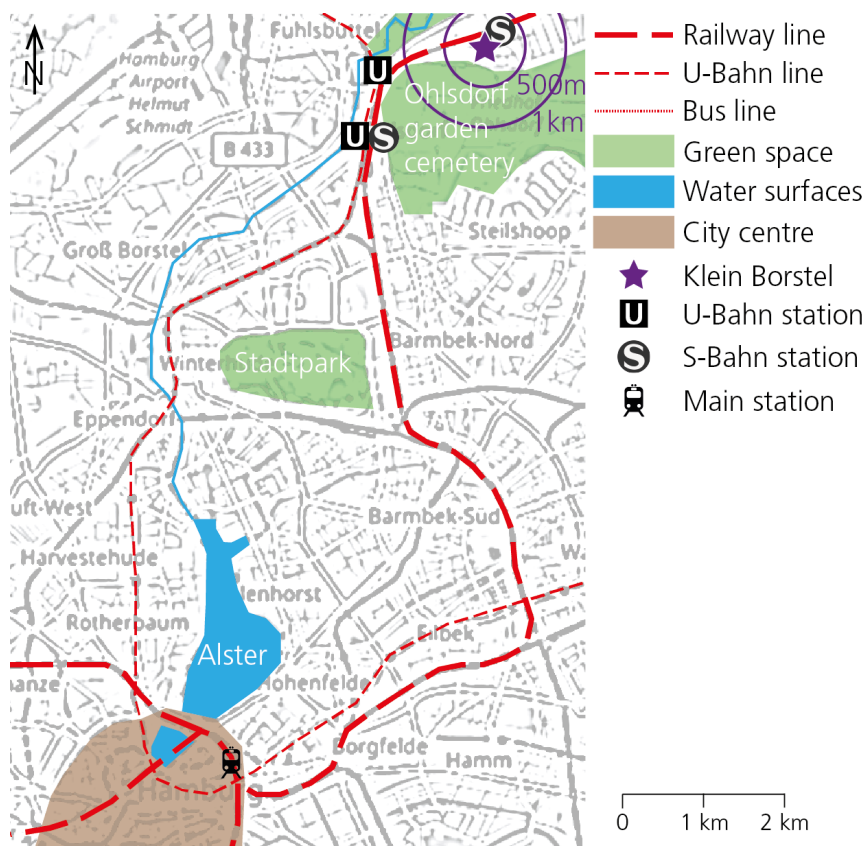
Map 14: Location of Klein Borstel within Hamburg (Source of map background: Open Street Map)
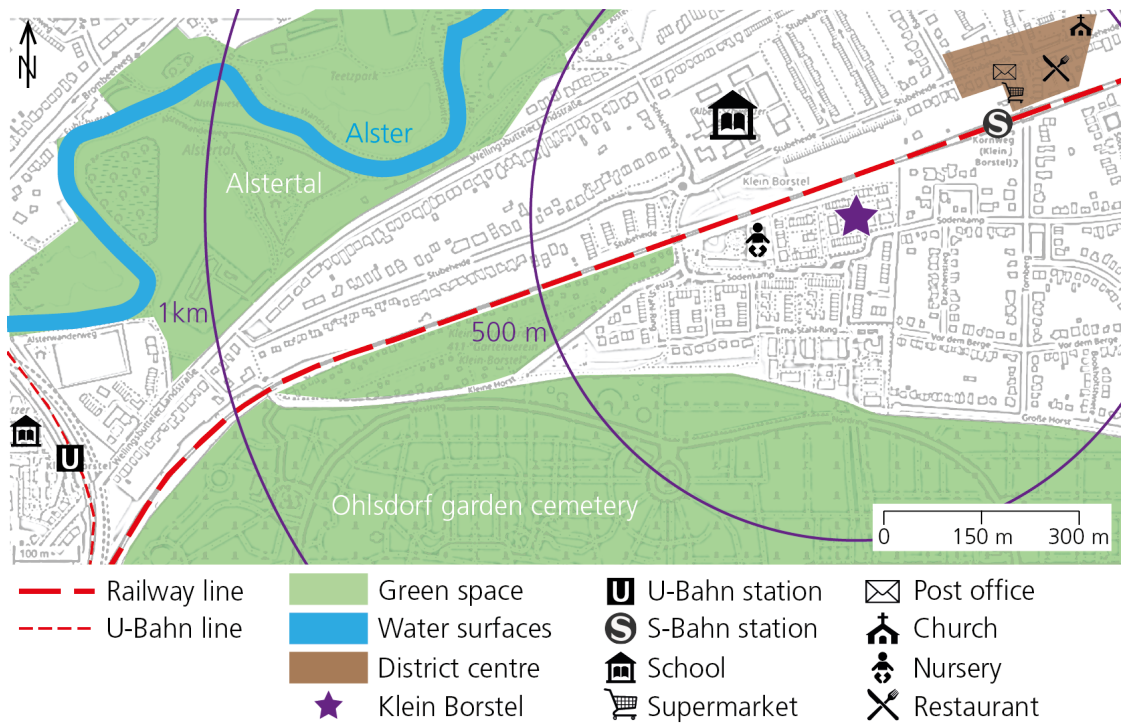
Map 15: Location of Klein Borstel (Source of map background: Open Street Map)

Photo 32: Bicycle shed and uncovered parking in the owner part of Klein Borstel

Photo 33: Bicycle shed (in the back) and uncovered parking in the cooperative part of Klein Borstel

5.2.2. Saarlandstraße, Hamburg-Barmbek

Saarlandstraße is one of the oldest car-free housing developments. The first residents arrived in 2000 and the last construction phase was completed in 2009. The development built on a brown-field site comprises three different parts, each composed of an L-shaped building and a "point building" (see Map 16). At the origin of the development, there was an association called "Autofreies Wohnen" ("car-free housing") that wanted to build such a housing project in Hamburg. There was also a political will at the end of the 1990s to develop car-free housing. After a long period of planning, this finally led to the first part of Saarlandstraße where the future residents intensively participated in the planning process. The two oldest units in the south of the development are a housing cooperative (WEG Autofreies Wohnen, see Photo 34) composed of an owner community (Eigentümergemeinschaft Barmbeker Stich) and a housing cooperative (Wohnwarft Genossenschaft für autofreies Wohnen). The latter is a particular type of public subsidised housing: residents need to have a "Wohnberechtigungsschein", a certificate of eligibility to rent subsidised dwellings. At the same time, they need to pay cooperative shares of €200 per square metre,

which restricts potential residents, but has never been a problem thus far. In the middle of the site, there is an L-shaped building with subsidised rental housing (of the municipal housing company SAGA-GWG) and a square building with flats for people with disabilities (Leben mit Behinderung (LmB), see Photo 35). The most recent part of the development (see Photo 37) opened in 2009 and also includes a part with a housing community for disabled people. It is a "housing project" ("Wohnprojekt") called "Am Eisenwerk" developed by future residents, within a larger housing cooperative (Fluwog).

In all three parts, formal obligations and commitments regulate that residents are not allowed to own and drive a car. The cooperative projects are self-administrated and low-energy houses, and in both there is a common room. The older housing project has two shared rooftop terraces. The outdoor areas are all shared, there are different playgrounds and many wild rabbits live in the area. Furthermore, there is a landing stage and a boat cellar in the southernmost part of the development. There is no formal collaboration between the different parts, but an informal association together with the surrounding (conventional) new-build housing developments, organising some events such as a flea market.

Owner/developer	Wohnwarft Genossenschaft für autofreies Wohnen and Fluwog (housing cooperatives); Eigentümergemeinschaft Barmbeker Stich (individual owners' community) and SAGA-GWG (municipal housing company)
Number of dwellings	141 (+29 for disabled people, not included in my study)
Type of residents	Renters (48 dwellings); owners (18); cooperative members (75)
Year of completion	2000/2009
Regulation of car-freeness	Residents sign formal obligations and commitments not to own and drive a car
Number of car parking spaces	27 for visitors
Carsharing	2 cars in the development, 1 within 300m (Cambio) and in the "home area" of the two free-floating carsharing providers (DriveNow and car2go)
Car parking spaces/dwelling	0.15
Bicycle parking	Bicycle sheds in front of the houses, underground bicycle parkings, most accessible by drivable ramps
Public transport	U-Bahn station at 400m (3 to 12 trains/hour)
Amenities	Common rooms in the two cooperative housings, shared rooftop terraces and boat cellar in the oldest cooperative, playgrounds, landing stage at the canal
Building standard	Low-energy houses
Particularities	Self-administrated and developed by future residents (except the part with the renters housing); two housing communities for disabled people; partly subsidised housing (Wohnwarft housing cooperative and SAGA-GWG)

Table 22: Characteristics of Saarlandstraße

Map 16: Map of Saarlandstraße

Legend:
- Foot / bicycle path
- Road (limited to 30 km/h)
- Road (50 km/h)
- Bus stop
- Access to underground bicycle parking
- Bicycle shed
- Bicycle parking
- P Car parking
- C Carsharing
- Green space
- Playground
- Football field

Scale: 0 — 50 m — 100 m

Map labels: Wiesendamm, Saarlandstraße, Barmbeker Stichkanal, Osterbekkanal, C, LmB, Fluwog, P, SAGA, LmB, P, WEG

Photo 34: Oldest part of Saarlandstraße

Photo 35: Rental buildings in Saarlandstraße

Photo 37: Most recent part of Saarlandstraße

Photo 36: Canals around the car-free housing in Saarlandstraße

The development is located in Barmbek in the south of the district of Hamburg-Nord, about 4 km as the crow flies from the city centre (see Map 17). It is surrounded by canals on the east and south (see Photo 37:), in the north and west there are other buildings protecting the development from the noise and air pollution of two large and busy roads (Saarlandstraße and Wiesendamm).

There are altogether 27 parking spaces for visitors and craftspeople or care services at two sites, at the north and the west of the development. Two carsharing cars are available at the northern car parking, one car at about 300 metres and the development lies within the "home areas" of the two free-floating carsharing providers present in Hamburg (DriveNow and car2go)[42]. Two "Stadt-RAD" bikesharing stations are located within a radius of 300 metres. Bicycle parking in the car-free housing is well developed. In the middle part, there are 24 bicycle sheds in front of the houses (see Photo 38) and bicycle cellars in every house. In the two housing projects, there are also bicycle sheds and underground bicycle parkings, easily accessible by drivable ramps (see Photo 39). A rather developed network of bike lanes and paths are available to reach the city centre (Hamburg main station is located at 5.5km) and the surrounding districts. The next U-Bahn station (Saarlandstraße) is at a distance of about 400m, and 20 minutes away from Hamburg's main station, trains run every 5 minutes during the day and every 20 minutes on weekends' nights. Bus stops are just around the corner and the S- and U-Bahn station of Barmbek, an important junction, is at 600m. A supermarket and three bakeries are located within a radius of 200m, different other shops and services as well as schools and nurseries are within 600m to 1 km. Besides the canals around the site, the next recreation area, the municipal park (Stadtpark) is situated at less than 500 metres, just behind Saarlandstraße station.
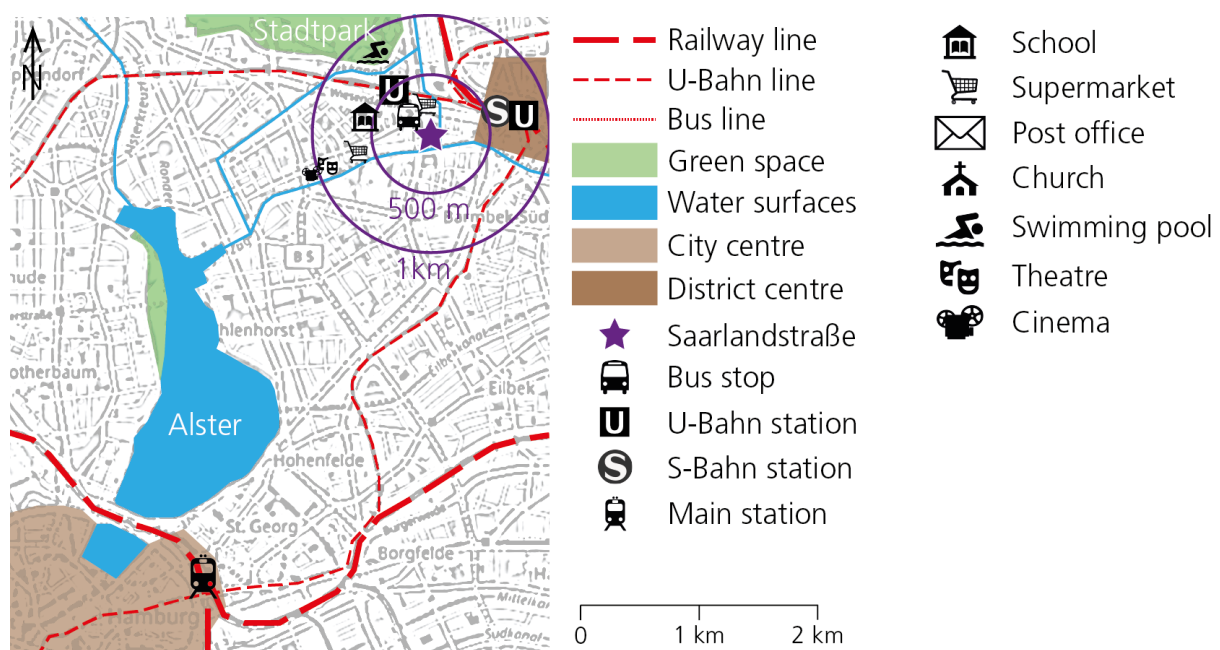
Map 17: Location of Saarlandstraße (Source of map background: Open Street Map)

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[42] Compared to "conventional" carsharing, where cars have to be returned to the place they were taken, freefloating carsharing allows to park a car anywhere within a certain "home area" in the city.

Photo 38: Bicycle sheds

Photo 39: Drivable ramp to bicycle parking

5.2.3. Stellwerk60, Cologne-Nippes

Stellwerk60 in Cologne is the biggest housing development studied in this thesis with 426 dwellings, including 79 row houses. They were built on a former railway repair centre and completed between 2006 and 2013 after a long planning process. In 1994, an association aiming at constructing a car-free housing development was founded and in 1998 the city council decided to build a new neighbourhood including a car-free development on this railway brownfield in the district of Nippes. It was realised by a conventional private developer from the Netherlands (BPD, formerly named Kontrola and Bouwfonds) and then sold to different private and public owners (details see Table 23).

Owner/developer	AXA (stock company; 160–180dwellings); VBL (federal investment; 60), GAG (municipal building society; 80–90), individual owners (rest)/developed by BPD (formerly named Kontrola and Bouwfonds; property development company)
Number of dwellings	426 (including 79 row houses)
Type of residents	Renters (80%); owners (20%)
Year of completion	2006 to 2013
Regulation of car-freeness	Residents have to buy an on-site parking space or sign to live car-free
Number of car parking spaces	80 for residents
Carsharing	20 cars on two sites in the development (Cambio)
Car parking spaces/dwelling	0.23
Bicycle parking	Bicycle sheds for row houses, underground bicycle parkings accessible by drivable ramps in the other buildings, uncovered bicycle racks at the entrances
Public transport	3 U- or S-Bahn stations at 600m (4–16 trains/hour)
Amenities	"Mobility station" (rental of different non-motorised vehicles, for children and to transport heavy items inside the development), public bicycle pump, common room with kitchen, community garden, site trailer for teenagers, playgrounds, small grocery shop and kiosk, nursery
Building standard	Low-energy standard, one solar passive house
Particularities	Car-reduced development, residents association organising the mobility station e.g.

Table 23: Characteristics of Stellwerk60

The majority of the residents (80%) rent their dwelling, the rest owns it. About 80 dwellings are public subsidised housing and 15 dwellings held by an institution for mentally disabled people. There are eleven buildings with flats and eleven with row houses (see Map 18 and Photo 40 to Photo 44). Private gardens are rather small in order to allow important common outdoor spaces. About half of the residents—most of the owners, but only few renters—are members of the residents' association (called "Nachbarn60"). They manage the mobility station (details see below) where also party accessories such as ale benches can be rented. They organise different other amenities for the residents such as a common room ("Kaffee-Kessel") where different types of cafés are regularly organised, an urban gardening site next to the car parking, a site trailer for teenagers and a yearly flea market together with neighbouring developments. There is also a small grocery shop and kiosk (see Photo 45) in the development and a nursery.

Stellwerk60 is car-reduced, there are 80 parking spaces, i.e. providing parking for 18% of the dwellings. Residents must buy a space in the centralised parking built in the south of the site (costing about €20,000) or confirm with their signature to live car-free. At the moment of the realisation of this thesis, some problems regarding car ownership appeared: the city's control showed that too many households own a car, and probably park in the surrounding neighbourhoods, even if a residential parking permit zone (inaccessible for car-free housing residents) was established there. The problem is that in the beginning, the private developer and owners sold or rented dwellings without specially looking for car-free households. Thus, too many car-owning households moved to the development. Today, Stellwerk60 is well-known in Cologne and many car-free households willing to live there are waiting to move in.

Photo 40: Different types of buildings in Stellwerk60

Photo 41: Solar row houses in Stellwerk60

Photo 42: Row houses in Stellwerk60

Photo 43: Four-storey flat buildings beside a playground in the centre of Stellwerk60

Photo 44: Four-storey flat buildings on the main "road" of Stellwerk60

Photo 45: Grocery shop and kiosk in Stellwerk60

Legend:
- Buildings with flats
- Row houses
- Foot / bicycle path
- Road (limited to 30 km/h)
- Road (50 km/h)
- Railway line
- Bus stop
- Access to underground bicycle parking
- Bicycle shed
- Bicycle parking
- P Car parking
- C Carsharing
- Green space
- Playground
- Nursery
- Kiosk / shop
- Community garden

0   50 m   100 m

Map 18: Map of Stellwerk60

Stellwerk60 is located at about 2.5 kilometres north of the city centre, at the western edge of the district of Nippes (see Map 19). The site is surrounded by a railway line in the west, other new-build housing developments in the north and south and an older residential neighbourhood in the east.

A three-storey car parking for residents and visitor parking is located at the southwest corner of Stellwerk60. It includes also one of two carsharing sites, the other is located at the northern entrance of the development. Altogether, there are 20 cars of the provider Cambio. Stellwerk60 is also located within the "home areas" of both free-floating carsharing providers available in Cologne (DriveNow and car2go) as well as of the two free-floating bikesharing systems present in the city (KVB-Rad and FordPass, formerly named "Call a bike").

The roads and ways within the development are all reserved for pedestrians and cyclists and can only be accessed occasionally with a special permit delivered by the municipality. Therefore, the residents' association manages a "mobility station" that rents, besides different vehicles mainly for children, handcarts and other vehicles to transport heavy things from the entrance of the development to the dwellings (see Photo 46). Bicycle parking in Stellwerk60 is exemplary, it was even nominated for "The German bicycle price (Der Deutsche Fahrradpreis)" in 2013: all row houses have a bicycle shed, the other buildings underground parking, easily accessible by drivable ramps (see Photo 47) and every dwelling has a marked parking space (see Photo 48). In front of all buildings, bicycle racks are available for short-time parking, mostly uncovered but with the possibility to lock bicycles, partly to specially designed bicycle-shaped structures (see Photo 49). Furthermore, a public bicycle pump is available. The bicycle network leading to the district as well as the city centre is variable, but several routes with bike lanes or paths exist and Cologne main station is located at about 3 km.

To access public transport, three S- or U-Bahn stations are at about 600 metres from the development. From the stations of Nippes and Geldernstr./Parkgürtel, two S-Bahn lines allow to reach Cologne main station in four minutes and run every ten minutes during the day and four times per hour in the evening. At the latter station there is also a tangential U-Bahn line. At Florastraße, there are two U-Bahn lines leading to the city centre every three to four minutes during the day and at least every 15 minutes. Finally, there is a bus station (St. Vinzenz-Hospital) nearby the development connecting to Geldernstr./Parkgürtel and Florastraße stations during the day, every 20 minutes on weekdays and every 30 minutes on the weekend. Thus, public transport is not very developed for such a big and car-reduced development, but distances to the centre and the main rail station are short and bicycle infrastructure rather good.

The next bakeries are at 300 metres from the development, the closest supermarket as well as the district centre of Nippes with an important number of shops and services are located at 600m. All types of schools are also present within a radius of 0.5 to 1 km. Larger recreation areas than the small park in the western part of the development are at least 1 km away from Stellwerk60, the Rhine is at about 2 km.

Photo 46: "Mobility station" in Stellwerk60

Photo 47: Drivable ramp to bicycle parking and outdoor bicycle parking space for short-time parking

Photo 48: Bicycle parking with delimited spaces for every dwelling

Photo 49: Bicycle parking in front of the buildings
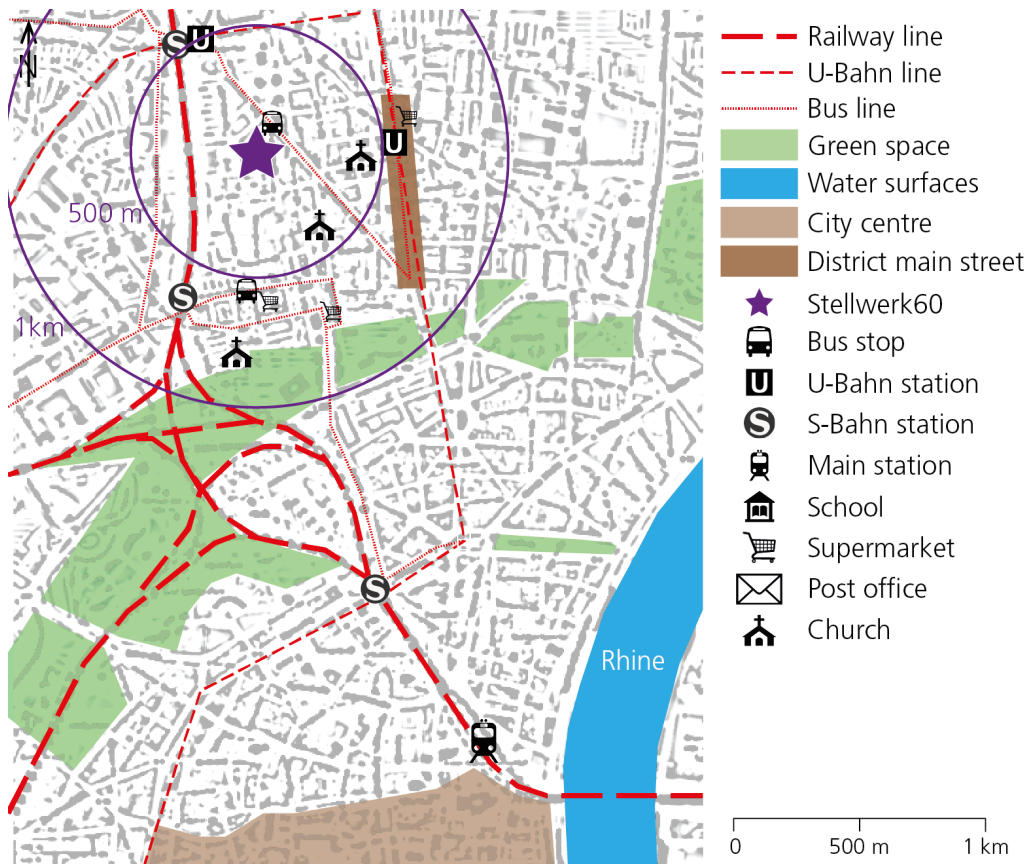
Map 19: Location of Stellwerk60 (Source of map background: Open Street Map)

5.2.4. Weißenburg, Münster (Westphalia)

The "Gartensiedlung (garden development) Weißenburg" in Münster in Westphalia is one of the oldest car-free housing developments. The first residents arrived in 2001 and the second part of the development was completed in 2003. It was built on a former military barracks site and developed by a public housing company (Wohnungsbaugesellschaft Münsterland, today: LEG), based on a decision of a red-green municipal council in place between 1994 and 1999. A group of interested future residents could participate in the development process. It consists of subsidised housing and is accessible only to households holding a "Wohnberechtigungsschein". There are 18 row houses (see Photo 50 and Photo 51) and six buildings with flats of one to five rooms where four other individual houses are integrated (see Map 20 and Photo 52). In 2018, after the survey and interviews had been conducted, four new buildings including 51 flats were finished, they are

non-subsidised rental flats with two to 3.5 rooms. About half of the residents are members of the residents' association which manages a bicycle workshop and the common room named "Geistreich" which can also be rented for parties and where different activities are organised, e.g. a café on Sunday afternoon, film screenings for children or yoga classes. A big playground (see Photo 53) and four small ones are located within the development and a lawn is shared with the neighbouring Johanniter academy and guesthouse.

The car-freeness is regulated in an appendix to the rental contract where residents sign "*not to own a private car*". But a resident sued the housing company and won, the court judged that owning a car cannot be forbidden. Therefore, an arbitration board (Schlichtungsstelle) organised by the residents' association exists which addresses the car-owning households to find solutions, sometimes a household can be allowed to use a car for a short period, but never permanently. This board is also consulted by the housing administration and interviews interested future residents to explain and ensure that only households willing to live car-free move in.

Owner/developer	LEG Immobilien AG (former Wohnungsbaugesellschaft Münsterland GmbH, public housing company)
Number of dwellings	136 (+51 since 2018)
Type of residents	Renters
Year of completion	2001/2003/2018
Regulation of car-freeness	Appendix to the lease including the ban to own a private car (but not legally binding since a court decision)
Number of car parking spaces	27 for visitors
Carsharing	10 cars in the development (Stadtteilauto)
Car parking spaces/dwelling	0.2
Bicycle parking	Uncovered in front of the buildings, in the basement accessible by steep stairs with ramps and heavy doors, shed at the car parking for special bicycles and trailers
Public transport	Bus stop at 200m (2–3 buses/hour)
Amenities	Common room with kitchen, community garden, bicycle workshop, bicycle and trailer rental, playgrounds
Building standard	Low-energy house standard (Niedrigenergiehausstandard)
Particularities	Participation in choice of new residents organised by the residents' association to assure car-freeness, subsidised housing

Table 24: Characteristics of Weißenburg

Photo 50: First part of Weißenburg with row houses on the right and three-storey buildings on the left

Photo 51: Western part of the row houses in Weißenburg

Photo 52: Buildings in the southern part of Weißenburg

Photo 53: Playground in Weißenburg

■	Buildings with flats
▨	Row houses
▦	completed in 2018
—	Foot / bicycle path
—	Road (limited to 30 km/h)
—	Road (50 km/h)
🚌	Bus stop
🚲	Bicycle shed
🚲	Bicycle parking
P	Car parking
C	Carsharing
■	Green space
	Community garden
	Playground
⚽	Football field
✗	Café & bakery
🛒	Supermarket

0   25 m   50 m
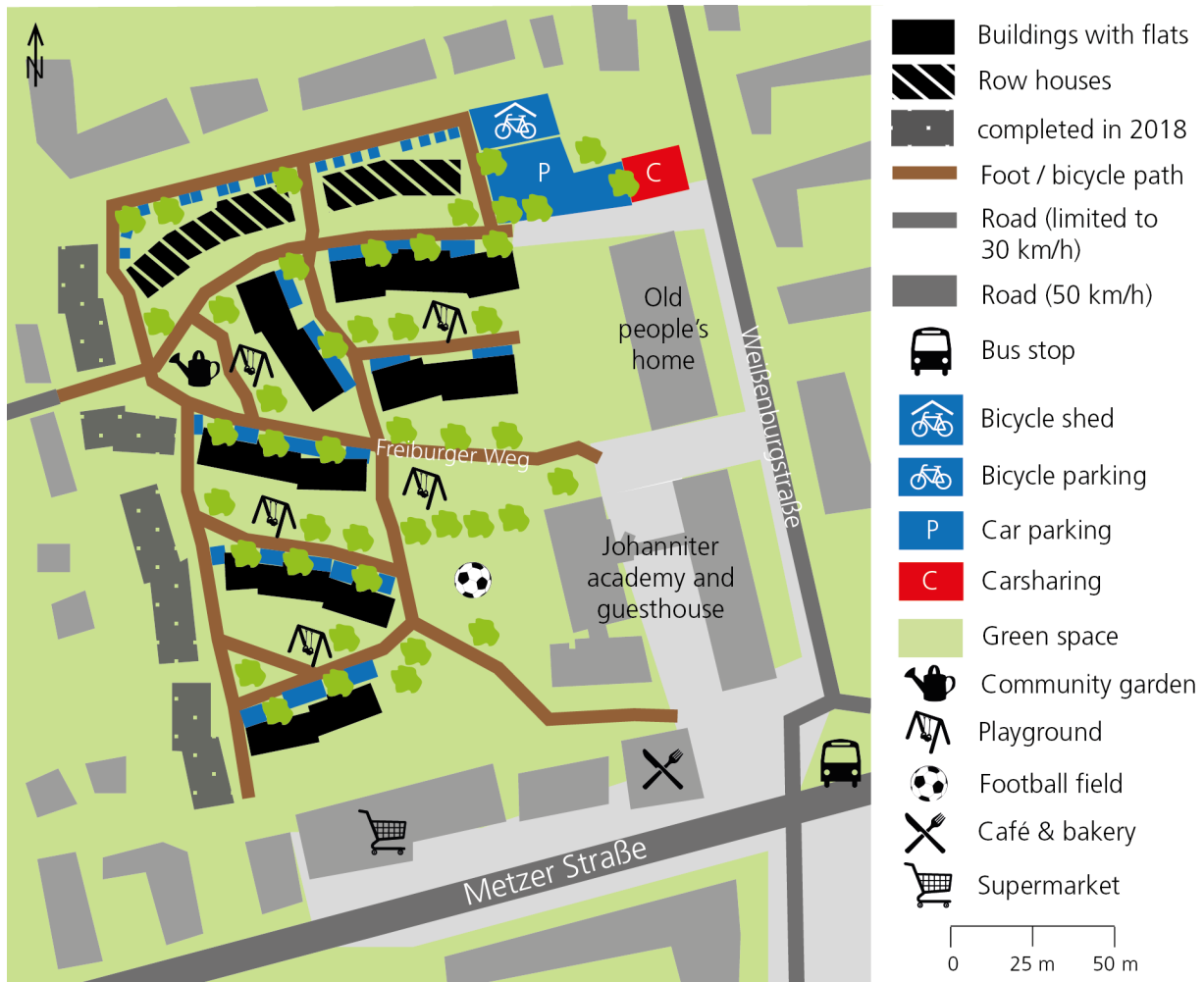
Map 20: Map of Gartensiedlung Weißenburg

Weißenburg is located about two kilometres south of the city centre of Münster in the neighbourhood "Geistviertel" (see Map 21). It is surrounded in the west by a garden city residential area dating back to the beginning of the 20th century and more recent housing areas on the other sides. Thus, there is a calm environment, the next busy streets are not very near. Between the development and the nearest street, at the east, there is an academy, guesthouse and old people's home of the Johanniter.

Just besides the Johanniter site, there is a car parking with 27 spaces for visitors and 10 carsharing cars of Stadtteilauto. There are also four covered parking spaces for disabled people and two

sheds for bicycle trailers, cargo bikes and other special two-wheelers (see Photo 54). Otherwise, bicycle parking is very insufficient, particularly for a car-free housing development in a bicycle city like Münster. There are uncovered racks in front of every house (see Photo 55), parking spaces in the basement are accessible only by steep stairs with ramps and heavy doors (see Photo 56). Therefore, many residents store their bicycle illicitly in the hallways everywhere they find some space (Photo 57). The bicycle network to reach the city centre (the main station is at 2.5km and has a big bicycle parking) and other districts is good—Münster is a cycling city, even if with the high number of cyclists and especially the increase in trailers or cargo bikes, some bike paths and lanes are not sufficient anymore. Public transport, instead, is not very developed. There are only buses, the nearest bus stop is at 200 metres (Heilig-Geist-Kirche) and served, during the day, by a bus line running only every 20 or 30 minutes and reaching the city centre in 10 minutes and the main station in 18 minutes. In the evening after 20:00 and early in the morning on weekends, it is served by another bus line which runs every half an hour (and every hour on Friday and Saturday night) and reaches Münster main station in nine minutes. Bus stations where more buses run are located at about 500m from the development.

There is a bakery just at the edge of the development and a supermarket some metres away, as well as a pharmacy, a restaurant and a bicycle shop. More shops and services are located at about 500 metres and in the district centre, Hammer Straße, leading to the city centre which is 2 km away. Different schools and nurseries are located within a radius of about 500m. The nearest park (Sentmaring) is also 500 metres away and the lake Aasee is a bit further than 1 km from Weißenburg.
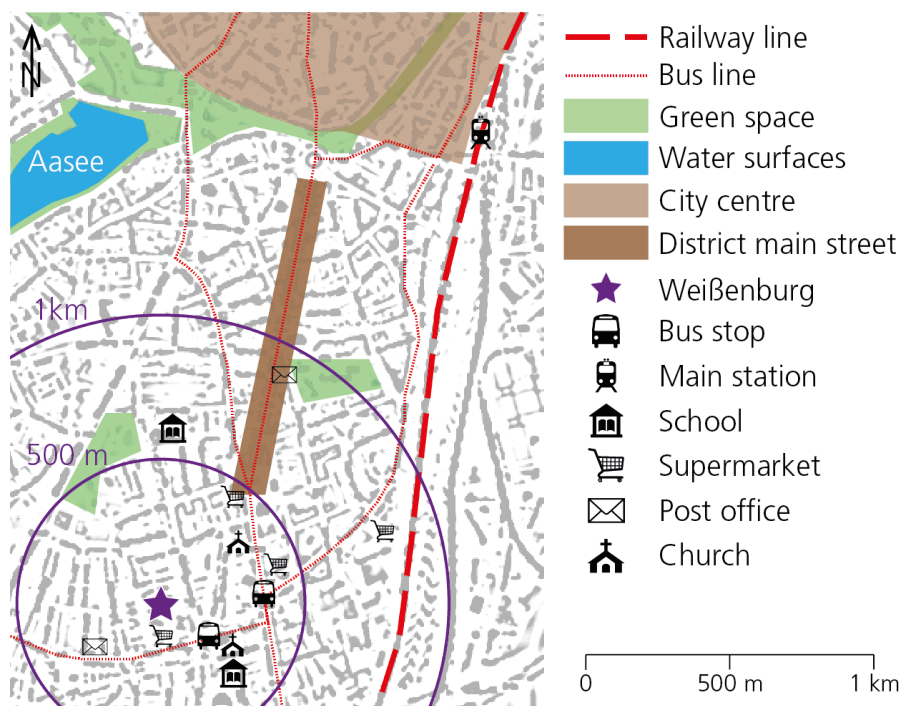
Map 21: Location of Weißenburg (Source of map background: Open Street Map)

Photo 54: Shed for bicycle trailers, cargo bikes etc. at the parking at the northern entrance of Weißenburg

Photo 55: Uncovered bicycle parking in front of a building in Weißenburg
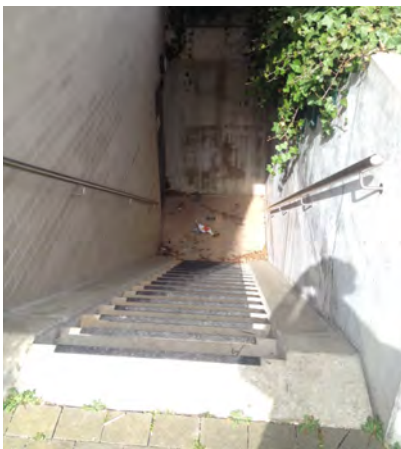
Photo 56: Stairs to access indoor bicycle parking in the basement in Weißenburg
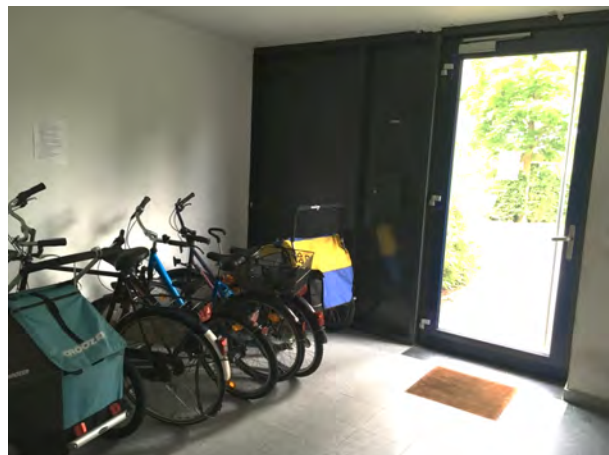
Photo 57: Bicycles and trailers stored in the entrance hallway of a building in Weißenburg

6.   Who lives in car-free housing developments

The first empirical part answers the research question on the profiles of the households living in the nine car-free housing developments. The four chapters present the different dimensions: the residents' socio-demographic as well as their socio-economic characteristics, their values, the dwelling characteristics as well as the residential mobility. Table 25 shows the different variables analysed for each dimension. The results of the variables with a * in the table are compared to corresponding data of the cities in which the developments are located. As urban populations are different from the overall population of a country, this comparison allows best to see whether there are differences between the car-free and other households in the same spatial context. These variables were chosen because of their relevance and the availability of data to compare with.

Chapter	Dimensions	Variables
6.1	**Socio-demographic characteristics**	Household type* Household size Age Sex Nationality
6.2	**Socio-economic characteristics**	Level of education* Activity status Employment level Type of economic activity Net household income
6.3	**Values**	Voting intentions* Basic human values
6.4	**Dwelling characteristics and residential mobility**	Occupancy status* Size Year of move-in Residential biographies Future housing plans

Table 25: Overview of the profiles' dimensions and variables (variables with a * are compared to the overall urban population in the comparison and discussion of each chapter)

These results are essentially based on the survey, except for residential mobility. They relate to the car-free households, excluding the few car-owning households living in the two car-reduced developments (Giesserei and Stellwerk60). These households will, however, be presented shortly in section 6.5 and compared to the car-free households living in these two developments.

My visits and the discussions I had in the housing developments confirm the profiles found in the survey. First, during my exploratory fieldwork, the representatives of the dwellings I interviewed told me their impressions of the households' profiles which match with the results. Second, the results were also confirmed in the discussions with residents attending my presentations in the car-free housing developments, as well when I presented first results from the survey in autumn 2017 as when I presented my conclusions in spring 2019.

6.1.   Socio-demographic characteristics

To start, the residents' socio-demographic characteristics are addressed. First, the types and sizes of households are presented. Then, the results regarding age, sex and nationality of the household's members are analysed.

6.1.1. Type of household

Overall, 41% of the households are couples with child(ren), 32% single households and 17% childless couples, 7% single-parent families and only 3% flat shares (see Figure 10). There are important differences between the developments, especially comparing the presence of children. The share of couples with child(ren) varies from 22% in Giesserei up to 69% in FAB-A and 66% in Klein Borstel, the part of single-parent families from none in Sihlbogen to 21% in Weißenburg. Finally, the proportion of persons living alone ranges from only 6% in FAB-A up to nearly half in Saarlandstraße (43%).
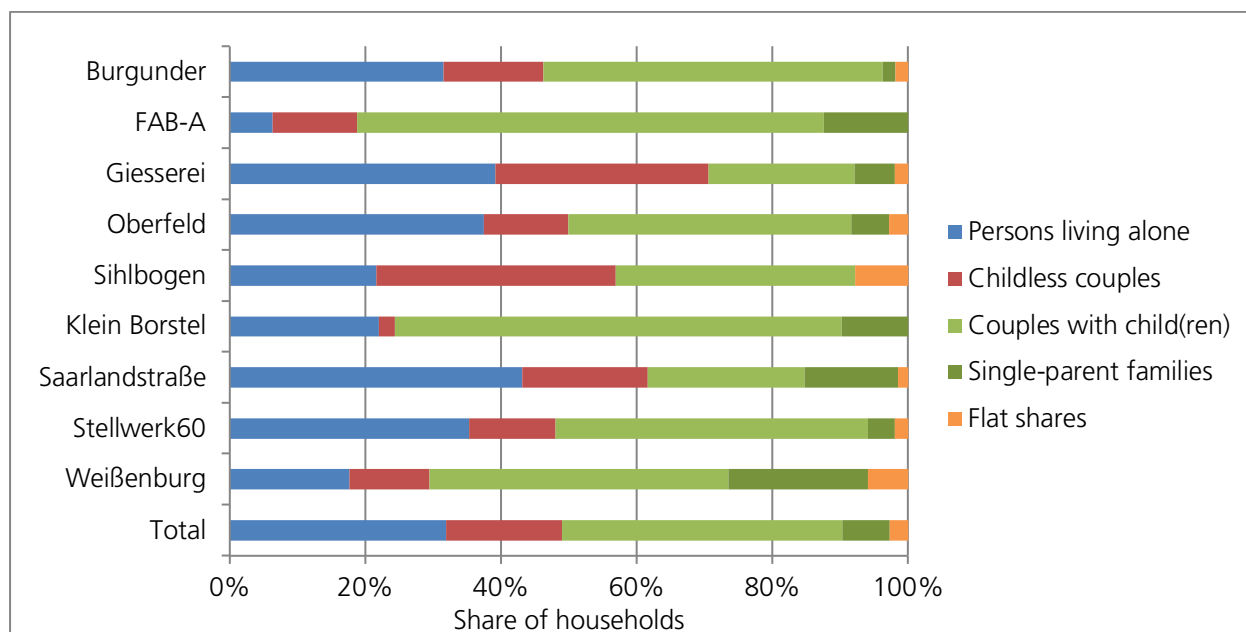
Figure 10: Type of household (N=486)

Considering the distribution of the types of households, three types of development appear:

− **Family developments** where a large majority of at least about two thirds of the households are (single-parent) families with one or two parents (FAB-A, Klein Borstel and Weißenburg);
− **Singles and family developments** where about half of the households are (single-parent) families and about a third are persons living alone (Burgunder, Oberfeld and Stellwerk60);
− **Mixed developments** where families, persons living alone and childless couples are all about equally important (Giesserei, Saarlandstraße—although with a high share of one-person households—and Sihlbogen).

The differences related to the household type can partly be explained by the different ages of the developments. If a household moved in 10 to 15 years ago as a family, it is likely that, in the meantime, children have left the household or even that some couples separated. These changes can explain higher shares of persons living alone or childless couples in some older developments. The dwelling sizes in the different developments also influence the household types, if there are many family-size dwellings and few small ones, this will affect the share of families, at least in the beginning.

6.1.2. Household size

The household sizes reflect the household types. Altogether, the most important category (32%) are one-person-households, followed by four-person- and two-person-households (23/24%). 15% of the households are formed of three persons and the remaining 6% of five or six persons (see Table 26). The mean size of a household is 2.5 persons. FAB-A, Klein Borstel and Weißenburg have

means of three or more, Giesserei and Saarlandstraße of only two persons. As for the household types, these shares reflect the presence of small and big dwellings in the developments as well as the occupation rules (in some cases, a minimum number of inhabitants per dwelling is requested).

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
1 person	32%	6%	39%	38%	22%	22%	43%	35%	18%	**32%**
2 persons	15%	19%	39%	18%	41%	7%	26%	17%	29%	**23%**
3 persons	19%	31%	10%	10%	22%	20%	12%	12%	18%	**15%**
4 persons	30%	38%	10%	22%	16%	46%	15%	30%	18%	**24%**
5 persons	6%	6%	2%	8%	0%	2%	0%	5%	12%	**4%**
6 persons	0%	0%	0%	4%	0%	2%	3%	1%	6%	**2%**
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	**100%**
Mean	2.6	3.2	2.0	2.6	2.3	3.1	2.1	2.6	3.0	**2.5**

Table 26: Household size (N=486)

6.1.3. Age

Overall, about one third of the inhabitants are aged less than 20 years and half are between 30 and 60 years old. Only 4% of the sample population is between 20 and 29 years old and the remaining about 10% aged 60 and older (see Figure 11 and Table 63 in the Appendix). Giesserei, conceived as a multi-generational housing, is the only case with a rather evenly distributed age structure. In the other housing developments, with some exceptions, there are only very few older and many young residents. The mean age is 34. It varies between 28 in Burgunder and 46 in Giesserei (FAB-A: 29; Sihlbogen: 30; Weißenburg: 31; Oberfeld, Klein Borstel and Stellwerk60: 33 and Saarlandstraße: 41).
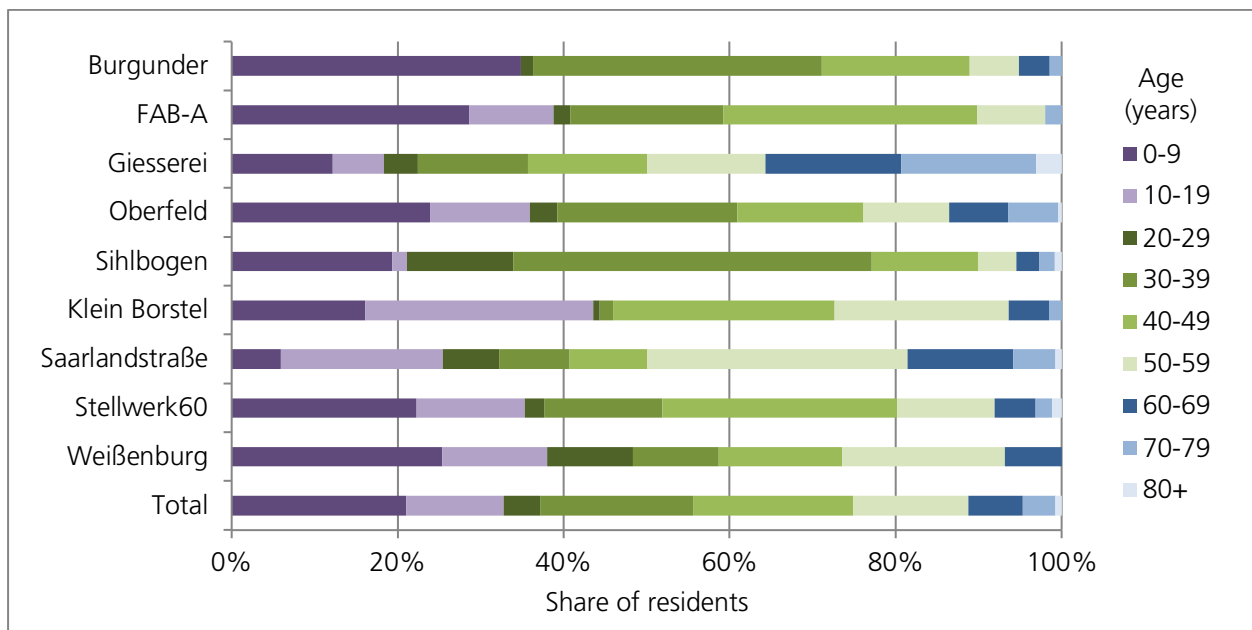
Figure 11: Age groups per development (N=1,151)

The over-representation of families mentioned before is even more striking when we look at the age of the residents at move-in (see Figure 12). Then, young adults (30–39 years) and children younger than 10 constituted over 50% of the residents.
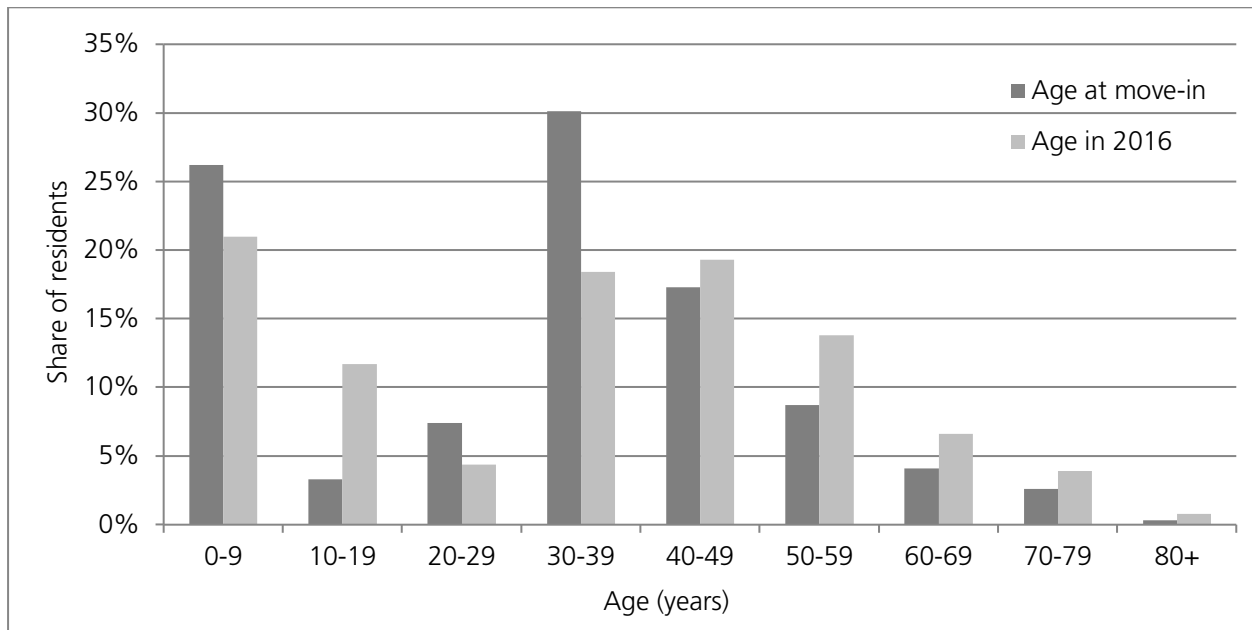
Figure 12: Overall age of the residents in 2016 and at move-in (N=1,151)

6.1.4. Sex

More women than men live in the households indicating the sex of their members in the questionnaire (see Figure 13), except in Sihlbogen (more men) and Oberfeld (nearly equal). Note that there are 18% of missing answers. This high share may partly be due to the fact that this was an open question and not a box to check in the questionnaire. This type was chosen to avoid proposing only male and female categories, even though no one indicated another sex in the questionnaire.
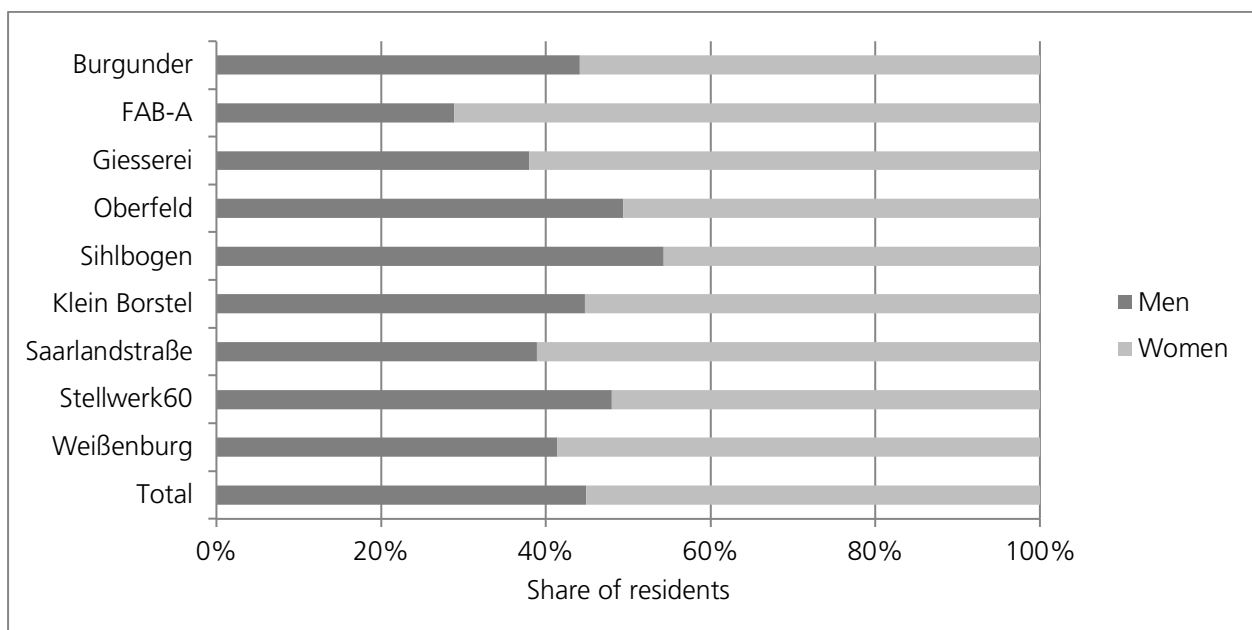
Figure 13: Sex of the persons in the respondents' households (N=975)

6.1.5. Nationality

In all developments, the vast majority of residents are citizens of the country in which they live (double citizens included; see Table 27). In all German case studies, they represent more than 94%, in Weißenburg even 100%. In the Swiss developments, there are slightly more residents with other nationalities, but still over 90% are Swiss citizens, except in Sihlbogen where 16% are Germans and 22% have another nationality[43]. Overall, the 56 residents with other nationalities come from countries all over the world: 26 from a member state of the European Union, six of another European country and 17 from countries outside Europe, seven residents did not precise their "*other*" nationality.

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Swiss	93%	92%	92%	92%	62%	0%	0%	2%	0%	**44%**
German	3%	8%	4%	3%	16%	98%	97%	95%	100%	**52%**
Other	5%	0%	4%	4%	22%	2%	3%	3%	0%	**5%**
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	**100%**

Table 27: Nationality of the residents (N=1,148)

The small share of foreign citizens is partly due to the importance of cooperative housing. These dwellings are often not advertised on conventional real estate websites and, thus, not that easy to find without particular knowledge or even personal contacts.

6.1.6. Comparison and discussion of socio-demographic characteristics

The analysis of the households' profiles shows that in most developments, the residents are different from the average and rather untypical for an urban context. Types of households are analysed as the central variable of the socio-demographic characteristics, as they also include indications about size and age of the residents. When comparing the developments with the municipalities (or the district in Hamburg) in which they are located, the most striking difference is the very high share of couples with child(ren) in car-free housing developments (see Table 28 for Switzerland and Table 29 for Germany). There is one exception: in the multi-generational housing of Giesserei, the distribution of household types is very similar to the entire municipality.

This comparison shows the particularly high attractiveness of car-free housing for families, many parents moved there with small children and many children were born there. Conversely, the share of persons living alone is much lower in most developments than in the cities where they are located. This is also related to the age of the residents, there are only few young adults between 20 and 30 years and few elderly people, two age groups often living alone.

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[43] 9% of the residents in Sihlbogen come from countries in the European Union, 6% from other European countries and the remaining 7% from outside Europe.

	Burgunder	Bern	FAB-A	Biel/ Bienne	Giesserei	Winterthur	Oberfeld	Oster- mundigen	Sihlbogen	Zurich
Persons living alone	32%	45.3%	6%	44.8%	39%	38.6%	38%	42.6%	22%	45.6%
Childless couples	15%	24.5%	13%	22.4%	31%	25.9%	13%	27.5%	35%	23.8%
Couples with child(ren)	50%	21.1%	69%	23.6%	22%	26.1%	42%	21.5%	35%	20.5%
Single-parent families	2%	4.7%	13%	7.4%	6%	5.6%	6%	6.3%	0%	4.8%
Flat shares	2%	4.4%	0%	1.8%	2%	3.8%	3%	2.1%	8%	5.3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 28: Comparison of types of households in Switzerland[44]

	Klein Borstel	Saarland- straße	Hamburg -Nord[45]	Stell- werk60	Cologne[46]	Weißen- burg	Münster[46]
Persons living alone	22%	43%	57.1%	35%	47.2%	18%	45.9%
Childless couples	2%	19%	20.4%	13%	23.5%	12%	23.6%
Couples with child(ren)	66%	23%	11.7%	46%	18.5%	44%	18.4%
Single-parent families	10%	14%	6.1%	4%	7.1%	21%	5.9%
Flat shares	0%	2%	4.7%	2%	3.7%	6%	6.1%
Total	100%	100%	100%	100%	100%	100%	100%

Table 29: Comparison of types of households in Germany

These findings are consistent with existing evidence on car-free housing developments, also reporting an over-representation of families (Brosig et al., 2015; Ernst, 2008; Mantau, 2010; P. Moser & Stocker, 2008; Scheurer, 2001b). Moreover, in urban new-build housing, families with children are often over-represented (Jarass & Heinrichs, 2014; van Raalten, 2012). Simultaneously, living without a private car appears most difficult for families with young children (Thomsen & Löfström, 2011), even if several recent studies on voluntary car-free families in urban areas can be seen as an indication that they become more common (Dowling & Maalsen, 2019; Lagrell et al., 2018; McLaren, 2016). In contrast, the residents' socio-demographic characteristics are clearly different from average car-free households which are mainly persons living alone (Haefeli & Bieri, 2008; Kühne et al., 2018; Mitra & Saphores, 2017; Preisendörfer & Rinn, 2003). However, as presented above, the share of car-free households is growing, particularly in cities (infas, 2018; OFS / ARE, 2017) and among household types typically owning cars (Haefeli & Arnold, 2015).

Finally, another particularity of the car-free housing residents are the very small proportions of foreign citizens. Except for Sihlbogen in the city of Zurich (BFS, 2016c), they are much lower than

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[44] Source: Federal Statistical Office, Structural Survey, cumulated data 2012-2016

[45] Source: Statistikamt Nord (2013)

[46] Source: IT.NRW (2014)

the ones in the respective cities (Statistical Offices of the Länder and Federal Statistical Office, 2016).

6.2. Socio-economic characteristics

This chapter presents the residents' socio-economic characteristics. First, the level of education is addressed. Then, the activity status, the employment level and the type of economic activity are presented. Finally, the net household income is analysed.

6.2.1. Highest level of education

The highest level of education of the residents aged 15 and older shows a population with a high cultural capital. Overall, 63% hold a university or university of applied sciences degree and 11% a degree from a professional college (see Figure 14). For about 9% each the apprenticeship or the Matura/Abitur (the higher education entrance qualification) is the highest level of education and only about 3% have not obtained any degree after compulsory school. Finally, 5% have no graduation (yet)—nearly all of them are aged 15 to 19. Comparing the developments, it appears that the share of residents with a university (of applied sciences) degree is the most important group everywhere, ranging from 50% in Giesserei up to 78% in Burgunder. In the Swiss case studies, the levels of apprenticeship and professional college (i.e. mainly a higher degree of an apprenticeship-based education) are more common, whereas in the German developments, the shares of residents with Abitur are higher.
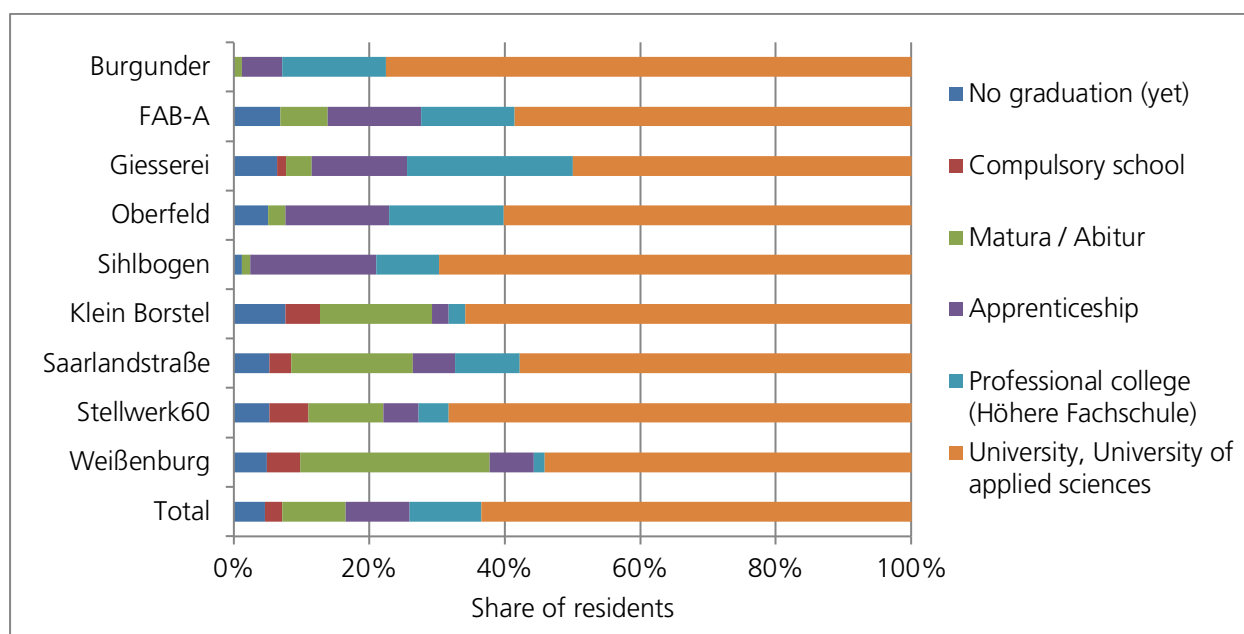
Figure 14: Highest level of education of the residents aged 15 and older[47] (N=785)

6.2.2. Activity status

About three quarters of the inhabitants aged 16 and older are employed, 9% in education, 2% are seeking work and 12% are pensioners (see Table 30). Only 13% considered themselves to be a house husband or housewife, even if multiple answers were possible in this question. Whereas in Burgunder, Sihlbogen and Stellwerk60, over 80% are employed, in Giesserei and Weißenburg, only about 60% are. In Giesserei this can be explained by the high share of pensioners (35%),

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[47] This definition of the age group follows the corresponding one of the Swiss Federal Statistical Office.

which is only between 1% and 16% elsewhere. In Weißenburg, there is a very high share of residents in education (28%), as in Saarlandstraße (19%). In the other developments, this share is only about 5 to 10%. Even if these results are closely linked to the residents' age, they highlight again the particular type of population present in car-free housing developments.

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
In education	5%	7%	6%	5%	5%	10%	19%	3%	28%	**9%**
Employed	84%	77%	57%	78%	84%	80%	70%	83%	61%	**76%**
Seeking work	6%	7%	0%	2%	1%	1%	2%	0%	5%	**2%**
House husband/ housewife	31%	10%	17%	24%	16%	6%	1%	5%	11%	**13%**
Pensioner	6%	3%	35%	16%	6%	4%	1%	9%	5%	**12%**

Table 30: Activity status of the residents aged 16 and older[48] (N=902) Note: multiple answers were possible for this question, so the total of each column is over 100%.

6.2.3. Employment level

Only few employed residents (8%) work low part-time (under 50%/20h per week), whereas more than half of them work higher part-time (50–89%/20-34h per week) and 41% full-time (see Figure 15). The employment level is somewhat different in Switzerland and Germany (except in the Swiss development of Sihlbogen which is similar to the German ones). In Switzerland 63% work high part-time and only 30% full-time, whereas in Germany over 50% work full-time. There are also important differences within the two countries: in Oberfeld, only 14% and in Weißenburg 43% work full-time, whereas in Sihlbogen 59% and in Stellwerk60 56% do so.
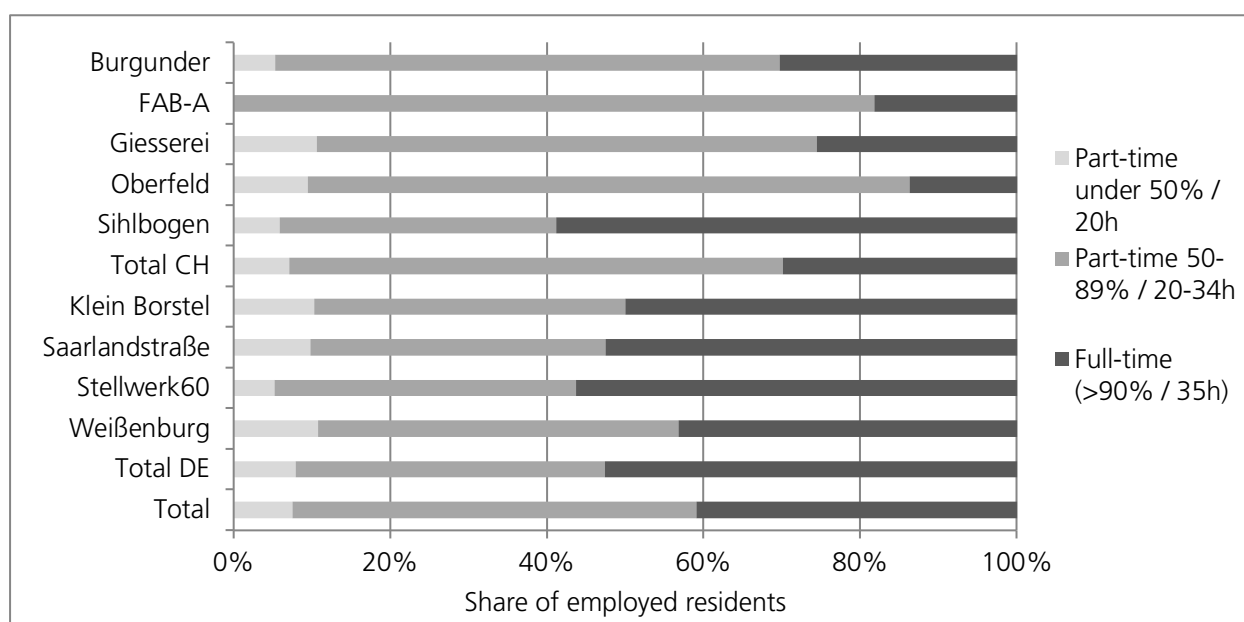
Figure 15: Employment level (N=599)

6.2.4. Type of economic activity

The 585 residents who indicated the type of their economic activity nearly all work in the service sector. When classified following "The Statistical Classification of Economic Activities in the European Community (NACE)" (Eurostat, 2016), the most important type is "professional, scientific and technical activities" (see Table 31). It contains about a quarter of all activities mentioned, including for example architects, lawyers, translators or consultants. Then follow "human health and social work activities" (18%), "education" (17%) and "information and communication" (11%). Most of the other important types are also related to services, e.g. public administration or arts/entertainment. Thus, the majority of the residents is working in the public or para public sector. However, not all academic activities are important, especially the finance and insurance sectors are underrepresented.

Professional, scientific and technical activities	24%
Human health and social work activities	18%
Education	17%
Information and communication	11%
Other service activities	9%
Arts, entertainment and recreation	8%
Public administration	4%
Financial and insurance activities	2%
Wholesale and retail trade	2%
Manufacturing	1%
Administrative and support service activities	1%
Construction	1%
Accommodation and food service activities	1%
Real estate activities	1%
Transportation and storage	1%
Total	**100%**

Table 31: Shares of residents per type of economic activity (N=585)

These types of activity add an interesting information to the portrait of the residents. The high shares of some particular activities, especially in the social and education sector, represent another indication of which values are important to them. Working in these sectors is often not just a job like any other but represents an engagement and is based on certain values.

6.2.5. Net household income

The last socio-economic variable, income, was asked for at the household level. It shows a relatively equal distribution: about one third of the households are in the mean group (CHF 6,001 - 9,000/€2,501 - 3,500[49]), a bit less than a quarter in the higher and a bit more in the lower group, whereas there are 13% in the highest but only 3% in the lowest group (see Figure 16)[50]. Most developments display a rather equal distribution of the different income categories, with two notable exceptions. In Sihlbogen, nearly one-third are high-income households; whereas in Weißenburg, more than half are in the two lowest income categories. This can be explained by the context

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[49] The categories were defined around the mean monthly net household income of both countries, it represents the mean of the middle category, about CHF 7,500 and €3,000 (Destatis, 2017; FSO, 2017).

[50] This question was the only one proposing a "no answer" category. Overall, 6 % of the respondents chose it, ranging from no household in FAB-A up to 12% in Saarlandstraße and 10% in Weißenburg.

and the type of the developments. Sihlbogen consists of quite standard rented flats in Zurich, a city with a high income level. Weißenburg, instead, is entirely subsidised housing.
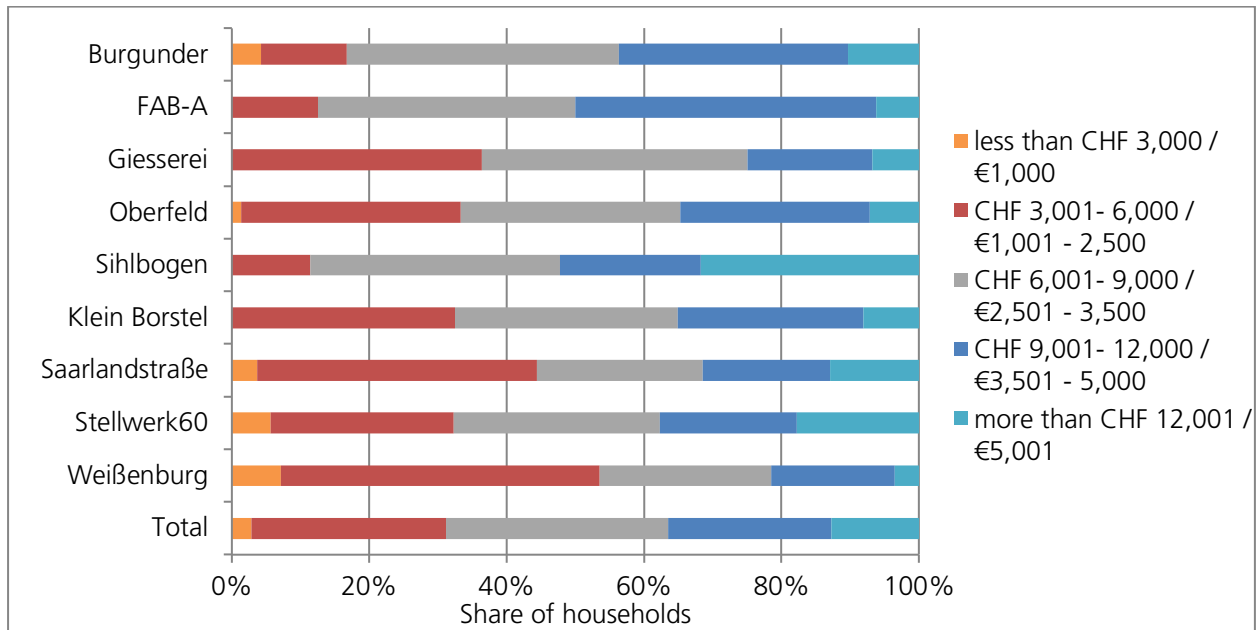
Figure 16: Net household income (N=430)

Moreover, the household incomes must be compared to the household size, which weakens the financial situation, considering the high number of families and big households (see Figure 17). What is actually more important is not the absolute household income in itself, but the purchasing power of a household which also depends on other factors such as for instance the number of persons who share an income. Without precise data on the income, this cannot be calculated more in detail. However, the results on the income show that car-free housing attracts all types of income levels and, overall, the higher income groups are more present than low-income groups— a first indication that, for most households, financial reasons cannot play a central role for living car-free.
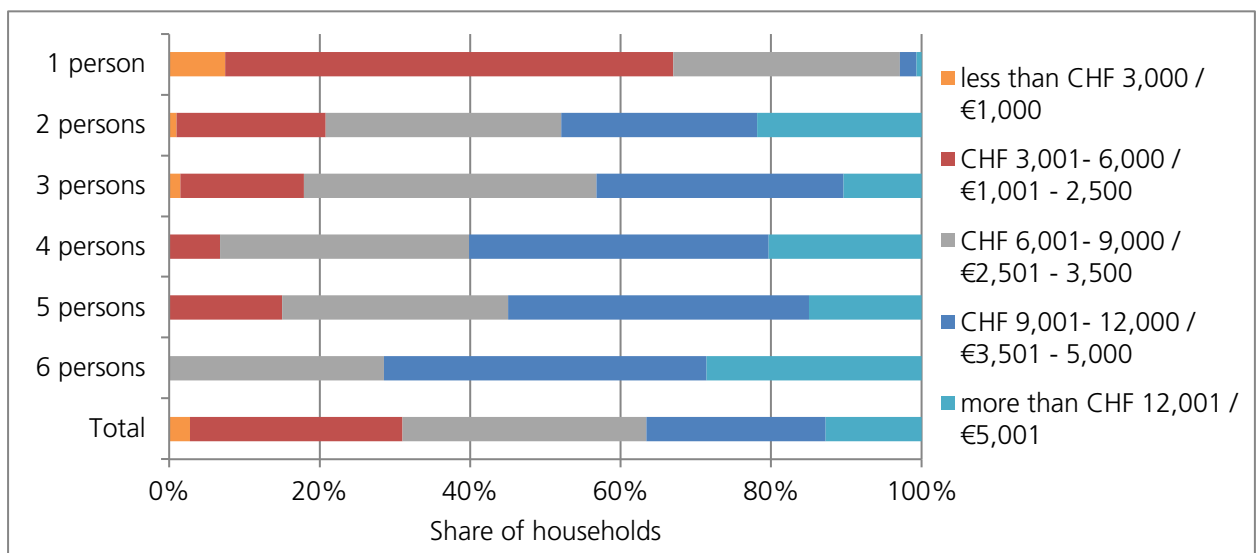
Figure 17: Net household income and household size (N=429)

6.2.6. Comparison and discussion of socio-economic characteristics

The level of education is taken as key variable for the socio-economic characteristics of the car-free housing residents and compared to the municipalities. At least 50% of the inhabitants aged 15 and older in each development hold a university (or university of applied sciences) degree, compared to only 11% to 35% in the Swiss municipalities (see Table 32) and 23% to 29% in Germany (see Table 33). In all developments, the difference is at least 50% compared to the overall population, the maximum is more than five times higher (Oberfeld, Ostermundigen: 60% and 11%). The differences for apprenticeship are even higher, particularly in the German developments where apprenticeship reaches values between three and seven per cent in car-free housing, compared to about 35% in all cities. In Switzerland, the differences are about double or triple, except in Sihlbogen, where it is comparably small.

Besides the age effect mentioned above—the presence of residents aged 15 and older who have not finished their education—the important differences compared to the overall population of the cities confirm the very high level of education of the residents, even in an urban context where it is generally higher (as the difference between the Swiss cities and the suburban municipality of Ostermundigen demonstrates). However, it may also partly be explained by the higher proportions of educated residents interested and willing to answer a survey. Nonetheless, given the high response rates in most developments, this cannot explain the important differences.

	Burgunder	Bern	FAB-A	Biel/ Bienne	Giesserei	Winterthur	Oberfeld	Oster-mundigen	Sihlbogen	Zurich
No graduation (yet)	0%	5.7%	7%	11.4%	6%	7.6%	5%	7.6%	1%	6.7%
Compulsory school	0%	12.7%	0%	19.7%	1%	15.4%	0%	19.7%	0%	12.4%
Matura/Abitur	1%	12.8%	7%	12.6%	4%	11.6%	3%	11.9%	1%	11.1%
Apprentice-ship	6%	27.0%	14%	31.2%	14%	32.1%	15%	39.6%	19%	24.2%
Professional college (Höhere Fachschule)	15%	11.8%	14%	10.2%	24%	12.9%	17%	10.3%	9%	10.5%
University, University of applied sciences	78%	30.1%	59%	15.0%	50%	20.3%	60%	11.1%	70%	35.1%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 32: Comparison of highest level of education in Switzerland (residents 15+ years)[51]

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[51] Source: Federal Statistical Office, Structural Survey, cumulated data 2012-2016

	Klein Borstel	Saarland-straße	Hamburg-Nord[52]	Stell-werk60	Cologne[53]	Weißen-burg	Münster[53]
No graduation (yet)	8%	5%	22.9%	5%	32.2%	5%	27.0%
Compulsory school	5.%	3%		6%		5%	
Matura/ Abitur	17%	18%		11%		28%	
Apprentice-ship	3%	6%	36.9%	5%	34.5%	7%	34.5%
Professional college (Höhere Fachschule)	3%	10%	11.2%	5%	9.9%	2%	9.8%
University, University of applied sciences	66%	58%	29.0%	68%	23.4%	54%	28.7%
Total	100%	100%	100%	100%	100%	100%	100%

Table 33: Comparison of highest level of education in Germany (residents 15+ years)

Other work-related information presented before (activity status, employment level and type of activity) reflect, on the one hand, the age distribution and provide, on the other hand, some first insights into the lifestyles of the residents. The presence of only few house husbands or house-wives compared to the high share of families and especially the over-representation of part-time work and of certain types of professions indicates the importance of values and practices related to equality and social engagement.

All these results confirm that the analysed residents are very different from the average urban population, which is in line with former research on car-free housing developments (Baier et al., 2004; Ganitta, 2011; P. Moser & Stocker, 2008; Ornetzeder et al., 2008), highlighting e.g. the high education level of residents. These profiles are not only specific to car-free housing, residents in collaborative housing are also mainly well-educated middle-income households (Bresson & Denèfle, 2015) as well as residents in new-build urban housing in general (Jarass & Heinrichs, 2014; Rérat, 2010). Conversely, these results contrast with data for all car-free households, re-porting low education levels and incomes (Haefeli & Bieri, 2008; Kühne et al., 2018; Mitra & Saphores, 2017; Preisendörfer & Rinn, 2003). However, as mentioned before, the share of highly educated car-free households has increased recently (Haefeli & Arnold, 2015).

6.3. Values

This chapter presents the basic human values important to the residents of the car-free housing developments and their voting intentions.

6.3.1. Basic human values

As explained in chapter 3.2.3, my approach of the residents' values is based on the work of Schwartz and his items of basic human values developed for the European Social Survey

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[52] Source: Statistikamt Nord (2013)

[53] Source: Statistische Ämter des Bundes und der Länder (2014)

(Schwartz, 2001). He defines four groups containing two or three values each. When we look at the shares of "very important" and "important" answers, a clear image appears: two groups of values with high scores and two with very low consent (see Figure 18 and Table 34). The items of the value groups "self-transcendence" and "openness to change", with one or two exceptions, all reach at least 50% of "(very) important" answers. The most important group, self-transcendence, includes benevolence and universalism values, the three most important items being "equal treatment and opportunities for every person" (UN1), "take care of nature, protect the environment" (UN2), and "devote myself to people close to me. Be loyal to them." (BE1). In other words, these are the social and ecological values that already appeared in other results presented before.
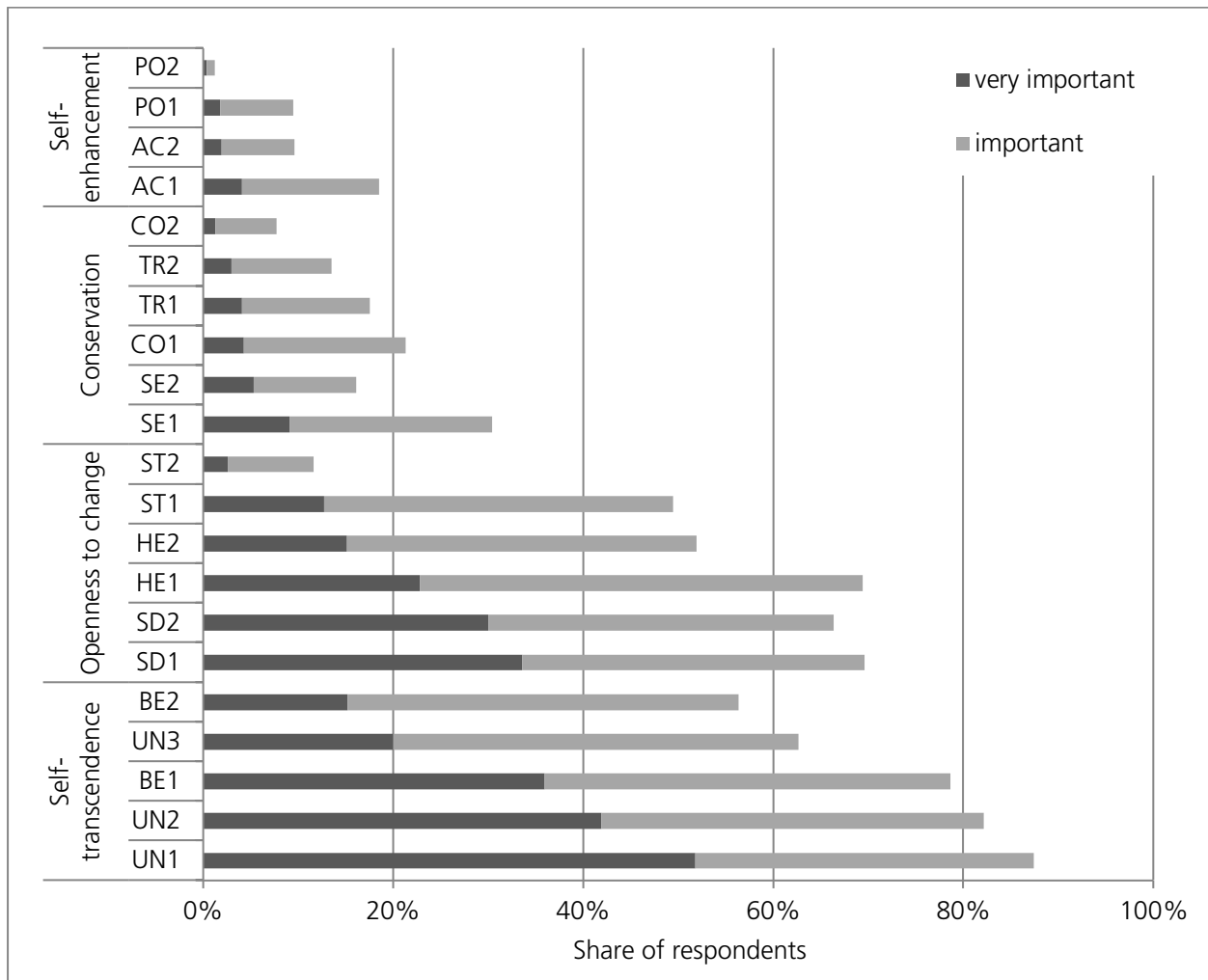
Figure 18: Groups of basic human values (N=452 to 475)

The second important group of values, "openness to change", comprises hedonism, stimulation and self-direction. The three items with the highest scores are "make my own decisions about what I do. Be free and not depend on others" (SD1), "do things in my own original way, be creative" (SD2) and "do things that give me pleasure" (HE1). The two other value groups, "conservation" and "self-enhancement", are much less essential, nearly all items of these groups reach less than 20% of "(very) important" answers. They include the values of conformity, tradition, security, power and achievement.

Comparing the results for the different housing developments, it appears that one is slightly different from the others, having higher shares for all the less important values as well as less important shares for the other ones: Sihlbogen. This is in line with the other differences of this development's residents.

Group of values	Values	Items
Self-transcendence	Universalism	1. Equal treatment and opportunities for every person.
		2. Take care of nature, protect the environment.
		3. Listen to people who are different. Wanting to understand other opinions.
	Benevolence	BE1: Devote myself to people close to me. Be loyal to them.
		BE2: Help people around me, care for their well-being.
Openness to change	Self-direction	SD1: Make my own decisions about what I do. Be free and not depend on others.
		SD2: Do things in my own original way, be creative.
	Hedonism	HE1: Do things that give me pleasure.
		HE2: Have a good time. "Spoil" myself.
	Stimulation	ST1: Have surprises and variety in life.
		ST2: Look for adventures and like to take risks. Have an exciting life.
Conservation	Security	SE1: A strong state that insures my personal safety.
		SE2: Avoid anything that might endanger my safety.
	Tradition	TR1: Be humble and modest. Not draw attention to myself.
		TR2: Follow the traditions of my religion or my family.
	Conformity	CO1: Follow rules at all times, even when no one is watching.
		CO2: Always behave properly. Avoid doing anything people would say is wrong.
Self-enhancement	Achievement	AC1: Be very successful. Be recognised for my achievements.
		AC2: Show my abilities, be admired from people.
	Power	PO1: Get respect from others. I want people to do what I say.
		PO2: Be rich, have expensive things.

Table 34: Items of basic human values

6.3.2. Voting intentions

Additionally, voting intentions were analysed as an illustrative example of values. In both countries, the questionnaire asked what is known in Germany as the "Sonntagsfrage" ("Sunday question"): "*Which party would you mainly vote for if next Sunday were national elections (even if you're not allowed to vote)?*" To compare the results of both countries, the different parties are classified into four categories, from left to right[54]. The voting intentions show that everywhere, the left (and ecological) parties get an important majority, ranging from 60% in Sihlbogen to 100% in FAB-A (see Figure 19). In Giesserei, Saarlandstraße and Weißenburg, the left also reaches more than 90%. Only in Sihlbogen, right-wing parties got some votes. In the other developments, these parties are completely absent and even the centre-right is very weak. The details (see Table 64 and Table 65 in the Appendix) show that in all German developments, the Green party reaches over 50% on its own, whereas in Switzerland this is the case only in FAB-A. This is probably also due to the fact that the Swiss Social Democrats have the same positions on environmental issues

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[54] The classification is the following (only parties mentioned in the questionnaire appear):
   Left: Switzerland: SP, Grüne, AL / Germany: Linke, Grüne
   Centre-left: GLP, EVP / SPD
   Centre-right: CVP, FDP, BDP / CDU, FDP
   Right: SVP / AfD

as the Greens. To sum up, the voting intentions are a very clear indication of the importance residents accord to social and ecological values.
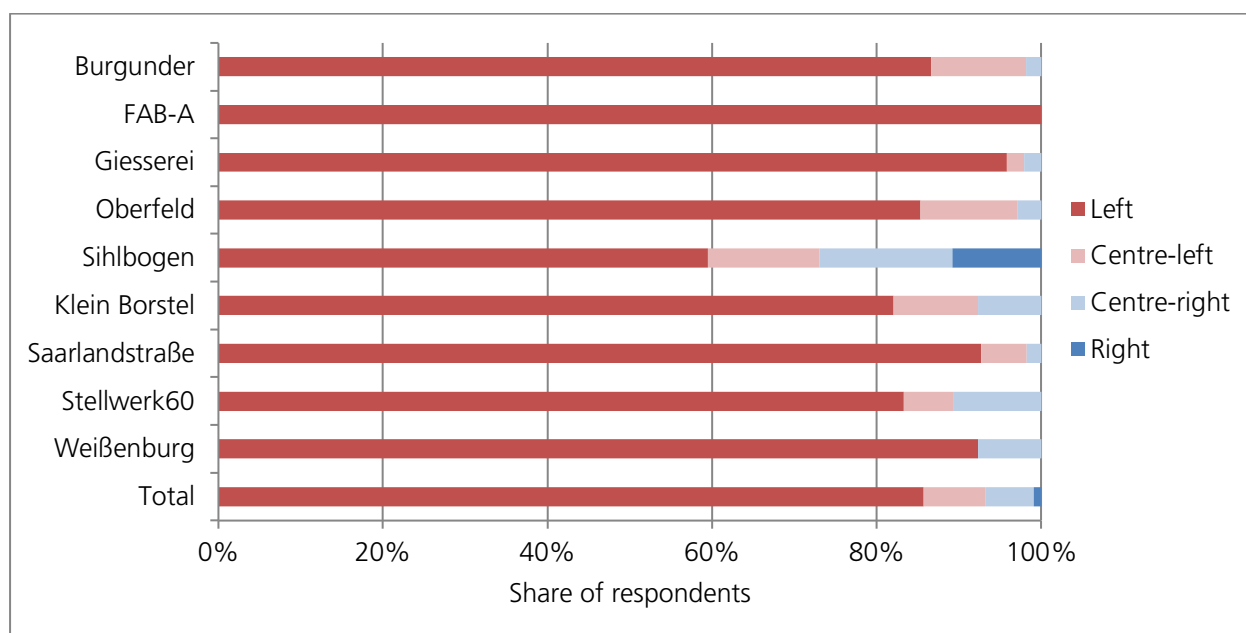
Figure 19: Voting intentions (N=425)

6.3.3. Comparison and discussion of values

In the previously discussed characteristics, some indications on the specific values important to car-free housing residents already appeared. The two variables directly related to values endorse this impression. When comparing the voting intentions of the car-free housing developments to the constituencies they are located in, important differences appear (see Table 35 and Table 36). While in car-free housing, a large majority of the respondents would vote for left-wing parties, they only get between 32% and 53% in the Swiss municipalities (mainly SP and Green Party) and about a quarter in the German ones (Die Linke and Green Party). In Germany, it is interesting to see that even the centre-left (SPD), much more important overall, attains a very small score in the car-free developments. Right-wing parties are completely absent in Germany and in most Swiss developments, whereas in Sihlbogen they reached 11% of the voting intentions, which still is below their share of 19% in Zurich.

	Burgunder	Bern	FAB-A	Biel/ Bienne	Giesserei	Winterthur	Oberfeld	Oster- mundigen	Sihlbogen	Zurich
Left	87%	53.1%	100%	46.9%	96%	35.2%	85%	31.9%	60%	42.5%
Centre -left	12%	12.1%	0%	9.0%	2%	13.8%	12%	12.3%	14%	11.1%
Centre -right	2%	19.5%	0%	18.5%	2%	19.6%	3%	26.0%	16%	20.1%
Right	0%	13.4%	0%	23.8%	0%	25.4%	0%	27.6%	11%	18.9%

Table 35: Comparison of residents' voting intentions and results of the 2015 National Council (federal parliament) election[55]

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[55] Source: BFS (2016b)

	Klein Borstel	Saar-landstr.	Hamburg-Nord	Stell-werk60	Köln III	Weißen-burg	Münster
Left	82%	93%	23.8%	83%	26.8%	92%	24.7%
Centre-left	10%	6%	21.4%	6%	24.6%	0%	20.9%
Centre-right	7%	2%	45.2%	11%	35.7%	8%	46.3%
Right	0%	0%	6.2%	0%	7.8%	0%	4.9%

Table 36: Comparison of residents' voting intentions and results of the 2017 Bundestag (federal parliament) election[56]

These voting intentions provide a first impression of which types of values are important to the residents of car-free housing developments, as voting for left-wing parties is linked to social and ecological concerns. The results of the basic human values' question emphasise this. The most important value group is "self-transcendence", containing values we could call the most ethical or ecological and social ones. Second comes the "openness to change" values group, showing that there are not only altruistic values guiding respondents living in car-free housing, but also more hedonistic and self-directed issues.

These results are consistent with findings from other research on car-free housing which highlighted that environmental and social issues are particularly important for residents (Loo, 2017; Ornetzeder et al., 2008; Scheurer, 2001b). This was also found in a study on co-housing projects in France: "*The middle classes who are currently involved in co-housing projects uphold humanistic and environmental values, opposing the values of capitalist economic liberalism, but nonetheless they are not part of a radical opposition to a social order in which they wish to play a more decisive role.*" (Bresson & Denèfle, 2015, p. 14). The results related to values tend to understand car-free housing residents' motivations as a voluntary choice of a car-free lifestyle or even a political statement. Furthermore, my results on the most important values also match with the Swedish study on sustainable lifestyles that found the most environmentally engaged people in the "self-transcendence" values segment (Ilstedt et al., 2017).

Finally, even if general trends are similar everywhere, some differences between the nine car-free housing developments exist. Sihlbogen often stands out and seems to be more "ordinary", i.e. less different from its urban context. This can be explained by its character of rather conventional rental flats, whereas the other developments are either forms of collaborative housing or include at least some particular elements such as a residents' association or partial self-administration which probably exclude residents not sharing certain social or ecological values. Thus, collaborative housing attracts a certain type of residents and can act as a *"social sorting machine"* (Boterman, 2012, p. 335), explaining, in turn, the relatively homogeneous profiles of its residents.

6.4. Dwelling characteristics and residential biographies

In this chapter, first, two characteristics of the survey respondents' dwellings are analysed: the occupancy status and the dwelling size. Then, two aspects of residential mobility are addressed: the year of move-in and the inhabitants' residential biographies, based on quantitative and qualitative data. Finally, their future housing plans are presented.

6.4.1. Occupancy status

Overall, 44% of the residents in the nine car-free housing developments are renters, 40% cooperative members and 16% owners (see Figure 20). In the three mixed-type developments, these

shares reflect more or less the effective proportions, even though more owners answered in Klein Borstel and fewer renters in Saarlandstraße.

The results show the high importance of cooperatives for car-free housing. As presented at the beginning of chapter 5, being a cooperative member means more than simply renting or buying a dwelling, it is usually linked to a certain collective engagement which is an indication of car-free residents' particular characteristics. The owners present in both Klein Borstel and Saarlandstraße, organised as a "housing project" ("Wohnprojekt"), are similar to a housing cooperative and not to a conventional community of owners which exists in Stellwerk60. Furthermore, the residents of Burgunder (and to a lesser extent also in Weißenburg) are partly self-administrating their development and therefore not comparable to conventional renters. Thus, the share of residents with an "alternative" status is even higher.
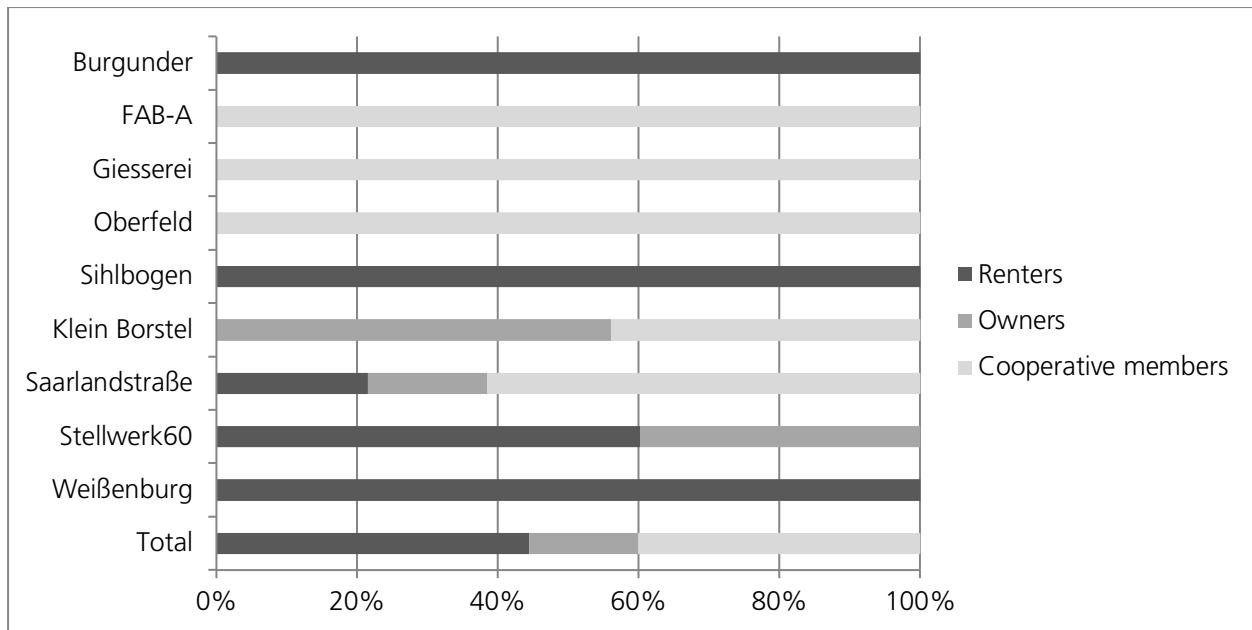
Figure 20: Occupancy status of the dwellings (N=484)

6.4.2. Dwelling size

The mean size of the respondents' dwellings is 3.4 rooms (see Table 37). Two developments (FAB-A and Klein Borstel) have a higher mean of nearly four rooms, whereas Saarlandstraße has the only one below three (2.9 rooms). About one third of the dwellings contain three or three and a half rooms, around a quarter one less or one more. Smaller dwellings are very rare, except in Sihlbogen, Saarlandstraße and Weißenburg. The share of flats with five or more rooms shows big differences: it ranges from none in Sihlbogen to about 25% in FAB-A, Weißenburg and Klein Borstel. As we saw in chapter 4.2.2, these shares correspond more or less to the effective distribution of the different dwelling sizes and the results of the survey are, thus, representative of the overall population of residents.

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
1-1.5 room	2%	6%	2%	0%	10%	2%	8%	0%	9%	**4%**
2-2.5 rooms	15%	19%	28%	28%	2%	17%	37%	31%	24%	**24%**
3-3.5 rooms	42%	19%	37%	35%	54%	20%	26%	32%	24%	**34%**
4-4.5 rooms	30%	31%	28%	19%	34%	34%	23%	22%	21%	**26%**
5-5.5 rooms	11%	25%	4%	15%	0%	22%	3%	11%	24%	**11%**
6-6.5 rooms	0%	0%	2%	3%	0%	5%	3%	4%	0%	**2%**
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	**100%**
Mean	3.6	3.8	3.5	3.6	3.5	3.7	2.9	3.2	3.3	**3.4**

Table 37: Dwelling sizes (N=484)

6.4.3. Year of move-in

In 2016, more than half of the residents lived in a car-free development for less than five years, especially because four out of five Swiss developments had only been completed after 2012 (see Table 38). In the older ones, an important majority of residents arrived in the first or second year of existence (often, all dwellings were not finished at the same moment). In Saarlandstraße, the two high shares correspond to the different years of completion of the three parts of this development. There seems to be little turnover in the older developments, except in Weißenburg and Stellwerk60 where there are, exclusively in the first and in a big part of the second, renters and subsidised housing. This finding was confirmed by the residents met in the car-free developments, it seems indeed linked to the occupancy status: owners and cooperative members often have a small turnover.

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Year of first completion	2011	2014	2013	2014	2013	2008	2000	2006	2001	
15+ years							42%		28%	**8%**
10–14years							8%	6%	22%	**4%**
5–9years	55%					98%	38%	62%	25%	**34%**
0–4years	45%	100%	100%	100%	100%	3%	13%	32%	25%	**55%**
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	**100%**

Table 38: Year of move-in (N=479)

6.4.4. Residential biographies

In the survey, respondents were asked to name the previous place of residence of all household members. The results show that, overall, 66% of the inhabitants already lived in the same city and 14% in the same urban agglomeration before (see Figure 21 and Table 66 in the Appendix for

details). Only 11% of the residents moved from further than the same canton or land in which the developments are located and 2.3% had lived abroad.

However, in Oberfeld, only 3.5% lived in the suburban municipality of Ostermundigen before, but 77% in the city region of Bern, including 47% in the core city. In contrast, over 80% in all German developments already lived in the respective cities before, up to 96% in Saarlandstraße. This can be explained by the different structures and scales of the German and Swiss municipalities. In Switzerland they are smaller, often including only the core city, whereas in Germany, especially in the city-state of Hamburg, the municipality encompasses the major part of the urban area. Except in Burgunder and Giesserei, over 80% of the residents lived at least in the same city region before. In Giesserei, a particularly high share of households (32%) moved from other parts of the canton, about half of them from the city of Zurich. These differences can partly be explained by the type of development, rental housing in Burgunder (even though this development is partly self-administrated, the dwellings are advertised on "conventional" platforms) and Sihlbogen attracting more residents from beyond the city in which they are located. Nonetheless, nearly half of the cooperative housing residents of Giesserei have not lived in Winterthur neither. This project, promoted as a multi-generational house, had a certain visibility for interested persons in the whole region and therefore attracted residents from beyond the city. A tense housing market situation also came into play, as in Sihlbogen in Zurich.
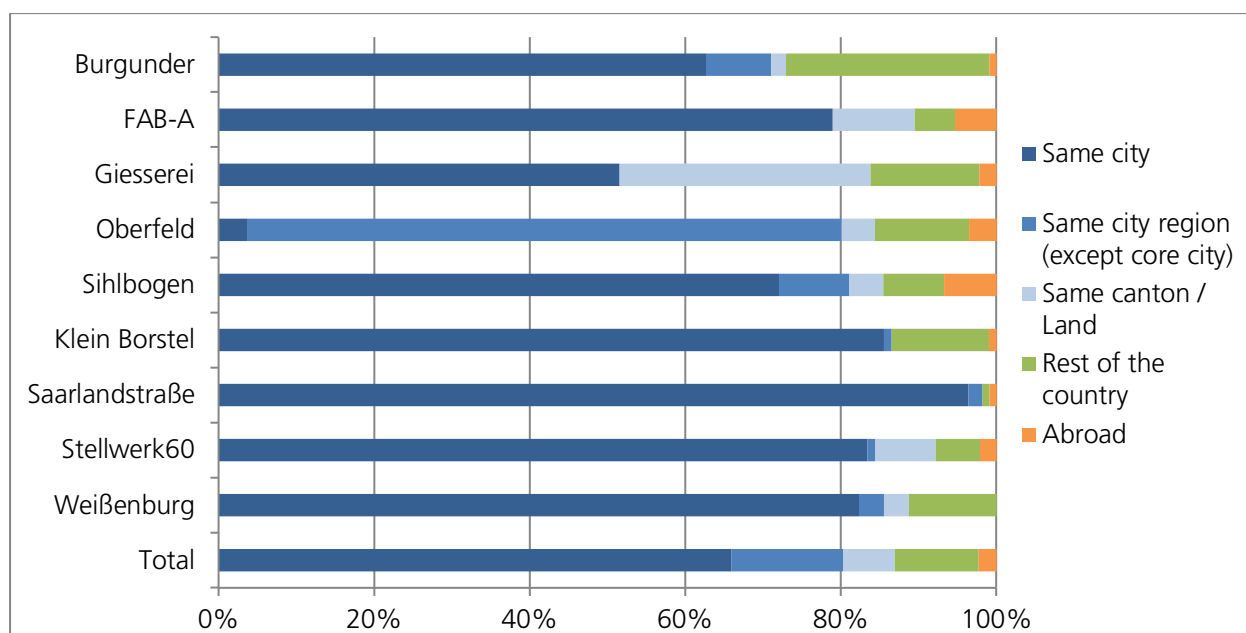
Figure 21: Previous place of residence (N=942)

In the interviews with the residents, their whole residential trajectory was addressed in order to understand if car-free living is related to a certain spatial context or if all types of trajectories are present. The residents can be grouped into four types, based on their former places of residence and the place where they grew up:

– **Residents who grew up (at least partly) and have always lived in the same city:** This concerns only three interviewees (two in Hamburg and one in Münster). Living one's whole life at the same place seems to have become uncommon nowadays.

– **Residents who grew up in the city or its agglomeration, but did not always live there:** Eleven residents (six in Germany, five in Switzerland) moved away for some time, typically when they were young, to study for example or for a job, and came back to the city

(region) they had grown up. The range goes from some years in a rural[57] area nearby to a longer period abroad.

– **Residents who grew up elsewhere, but lived in the same city before:** This is clearly the most common trajectory, it applies to 31 residents. This trajectory can further be separated into two types based on the place where a person grew up:
    – **Grown up in a rural context:** These 17 persons (10 in Germany) moved from their rural hometown to a city to study or work and stayed there, often it was already the city in which they live now. Most of these residents have always lived in an urban context since, for several reasons, often to be able to live without a private car.
    – **Grown up in an urban context:** The other 14 of these residents (only three in Switzerland) already grew up in an urban context and most of them never lived outside a city. As the former group, they left their hometown to study or for work. They were not all and always car-free, but for most, the amenities and accessibility given in a city was an important factor.

– **Residents living elsewhere before moving to the car-free housing development:** Finally, a small group of nine residents have never lived in the city before they moved to the car-free housing development, four of them grew up in a rural and five in an urban context.
    – **Grown up in a rural context:** Their characteristics are the same as the former group grown up in a rural context. Except one person living in a small town near a big city, they lived at least in a small city before they moved to the car-free housing development.
    – **Grown up in an urban context:** These residents also correspond to those described above, with the difference that they lived in another city before they moved to their actual place of residence.

To sum up, most residents lived in the city before or even grew up there, or at least lived for a long time in an urban context, where car-free living is more common and easier to realise. Rural places of residence appear only during childhood or for short periods during the residential trajectory and are often negatively connoted:

> *Ich bin geboren zwar in [small town in Schleswig-Holstein], das finde ich ein bisschen peinlich, weil ich als mein Geburtsort oder als meine ursprüngliche Herkunft eigentlich [big city in North Rhine-Westphalia] betrachte, weil ich da meine ersten vier Jahre verbracht habe, Eltern, Dachgeschosswohnung. Also vielleicht ein bisschen angestossen davon, also Grossstadt ist eher mein Ding als auf dem Land zu wohnen, das wäre überhaupt nichts für mich. Ich habe dann mit meinen Eltern in [rural region in Schleswig-Holstein] gewohnt, das fand ich ziemlich furchtbar, weil es gab nur wenig Bäume, nichts an Bergen, nur flach, es gab nur miserable Möglichkeiten irgendwelche Draussenspiele zu machen. Meine Eltern sind dann mit mir umgezogen nach Stade, also auch auf dem Land, auch eine Kleinstadt, auch nicht schön. Ich bin dann nach Hamburg gezogen, für mich war's natürlich, in eine Wohngemeinschaft gezogen und habe dann lange in einer Wohngemeinschaft gewohnt. Dann nach vier fünf Jahren bin ich mit zwei Männern zusammen gezogen auch in eine Wohngemeinschaft und ab dann habe ich alleine gewohnt und zwar anderthalb Kilometer weg von hier. [...] Diese WG in [district at about 10 km from Hamburg city centre], das waren nette Leute, leider fand ich [...] das fand ich ein bisschen zu weit draussen. Also das hätte ich netter gefunden, wenn es was weiss ich in [central district] oder näher, zu der Zeit habe ich studiert noch, näher an Uni und Stadtzentrum so.[58]*
> Man, 60, living alone, Saarlandstraße (SA04: 14 - 16)

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[57] The distinction between rural and urban is mainly based on the interviewees' statements and therefore rather qualitative. A rural context means low density and long distances between places of everyday life and is relatively car-dependent, whereas urban contexts are the opposite, places where car-free living is facilitated by shorter distances and cycling infrastructure as well as more developed public transport.

[58] The citations respect the Swiss orthographic rules of High German.

Finally, three households mentioned in the interviews that they moved within the car-free housing development. Two households moved to a bigger dwelling when a (second) child was born, one elderly resident switched to a smaller flat. This indicates their high satisfaction and attachment to the housing development.

6.4.5. Future housing plans

The residents' future housing plans were addressed in the interviews. Except one resident who has planned to move to another city where his partner lives, all other interviewees have no plan to move in a near future. This represents a first indication of their housing satisfaction (further details see 10.1). While few households have the idea to move in the future, all the others have no wish or plan to move:

> *Wir könnten uns auch nicht vorstellen, wegzuziehen.*
> Man, 40, couple with children, Burgunder (B1: 40)

> *Nein, also ich würde hier wirklich nur wegziehen, was weiss ich, wenn ich arbeitslos werde, mir die Wohnung nicht mehr leisten kann, wenn meine Rente nachher nicht reicht und ich krieg hier im Projekt keine kleinere Wohnung oder aus gesundheitlichen Gründen, wenn's mal sein muss.*
> Woman, 55, living alone, Saarlandstraße (SA01: 15)

> *So lange es geht, möchte ich hier bleiben [lachen]. Ich finde es sehr schön.*
> Woman, 55, childless couple, Saarlandstraße (SA06: 56)

Several residents also mentioned the possibility to live in the development once they are older, either because the building is adapted, or could be adapted or because their wish to live there is so strong—the community plays a central role, especially for persons living alone:

> *Ich möchte gerne hier wohnen bleiben. Was auch gleich Thema war, dass es hier 2. Stockwerk ist, in das ich klettern muss. Ich sag, Herrgott, irgendwas ist immer. Ich mache Sport, ich halte mich fit, wenn es tatsächlich irgendwie dumm kommen sollte, dass ich die Treppe nicht mehr schaffe, dann gibt's auch Treppenlifte oder was.*
> Woman, 65, living alone, Klein Borstel (K2: 22)

> *Es ist rollstuhlgerecht [lachen], das heisst es ist meine Vorstellung, bis ins hohe Alter zu bleiben, weil ich auch die Alters- und Generationendurchmischung finde ich Lebensqualität. Wenn ich mir vorstelle, im Alter nur mit Alten zu wohnen, das finde ich nicht gesund. […] Ich möchte gerne bleiben, es ist ideal, du kannst am Leben teilnehmen, hast noch Aufgaben. Ich wüsste nichts Besseres, auch wenn ich nicht mehr berufstätig bin oder im Alter*
> Woman, 55, living alone, Oberfeld (O5: 68)

For those residents having future housing plans, there are primarily two types. On the one hand, families where the parents chose the car-free housing development as a perfect residence with children, but can imagine to live in an older and more central city district later, especially those living in developments in the outskirts:

> *Dass es die Kinder gut haben und Nähe zur Natur ist mir im Moment wichtiger. Aber ich kann mir gut vorstellen, später wieder mal mitten in der Stadt zu wohnen.*
> Man, 45, couple with children, Oberfeld (O7: 46)

> *Es ist für mich immer ein Wohnen auf Zeit. Also für mich geht's halt auch drum zu kucken, wenn die Kinder aus dem Haus sind, wie geht's dann weiter, können wir dann wieder in die Stadt zurück oder bleiben wir hier, weil es aus bestimmten Gründen gut ist, hier zu bleiben.*
> Woman, 45, couple with children, Klein Borstel (K3: 6)

On the other hand, there are also people who imagine living, once they are retired, in a less central place where it is calmer and greener:

> *Ich könnte mir vorstellen, wenn ich mehr im Grünen wohnen möchte, wenn ich nicht mehr täglich nach Hamburg reinmüsste zur Arbeit später, dass man sagt, was weiss ich, so Richtung Endstationen von U-Bahnen und S-Bahnen, die so ein bisschen an den Stadtrand oder drüber hinaus,*

6.4.6. Comparison and discussion of dwelling characteristics and residential mobility

The occupancy status is another indication of the important difference between the car-free housing developments, and the municipalities in which they are located. In Switzerland, cooperative members represent only between 3% and 16% of the population, whereas three car-free housing developments are entirely cooperatives (see Table 39). In Germany, statistics include only owners and renters, cooperative members are not specified (they can be both, the comparison is thus less helpful; see Table 40). However, in Hamburg, they account for 20% of the *rental* housing market.[60]

	Burgunder	Bern	FAB-A	Biel/ Bienne	Giesserei	Winterthur	Oberfeld	Oster-mundigen	Sihlbogen	Zurich
Owners		16.6%		20%		25.2%		19.7%		9.0%
Tenants	100%	78.8%		68.5%		67.2%		73.9%	100%	74.6%
Cooperative members		3.4%	100%	9.8%	100%	6.5%	100%	5.1%		15.5%

Table 39: Comparison of the occupancy status in Switzerland[59]

	Klein Borstel	Saarland-straße	Hamburg-Nord	Stell-werk60	Köln III	Weißen-burg	Münster
Owners	56%	17%	33.6%	40%	26.7%		32.4%
Tenants		22%	66.4%	60%	73.3%	100%	67.6%
Cooperative members	44%	62%	[60]				

Table 40: Comparison of the occupancy status in Germany (cooperative members are not specified in the German statistics, only owners and renters)[61]

Car-free housing is, thus, quite a particular dwelling type. Cooperatives as well as owners organised in a "housing project" ("Wohnprojekt") play an essential role. This is partly due to the fact that collaborative housing is more innovative regarding ecological and social aspects, whereas the conventional housing construction sector is often mainly driven by the return on investment and minimising risks. Cooperatives, and particularly collaborative housing projects, are often small entities, created by future residents willing to realise a different housing type to what already exists and engaged for several years. In contrast, the little importance of owners, the least flexible way of housing, is in line with the general situation in Swiss and German cities.

Similarly to the few existing evaluations reporting the former place of residence of car-free housing residents in Hamburg, Cologne and Münster (Baier et al., 2004; Mantau, 2010), I found that a majority ranging from 52% up to 98% of the residents already lived in the same city or city region before. This is also in line with other studies on new-build inner-city residential areas

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[59] Source: Federal Statistical Office, Buildings and Dwellings statistics (BDS), cumulated data 2012-2016

[60] In Hamburg, the 30 housing cooperatives united in an association own 130,000 dwellings, corresponding to 20% of the city's *rental* housing market ('Hamburger Wohnungsbaugenossenschaften', 2019).

[61] Source: Der Bundeswahlleiter (2017b)

which found that most residents already lived in the neighbourhood or the (same or another) inner city before (Jarass & Heinrichs, 2014). These high shares as well as the low share of zero to 7% of residents that lived abroad before can be explained by the characteristics of most developments. To know about a cooperative or housing project, certain local knowledge is needed and the dwellings are not simply advertised on the conventional housing market.

The analysis of the residential trajectories shows a variety of types, even though an important majority have a strong relationship to the city in which they live, whether they lived there before or had already grown up there and came back to their origins. Thus, most residents already had an important local knowledge and experience of car-free living in a (at least similar) urban context. However, not all have grown up in an urban area. About one third of the interviewed residents lived in a more car-dependent rural environment during their childhood and youth, but they all left their rural hometowns at the "key event" represented by the begin of university studies or another education, taking place normally in a city of a certain size.

Finally, both the fact that many residents live in their dwelling since the development exists and the absence of concrete future housing plans—or even most residents' will to stay as long as possible—are two indications of the satisfaction of car-free housing residents. They also highlight its adaptability to all different stages of the life course—from young adulthood over family phase to retirement.

6.5. Differences between car-free and car-owning households

In this last chapter related to profiles, the car-free households in the two car-reduced developments are compared to the car-owning households in Stellwerk60 (n=56) and Giesserei (n=16). Comparing the occupancy status, it appears that the shares of owners and tenants are rather similar in Stellwerk60 for both groups of households, while in Giesserei there are only cooperative members. For the other characteristics, some important differences exist between car-free and car-owning households (see Table 41). As in general, persons living alone are more likely to be car-free. In Giesserei, the other household types have only minor differences between car-free and car-owning households, whereas in Stellwerk60, the shares of families and childless couples are clearly higher among households with cars. The net household income distribution shows only small differences in Giesserei, whereas in Stellwerk60, car-owning households have more often higher incomes. The results on the highest education level are, instead, similar in Stellwerk60, while in Giesserei more car-free households have an apprenticeship and less accomplished a professional college as highest education level.

These findings confirm to some extent existing knowledge about car-free and car-owning households, persons living alone and with lower incomes are more often car-free. However, given the very small number of households compared and the particular profiles of car-owning households, this comparison should not be overrated.

	Giesserei		Stellwerk60	
	Car-owning households (n=16)	Car-free households (n=51)	Car-owning households (n=56)	Car-free households (n=103)
Occupancy status				
Owners	-	-	44%	40%
Tenants	-	-	56%	60%
Cooperative members	100%	100%	-	-
Types of household				
Persons living alone	19%	39%	13%	35%
Childless couples	38%	31%	21%	13%
Couples with child(ren)	25%	22%	64%	46%
Single-parent families	13%	6%	2%	4%
Flat shares	6%	2%	0%	2%
Net household income				
<CHF 3,000/€1,000	0%	0%	0%	4%
CHF 3,- 6,000/€1,001 - 2,500	25%	34%	6%	19%
CHF 6,- 9,000/€2,500 - 3,500	50%	42%	22%	27%
CHF 9,- 12,000/€3,501 - 5,000	19%	18%	40%	27%
>CHF 12,001/€5,001	6%	7%	31%	22%
Highest education level				
No graduation (yet)	7%	6%	2%	5%
Compulsory school	3%	1%	1%	6%
Matura/Abitur	3%	4%	7%	11%
Apprenticeship	3%	14%	5%	5%
Professional college (Höhere Fachschule) etc.	38%	24%	5%	5%
University (of applied sciences)	45%	50%	79%	68%

Table 41: Comparison car-free and car-owning households

7. Why live (in a) car-free (housing)

This part answers the second research question with its two dimensions: why do households live car-free, and why have they moved to a car-free housing development (see Table 42). The first chapter addresses the reasons to live without a private car. The second investigates the housing choice. All analyses combine results from the survey and the interviews with residents. But to start, there is a short excursus presenting the motivations of the car-owning households living in the two car-reduced developments.

Chapter	Dimensions	Variables
7.2	**Reasons to live car-free**	Deliberate choice
		Practical reasons
		Financial reasons
		Personal reasons/convictions
		Other reasons
		Meaning of the car
7.3	**Reasons to move to a car-free housing**	Location/mobility
		Dwelling characteristics
		Development characteristics
		Residents of the development

Table 42: Overview of the chapter on reasons to live (in a) car-free (housing development)

7.1. Excursus: Motivations of car-owning households

Before we focus on the car-free households' motivations, the few car-owning households living in the two car-reduced developments of Giesserei and Stellwerk60 are addressed. Overall, 74 of the 561 households answering this question declared owning a car (13.2%). They represent 24% of all households in Giesserei and 35% in Stellwerk60. The first is a bit higher than the 0.2 parking spaces per dwelling that would allow 20% of the households to own a car. The second is clearly above the 0.18 and, thus, reflects the problems this development has (see 5.2.3). More surprisingly, two households in two German car-free developments have stated owning a car, even if this is not allowed, and both also want to keep it.

The car-owning households in Giesserei and Stellwerk60 mentioned 56 reasons why they own a car in the open question in the survey. The most important (11 mentions) is holidays or leisure, followed by professional reasons (9), independence, flexibility or comfort (8), visiting relatives and friends (7) and children (6). Other reasons are disabilities or disabled persons in the household (4), shopping/transport (4), accessibility with other means of transport (4) and three households argued that they owned a car before. Thus, except the nine households mentioning professional reasons, the (real or perceived) inaccessibility of leisure activities (including holidays and visiting relatives and friends) plays the most important role to own a car.

Only a small minority of these households plans to give up the car: three in Giesserei (19% of the car-owning households) and six in Stellwerk60 (11%). Six of them mentioned their motivations: three stated the age of the car (as soon as it breaks down, they will not replace it), one person a job change and another the low need. A last household mentioned ecological reasons and has already started selling the car. The reasons to keep the car are similar to those mentioned for owning a car: six out of 26 households just mentioned, "*see answer before*". Three other households wrote as a reason that a car is needed. Several other reasons were mentioned: the car is shared (2 households), luxury (2), loss of mobility (1), nostalgia (1) and "*not the right moment*" (1).

7.2. Reasons to live car-free

After this excursus, we now focus again on car-free households and one of the main research questions of this thesis, understanding why a household lives without a private car. First, the question if car-free living is a deliberate choice for the residents is answered. Then, the different reasons to live car-free are presented, including the meaning the car has for the residents. Answers to the closed and open survey questions as well as from the interviews are combined to analyse the motivations for car-free living.

7.2.1. Choice to live car-free

It already appeared in several results of the residents' profiles, and both the survey and the interviews confirmed it: nearly all residents live car-free by choice. In the survey, almost all households agreed to the statement "*My household lives deliberately without a car*" (see Figure 22). In every development, at least 90% of the households live voluntarily car-free, except in Sihlbogen (80%) where probably many households accept a car ban to get a dwelling on the difficult housing market in Zurich. All the cooperative housing projects reach nearly 100%. In absolute numbers, only between one and three households per development (except ten each in Sihlbogen and Stellwerk60) reject voluntariness.
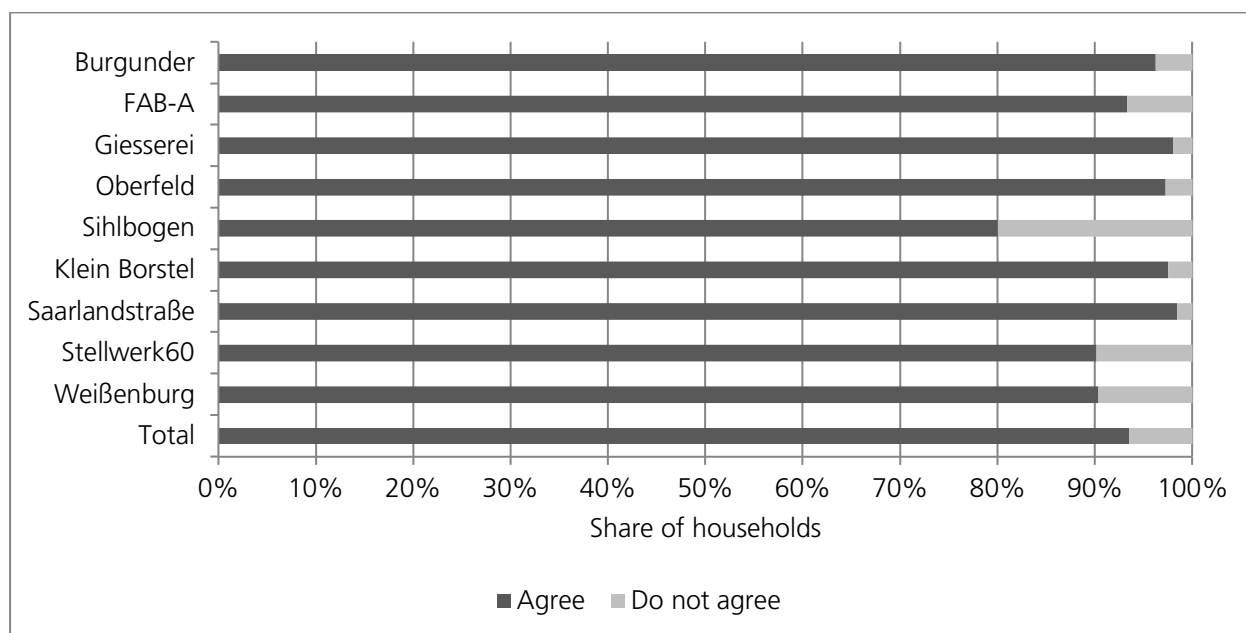
Figure 22: Share of answers to "my household lives deliberately without a car" (N=474)

The survey did not allow to understand what this deliberate choice means, for example if residents choose deliberately to make a sacrifice by living car-free. The interviews shed light on this, numerous respondents mentioned that living without a private car represents no sacrifice or restriction for them—and no one mentioned the opposite:

> *Insofern ist es nicht, nie das Gefühl von Verzicht und Verlust gewesen, sondern eher von gebe ich das Geld für Schokolade aus oder für Cola aus. Dann entscheidet man sich für das Gut, was man höher schätzt und dadurch hat man aber nicht den Verlust, ich esse eine Schokolade also verzichte ich auf Cola, sondern ich freue mich, dass ich Schokolade esse.*
> Man, 55, childless couple, Saarlandstraße (SA02: 48)

> *Für mich ist das überhaupt kein Verzicht, ich glaube das funktioniert auch nicht.* […] *Man muss irgendwie so leben, dann ist es einfach eine totale Bereicherung.*
> Woman, 55, living alone, Saarlandstraße (SA11: 8)

Es ist ein Luxus für mich, so zu leben, und kein Verzicht.
Man, 40, couple with children, Weißenburg (W7: 187)

This is an important aspect for the analysis of all the results: the residents chose (at least more or less) deliberately to live car-free and are not constrained to do so, as we will see in the following sections of this chapter.

7.2.2. Overview of the reasons to live car-free

Before addressing the different types of reasons to live car-free more in detail, this section provides an overview based on the results of the survey. To understand why the residents live car-free, the survey contained, first, an open question on this topic, as well as, later in the questionnaire, a closed question. This method was chosen to receive a spontaneous answer and not influence the respondents, but also get their evaluation of the most important motivations to live car-free found in the literature (as explained in 2.4.3).

In the open question, 327 households stated over 700 reasons why they live without a private car (the number of motivations was limited to three in the questionnaire). They were categorised into the types of reasons of the closed question (see below) and additional ones were added for other responses. Three types clearly stand out: environmental reasons, no need and the alternative mobility offer. They were all mentioned by over 35% of the households answering this question (see Figure 23). Even if the absence of a need for a car reaches nearly the same score, environmental reasons are the most often cited motive. Their importance is emphasised by the fourth most important motivation, "other personal reasons" (20%). It contains convictions that were not further detailed, for example just *"out of conviction"*. Together with environmental reasons, personal motivations reach 60% and show the importance of altruistic values or extrinsic motivations for the residents. The category "other financial reasons", including the preference to spend money on other things, arrives in fifth place. The two other motivations found in the literature are of little importance, both the affordability of a car and health or age were mentioned by less than 13% of the respondents. Some other motivations appeared in the open question. About 13% stated that a car is unnecessary or impractical in the city. The car ban in the development was mentioned by 12% of the households. This indicates that some households chose to live in a car-free housing development *despite* the car-freeness and gave up (or did not buy) a car for this reason. Some other households mentioned the negative aspects of a car (ranging from the too important amount of space cars need in the city to the burden they represent for an owner), the absence of a driving licence or the fact that they never ever owned a car.

At the development level, some differences appear (see Table 67 in the Appendix), especially for the environmental reasons. In Sihlbogen and Weißenburg only about 18% mentioned them spontaneously, while in Klein Borstel 61% did so, as well as half or more in FAB-A (50%), Giesserei (57%) and Saarlandstraße (51%). In Burgunder, 60% stated that they do not need a car, while in the other developments this reason attained only 27% to 43%. Personal convictions play a very important role in both car-free sites in Hamburg with about 40% of the households mentioning them. Added to the scores of the environmental reasons, convictions reach about 100% in Klein Borstel and Saarlandstraße. In Weißenburg, more than one third wrote that a car is unnecessary or impractical in the city, in Klein Borstel still 22%. Finally, the car ban was mentioned by about 30% in Sihlbogen and Klein Borstel and 18% in Weißenburg but less than 10% in Oberfeld and Saarlandstraße, indicating where this was a central motivation for residents or more a bullet to bite.
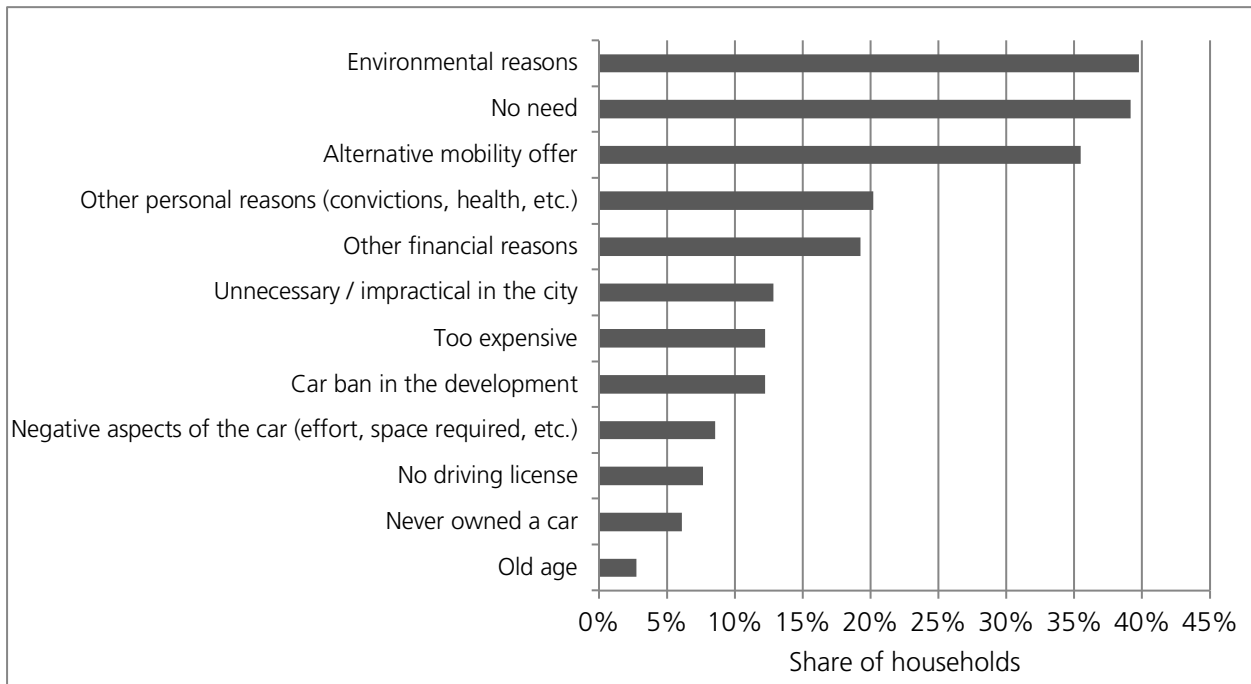
Figure 23: Reasons to live car-free mentioned in the open question in the survey (N=327)

The closed survey question included six elements to which respondents could agree or not. Considering their importance, three types of reasons appear (see Figure 24): two each are very important (over 95% of agreement), important (over 70%) and unimportant (less than 20%). The two top motivations are "there are enough alternatives to a private car" (97%) and "my household doesn't need a private car" (96%). Then follows "my household prefers to spend the money on other things" (85%) and "my household doesn't have a car for environmental reasons" (74%). The last two motivations reach very low scores: only 18% state "my household can't afford a car" and 9% "I/we don't drive (anymore) for health reasons".
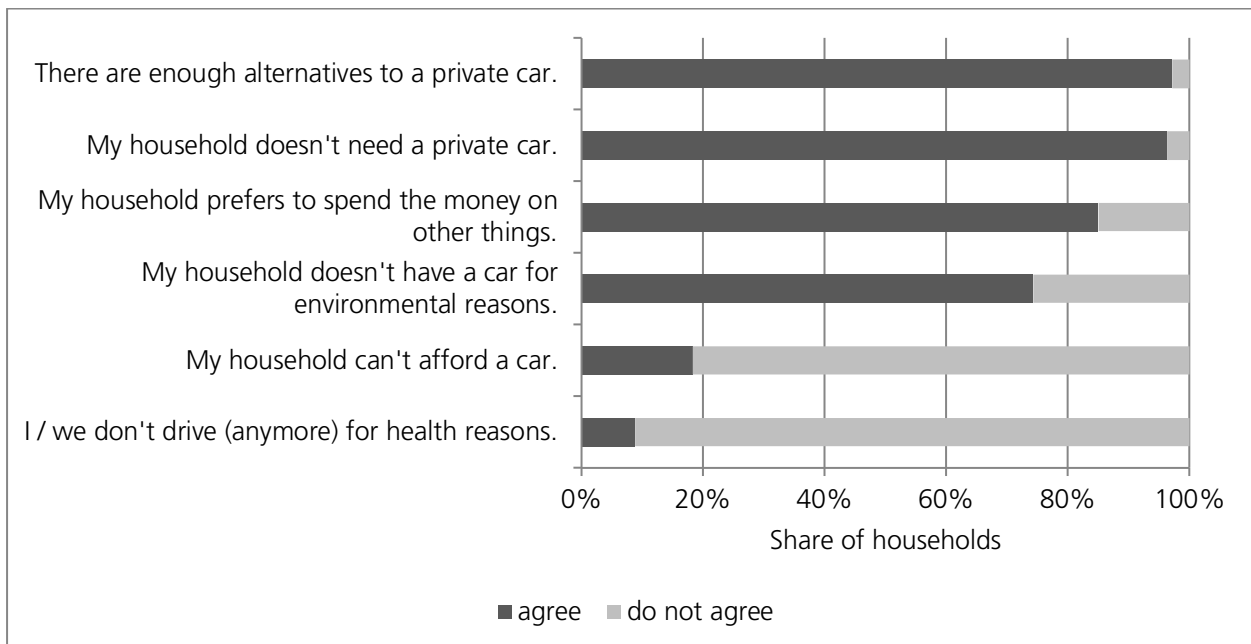
Figure 24: Reasons to live car-free, results of the closed question (N=468 to 481)

The two main motivations both reach at least 88% of agreement in every car-free housing development, going up to 100% in several cases. Similar to the open question, several differences appear between the developments (see Table 68 in the Appendix). Again, Sihlbogen contrasts most,

for nearly all reasons. The highest differences concern the environmental reasons: only 38% agree, whereas in the other developments at least 68% do so. Weißenburg, entirely subsidised housing, stands out regarding the affordability of a car: 37% agree, compared to 7% to 23% in the other developments. This development in Münster also has a slightly lower agreement for the alternatives and the absence of a need, probably due to a context of a city with a less developed public transport network. The health reasons mirror, in part, the age distribution—where more elderly people live, this share is higher.

Comparing both questions on the motivations to live car-free, it appears that the results are similar (see Figure 25). Four of the five most important factors in the open question are among the most important reasons in the closed question, the two other elements of the closed question were much less important in both questions. Surprisingly, the environmental reasons appeared to be the most important motivation in the open question. Or, at least ecological motivations were mentioned as often as "no need" and "alternative mobility offer", whereas in the closed question, the two latter are clearly more important.
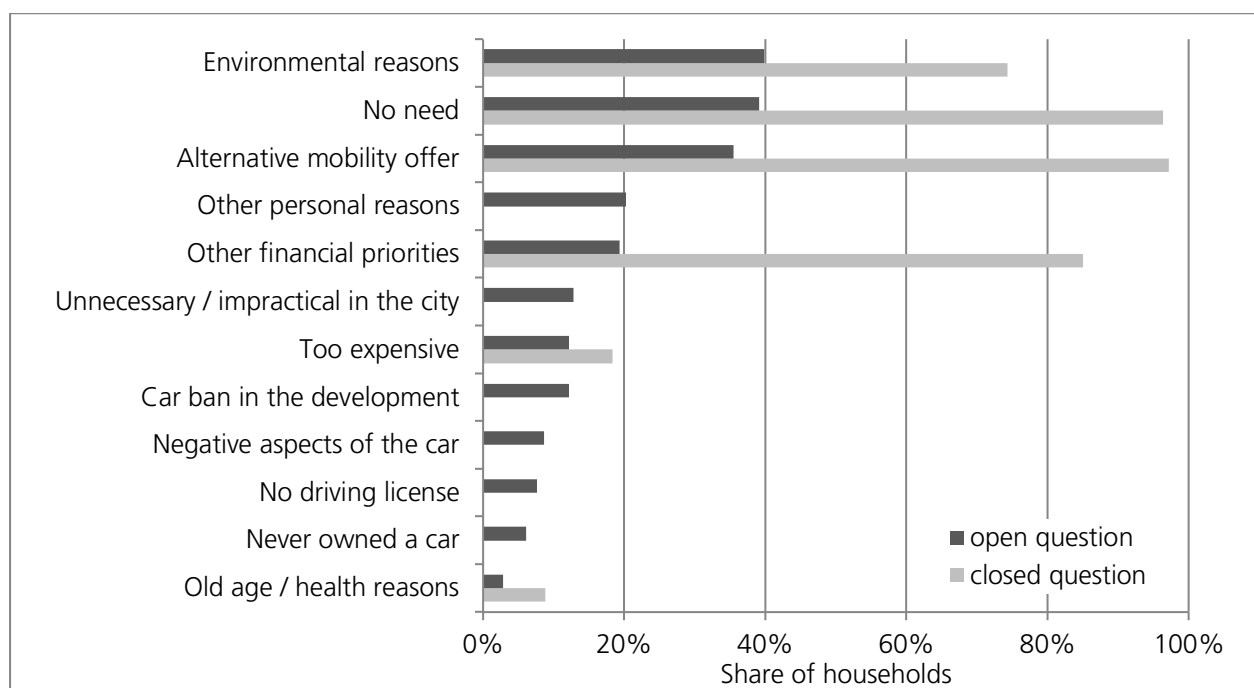
Figure 25: Comparison between the open (N=327) **and the closed question** (N=468 to 481)

Similar results appeared in the interviews (see Figure 26). While nearly all respondents mentioned practical and personal motivations to live car-free, only about half spoke about financial reasons. Only very few stated other reasons. Confirming the survey results, health and age have a very small importance. A couple of other single elements appear, ranging from technologies making it easier to live car-free nowadays to the car ban in the development. In the following sections, the three types of reasons to live car-free are detailed: the two major, practical and personal reasons, and the minor, financial reasons. Then, the different combinations of these motivations are addressed. Finally, the meaning of a car for residents is analysed.

City adapted for car-free life
Not like cars / negative to individual mobility
Savings without a private car
Be tired of cars / driving / negative aspects of a car
Demonstrate that is possible to live car-free
Ecological convictions
Freedom/liberty/liberation/relief Too expensive Alternative mobilty offer No need
Use not own (share) vehicles Age / health reasons No car in the city
Other reasons Personal conviction, not be missionary Will to live car-free
Car-free habit / normal to live car-free
Preference to spend money for other things
Move self, personal well-being
Other personal convictions / altruistic reasons

Figure 26: "Code cloud" showing the importance of reasons to live car-free mentioned in the interviews (the size corresponds to the frequency a code was attributed, source: MAXQDA)

7.2.3. Practical reasons

Two different types of practical reasons appear: aspects related to the individual and to the context (see Table 43). The first refers to the mobility capital and the second to the hosting potential of a territory. However, as mentioned before, the individual is rarely completely alone, especially his or her household has a certain influence on motivations to live car-free. And contextual reasons always depend on the individual's characteristics. Attractive alternatives and the adaptation to live car-free are not something completely objective, but different for every person and also influenced by the household in which one lives.

Individual practical reasons	– No need – Car-free habit – Negative aspects of owning or driving a car – Share and use, not own vehicles
Contextual practical reasons	– Alternative mobility modes – City adapted for car-free life

Table 43: Types of practical reasons

7.2.3.1. Individual practical reasons

As for the individual practical reasons, about half of the interviewees mentioned explicitly the absence of a need to own a private car, personally and for their entire household:

> *Wir haben absolut keinen Bedarf nach Auto. Also es ist auch nicht eine Weltanschauung, es ist einfach, ich wüsste nicht, was ich machen sollte mit einem Auto [lachen].*
> Man, 70, childless couple, Burgunder (B2_M: 18)

> *Das ist selbstverständlich, dass ich kein Auto brauche und keins habe.*
> Woman, 50, living alone, Oberfeld (O6: 76)

In these citations appears a second element many respondents mentioned: a car-free habit—for many residents it is just *"normal", "obvious"* or *"self-evident"* to live without a private car:

> *Für mich ist das wie normal gewesen. Wir leben in einem Land, in dem du fast in jedes Kaff mit öV kommst, nicht grad zu jeder Zeit, aber wenn du dich etwas gewöhnt bist, dich so zu arrangieren, kommst du problemlos zurecht. Für mich ist es normal.*
> Man, 40, couple with children, Burgunder (B6: 10)

Ich glaube ich bin es so gewohnt, glaub ich wirklich. Das ist einfach nicht mehr, ja, ich brauche es einfach nicht. Meine Freundin, die ist jetzt wieder demnächst im Urlaub, sagt sie: „Dann kannst du ja mein Auto haben", sag ich: „Ja, brauch ich aber nicht" [lachen].
Woman, 55, living alone, Saarlandstraße (SA01: 73)

Das ist für mich selbstverständlich. Ich lebe jetzt wirklich schon bald 30 Jahre ohne Auto, das ist irgendwann wie Zähne putzen.
Woman, 70, living alone, Saarlandstraße (SA12: 133)

Another reason was mentioned by about half of the interviewees: negative practical aspects of owning a car or the fact of being tired of cars or driving, in the city especially:

Früher sind wir dann mit dem Auto an die Ostsee gefahren, dann war ich schon immer unentspannt, weil ich dann wusste, wir kommen in den Stau, und das dauert so lange, und ich bin dann so todmüde, dann ist die Erholung hin. Das sind echte Vorteile mit der Bahn.
Woman, 50, single-parent family, Klein Borstel (K1: 78)

Es fing auch an mich zu nerven, dass ich mich ewig um alles kümmern muss, Winterreifen, Ölwechsel, Versicherung und was es da alles gibt.
Woman, 65, living alone, Klein Borstel (K2: 18)

Finally, the idea of using and sharing, not owning, vehicles, is often an important reason for car drivers to live car-free:

Ich will ja gar nicht auf ein Auto komplett verzichten, ich brauche nur einfach überhaupt keins besitzen. Es ist mir auch viel zu anstrengend, mich darum zu kümmern, für die Male wo ich real ein Auto brauche.
Man, 40, couple with children, Weißenburg (W7: 32)

7.2.3.2. Contextual practical reasons

The other type of practical reasons is related to the spatial context and particularly to available alternatives to a private car. All modes are mentioned, from walking and cycling over public transport to carsharing, or taxis and even in the case of an emergency:

Mit Rad und öffentlichen Verkehrsmitteln kommt man ja eigentlich überall hin, und wenn's dann wirklich mal weiter weggehen soll, dann haben wir hier die Anbindung an Stadtteilauto [carsharing].
Woman, 40, couple with children, Weißenburg (W3_F: 14)

Wir haben die U-Bahn irgendwie direkt 2 Minuten vor der Nase, wir haben zig Bushaltestellen, Barmbek mit S- und U-Bahn auch fussläufig 5 Minuten, wozu brauch ich da ein Auto?
Man, 45, couple with children, Saarlandstraße (SA05: 4)

Viele haben ja das Gefühl, du musst ein Auto haben, unbedingt, wenn mal was passiert mit den Kindern, dann musst du doch zum Arzt können. Mir ist noch nie sowas passiert, aber dann hat es ein Mobility hier. Wenn es nicht verfügbar ist, rufst du ein Taxi und wenn du nicht auf ein Taxi warten kannst, musst du halt die Ambulanz holen. Ich hatte wirklich nie das Gefühl wegen dem müsste ich ein Auto haben, ich sehe wirklich keinen Grund [lachen].
Man, 45, couple with children, Oberfeld (O7: 80)

Besides such more specific reasons, even more respondents mentioned that, in general, cities—and also especially the city they live in—are adapted for a car-free life:

Also in Bern braucht man es ja nicht.
Woman, 65, single-parent family, Oberfeld (O3: 14)

Letztlich braucht man in Hamburg, wenn man jetzt nicht in einem wirklich extremen Randgebiet lebt, braucht man kein Auto, weil hier Tausende U-Bahnen fahren, Busse fahren, es ist wirklich unglaublich gut angeschlossen. Ich meine, inzwischen hat sich dann ja auch noch die Kultur der Carsharers, Autoteilung, Cambio und so weiter, entwickelt. Die Stadtfahrräder, die an jeder Ecke stehen.
Woman, 55, living alone, Saarlandstraße (SA01: 6)

Ich brauche es wirklich nicht in der Stadt Zürich.
Woman, 30, flat share, Sihlbogen (SI5: 8)

Ein Auto braucht man in Münster sowieso nicht.
Man, 65, childless couple, Weißenburg (W9: 3)

7.2.4. Personal reasons

Personal motivations are related to three different types: personal convictions, personal preferences and negative attitudes towards cars (see Table 44).

Personal convictions	– Environmental convictions
	– Be a good example
	– Other personal convictions
Personal preferences	– Preference for other mobility modes
	– Liberty or relief to live car-free
Negative attitudes towards cars	– General negative attitude towards cars
	– Negative attitude towards cars in cities
	– Irrationality to own a car

Table 44: Types of personal reasons

7.2.4.1. Personal convictions

By far the most important personal reason to live car-free, in the interviews as well as in the questionnaire, are environmental convictions. However, the range of these convictions is broad, beginning by mentioning ecology only as one among other reasons:

Natürlich hat es auch einen ökologischen Aspekt.
Woman, 34, single-parent family, Oberfeld (O8: 8)

Klar, im Hinterkopf hat man natürlich auch so Umweltaspekte, aber das ist jetzt ein Grund von vielen so.
Man, 45, couple with children, Saarlandstraße (SA05: 4)

In contrast, for many respondents, living without a car is more essential and part of a broader aim to live sustainably:

Ich kann nicht viel tun, aber das, was in meiner Verantwortung steht, das kann ich tun. Ob's nun ökologisch ist, dass ich kein Auto fahre, dass ich möglichst wenig Müll verursache, oder im Sozialen, dass ich mit meinen Mitmenschen freundlich und respektvoll umgehe. Das sind alles so Sachen, die kann ich machen und vielleicht kann ich damit meine Umwelt ein ganz klein bisschen beeinflussen.
Woman, 65, living alone, Klein Borstel (K2: 98)

Für mich ist sozusagen autofrei die Konsequenz aus einem übergeordneten Anspruch, ökologisch und nachhaltig zu leben. Das bedeutet nicht, dass ich vollständig aufs Auto verzichte, sondern dass ich es da einsetze, wo es sinnvoll ist.
Woman, 45, couple with children, Klein Borstel (K3: 14)

Gut, sicher, das will ich natürlich drin haben, ökologische Gründe [lachen]. Für mich war Mobilität immer einer der Haupttreiber, in Sachen wieso geht's der Umwelt so schlecht. Ich bin umweltbewegt seit den 80er-Jahren, für mich war Mobilität immer ein wichtiger Grund, das ist für mich selbstverständlich. […] Für mich, das kann ich so sagen, ideologische Gründe, Umweltgründe, gegen das Auto, gegen das Fliegen auch, das sowieso, das noch stärker. Und das andere, die opportunistischen Gründe, die viele irgendwie, ich hätte spontan auch grad so reagiert, man stellt das Umweltargument, habe ich manchmal das Gefühl, unter den Scheffel, das will ich nicht wirklich sagen, sage ich doch einfach ich brauche es nicht.
Man, 50, living alone, Sihlbogen (SI1: 10)

This last citation indicates that maybe not all respondents gave the environmental convictions the appropriate weight. During the interviews, this aspect could also appear later and, thus, its significance for a person better understood when he or she mentioned environmental aspects regarding other issues.

Several residents are also motivated to live car-free in order to be *"a good example"*. They want to demonstrate that it is possible, to everyone or/and to their children, sometimes even to (try to) convince other people to do so, or at least to make them think about mobility, and cars especially:

> *Zudem finde ich es wichtig, bei diesem Thema auch ein gutes Vorbild zu sein und zu zeigen, zum Beispiel auch meinen Kindern oder Angehörigen, Freunden, dass es auch so geht, ohne Einschränkungen.*
> Woman, 40, couple with children, Burgunder (B4: 69)

> *Ich würde auch gerne meinen Enkelkindern erzählen, ich habe nicht so viel dazu beigetragen, oder ich habe dazu beigetragen, dass ich nicht so viel Emissionen, also das Fahrgerät, ausgeschüttet hat. Ich würde gerne das erzählen können, dass ich eine Haltung habe, die sich blicken lassen kann. Aber gar nicht mit so einem hohen ethischen Anspruch, sondern einfach so, weil ich dieser Mensch bin.*
> Woman, 50, single-parent family, Saarlandstraße (SA03: 17)

On the opposite, a few interviewees emphasised that they do not want to be *"missionary"*, that it is simply their personal decision or conviction:

> *Zeigen, dass es geht, muss ich nicht unbedingt, eigentlich ist das für mich klar, dass es geht und für die Leute, die sich dafür interessieren, denke ich, könnte es auch klar sein. Also von daher, es ist meine persönliche Entscheidung, das zu machen, auf bestimmte Sachen zu verzichten.*
> Man, 60, childless couple, Weißenburg (W1: 44)

As in the questionnaire, during the interviews, several residents mentioned other types of personal convictions, beyond environmental concerns. They range from a simple "*I do not want to have a car*" to various arguments related to health, land use, a contribution to a better society or for posterity:

> *Ich möchte nicht mit Preisen überhäuft werden, aber ich lebe schon im Bewusstsein, dass das die zukünftige oder dass das die sinnvolle Form ist, um in der Stadt zusammen zu leben, um die Abgase zu minimieren, den Lärm zu minimieren um mehr Flächen zu haben, die anders genutzt werden können als für Parkplätze, als Spielflächen, als Grünflächen.*
> Woman, 45, couple with children, Klein Borstel (K3: 24)

> *Dabei lebe ich so gesund, warum sollte ich Auto fahren? Und wenn man sowas erlebt, will man kein Auto haben, weil man merkt, dass es klappt ohne Auto.*
> Woman, 45, couple with children, Klein Borstel (K6: 127)

> *Wenn man ein Auto weggibt, dann entbehrt man auch etwas dafür, man könnte sagen, dass man dort sich andere Gedanken macht und die Welt als weniger als nur etwas, wo ich nur meine individuellen Ziele erreichen möchte, dann ist es wie ein Beitrag an etwas Grösseres, Ganzes, dann bekommt es auch einen positiveren Wert, man tut auch etwas dafür, nicht im Sinn von sich selbst kasteien, sondern dass es ein Beitrag ist [...] Es gibt mir auch ein gutes Gefühl zu sagen, ich verzichte aufs Auto fahren, es ist ein Beitrag für die Allgemeinheit.*
> Man, 40, couple with children, Oberfeld (O4: 28)

> *Ich bin ausgebildeter Ökonom und ich kenne das unter „selfish altruism", das heisst, wenn man so was macht, klopft man sich auf die Schulter und sagt sich, ich mach was Gutes und das ist mir mehr wert als der Komfort irgendwie mit dem eigenen Auto durch die Gegend zu fahren. Das ist eine Werteabwägung.*
> Man, 55, childless couple, Saarlandstraße (SA02: 26)

7.2.4.2. Personal preferences

The second type of personal reasons are preferences, especially to use other mobility modes, for example taking public transport instead of being alone in a car or using active modes for personal well-being:

> *Ich finde es einen riesigen Mehrwert, öV fahren zu können und unter die Leute zu kommen, obwohl ich die nicht gleich kennen lerne, aber es ist ein Mehrwert. Es gibt mir ein besseres Gefühl, als nur mit dem Auto rumfahren.*
> Woman, 30, flat share, Sihlbogen (SI5: 88)

> *Weil es mir guttut, diese Bewegung. Wenn ich es jedes Mal anstrengend finde, wäre ich längst ausgestiegen, autofrei zu leben.*
> Woman, 45, couple with children, Klein Borstel (K6_F: 125)

For several residents, particularly persons who owned a car before, car-free living represents a liberty or a relief, because owning a vehicle includes many constraints:

> *Es ist eine Erleichterung, dass ich mich nicht mehr um so ein Fahrzeug kümmern muss, ich habe es auch als Befreiung erlebt.*
> Man, 70, childless couple, Oberfeld (O1: 106)

> *Für mich ist es ein Stück Freiheit. Wenn ich den ganzen Stress jetzt höre, mit dem Diesel und so, denke ich mir immer nur: wie gut, dass ich diese Probleme nicht habe [lachen].*
> Woman, 60, living alone, Weißenburg (W5: 66)

> *Da ist kein Verzicht für mich, im Gegenteil, es ist Freiheit, jemand anderes kümmert sich um meine Autos und stellt die mir fertig gewartet dahin.*
> Man, 40, couple with children, Weißenburg (W7: 113)

7.2.4.3. Negative attitudes towards cars

The third type of personal reasons identified in the interviews is a negative attitude towards the car. The strongest version is a general rejection of cars:

> *Autos braucht es nicht, vor allem in der Schweiz, das ist meine Einstellung.*
> Man, 40, couple with children, Burgunder (B1: 6)

> *Ich hoffe, dass irgendwann das Öl alle ist, dass die Leute endlich mal von diesen blöden Kisten runtersteigen. Ich finde die sind lebensgefährlich, die nehmen Platz, die Autos, die versauen die Luft. Ich finde man muss keine Autos haben. Man sollte die Schienen wieder zurück bauen, den öffentlichen Nahverkehr verbessern. Ich finde Privatautos kann man abschaffen.*
> Woman, 75, childless couple, Saarlandstraße (SA09: 124)

> *Wir leben autofrei, weil wir keine Autos mögen [lachen].*
> Woman, 40, couple with children, Weißenburg (W3_F: 184)

Others are less radical and argue more specifically they do not want to own a car in the city, because cars and cities do not go together:

> *Ich hatte auch selber ein Auto, aber in der Stadt sicher nicht, da hat man auch andere Möglichkeiten, das hatte ich schon als Student intus, dass man nicht in der Stadt rumfahren sollte mit dem Auto.*
> Man, 70, childless couple, Burgunder (B2_M: 47)

> *Ich bin nicht dogmatisch autofrei, ich bin autofrei, weil es keinen Sinn hat, in Eimsbüttel [central district of Hamburg] Parkplätze zu suchen. [...] Ich finde Auto für Städte keine angemessene Lösung. Also es muss über den öffentlichen Nahverkehr geregelt werden, über Carsharing, Fahrräder. Das kann doch nicht sein, dass da alle mit Autos durch die Gegend fahren, das finde ich völlig irre, ich finde Autos gehören sinnvoll eingesetzt, da wo sie hingehören [lachen].*
> Woman, 45, couple with children, Klein Borstel (K3: 10-12)

Ich finde unsere Städte sind viel zu fest dominiert vom Auto [lachen]. Ich finde es eigentlich sehr schade, man könnte den öffentlichen Raum sehr viel ansprechender gestalten, wenn man weniger Autoverkehr hätte.
Woman, 50, living alone, Oberfeld (O6: 6)

Ich wünsche mir wirklich autofreie Innenstädte, weil ich finde, dass Autos in Grossstädten auch nicht notwendig sind einfach. Mit öffentlichen Verkehrsmitteln und Fahrrad und zu Fuss kann man alles erreichen in der Stadt.
Woman, 40, couple with children, Weißenburg (W3_F: 174)

Finally, what is perceived as the irrationality to own a car was also mentioned as a reason to live car-free:

Es gibt, wenn man's durchdenkt – Zeit, Geld – wenig rationale Gründe ein Privatauto zu haben. Es gibt möglicherweise berufliche Konstellationen, was auch immer, aber in aller Regel kann man das durch die Wahl des Wohnorts ausschliessen und wenn man dann mal Zeit, also es ist einfach rationaler, es ohne zu machen.
Man, 55, childless couple, Saarlandstraße (SA02: 26)

7.2.5. Financial reasons

While only very few interviewees mentioned that they cannot afford a car, two types of equally important financial motivations appeared in the interviews. First, the preference to spend money for other things even if the household could afford a car (corresponding to an item in the survey questionnaire):

Ich hätte mir kein Auto leisten wollen.
Woman, 55, couple with children, Klein Borstel (K7: 32)

Mich hätte auch das Geld gereut, ich habe immer Geld gespart, um zu reisen irgendwo […] Das war mir wichtiger, ich hatte nie die Idee 20'000 oder so für ein Auto hinzublättern.
Man, 45, couple with children, Oberfeld (O7: 58)

Two respondents also mentioned (work) time, not money, they prefer to spend for something else:

Da ist mir die Zeit zu kostbar, ich will für das Geld sinnvollere oder andere Sachen machen oder mehr Zeit haben einfach. Und da denken ja viele nicht drüber nach, dass sie einfach um ein Auto zu haben erstmal ziemlich viel von ihrer Lebenszeit geben müssen.
Woman, 50, childless couple, Weißenburg (W6_F: 46)

Second, there is a more neutral mention of the savings of living without a private car, without saying if the household could afford it or not:

Es ist ja viel billiger auch so zu leben, muss man ja auch ehrlich sagen.
Woman, 50, couple with children, Klein Borstel (K5: 112)

Ich meine, rechne, auch ein bescheidenes Auto sind 10'000 Franken im Jahr.
Man, 70, living alone, Sihlbogen (SI2: 2)

7.2.6. Combinations of reasons to live car-free

After the presentation of the different reasons, it is interesting to understand how they are combined. As the following quote shows, indeed, often a complex combination of motivations was cited when I asked a resident, *"why do you live car-free?"*:

Es ist natürlich auch so ein bisschen sportlicher Ehrgeiz, der sich dann so entwickelt. Also erstens war das die Eintrittskarte hier, das war sozusagen die Voraussetzung, und wir haben gesagt, wir schaffen das, wir fahren einfach viel mit dem Fahrrad. Ich bin mit Fahrrad gross geworden, meine Mutter hat auch die Familieneinkäufe mit dem Fahrrad hingekriegt, warum sollen wir das nicht schaffen. Ja, und natürlich sind wir ökologischer Gesinnung, ich bin in der Öko-Bewegung gross geworden und wo man da was zu beitragen kann ist das gut. Ich find's auch schön, dass die Kinder damit jetzt gross werden, einfach zu merken man kann sich auch selber mit seiner eigenen Kraft

gut fortbewegen, die kennen das ja gar nicht anders. Ist natürlich auch viel gesünder für einen sel-
ber, ich arbeite viel, und dadurch, dass ich meine ganzen Arbeitswege mit dem Fahrrad mache,
brauch ich nicht mehr ins Fitnessstudio zu gehen.
Woman, 50, couple with children, Klein Borstel (K5: 16)

Actually, in the interviews, all respondents stated at least two different types of reasons and several said explicitly that a combination of reasons makes them live without a private car. Overall, four types of combinations can be found (with the number of interviewees corresponding to each type in brackets to get an impression which are more common):

– Personal reasons predominant, practical reasons secondary (23)
– Practical reasons predominant, personal reasons secondary (12)
– Practical, personal and financial reasons important (11)
– Practical and financial reasons important (4)

As the numbers show, for nearly all of the residents, it is a combination including personal and practical reasons. The most important group are respondents who state primarily strong (ecological) convictions or other personal motivations not to own a car and mention practical reasons as secondary:

Also sicher einerseits aus Überzeugung und andererseits auch weil es rumstehen würde, weil wir
keins brauchen.
Woman, 35, couple with children, Burgunder (B5: 6)

Ich bin sehr froh, dass ich kein Auto habe, erstens aus dem Grund, weil ich meine, dass die Autos
sehr viel zerstören. Und ausserdem bin ich ganz persönlich froh, dass ich kein Auto habe, weil ich
dann weniger Sorgen habe und weniger verwalten muss und mich um weniger kümmern muss.
Woman, 75, living alone, Klein Borstel (K8: 81)

The opposite type exists, too: residents who first mention practical reasons—no need of a car to be mobile—and appreciate the positive aspects regarding personal reasons or convictions, e.g. for the environment:

Ich bin irgendwie auch ein bisschen so der Opportunist, ich brauche auch das Flugzeug. Ich bin
nicht der, der sagt, ich verzichte aufs Auto aus rein ökologischen Gründen, sonst müsste ich auch
auf Flugreisen verzichten.
Man, 35, childless couple, Sihlbogen (SI3: 76)

Weil ich es nicht brauche, also wir fahren Fahrrad, gerne. Und man kann es, also, man fährt auch
mit dem Auto die Hälfte der Zeit um einen Parkplatz zu suchen und in Münster in der Innenstadt
ist es wahnsinnig umständlich [...] Also dass es umweltfreundlich ist, finde ich auch überzeugend,
aber das wäre für mich nicht das ausschlaggebende.
Woman, 65, childless couple, Weißenburg (W2: 12–14)

The third frequent combination adds financial reasons to practical and personal motivations for living without a private car:

Ich müsste Geld bezahlen und das Auto regelmässig um den Block fahren, ich habe mich über die
Jahrzehnte autofrei eingerichtet, dass so die Situationen, wo brauche ich ein Auto, die sehe ich ein-
fach nicht [lachen].
Woman, 65, living alone, Saarlandstraße (SA08: 27)

Finally, there are is a small number of households for whom personal reasons did not play a role, but a combination of practical and financial reasons led to live without a private car:

Bei mir ist es mit Sicherheit damals die Motivation auch finanzieller Aspekt und ja, wenn du's
nicht oft brauchst, ist ja Quatsch.
Man, 55, living alone, Weißenburg (W4: 18)

7.2.7. Meaning of the car

Finally, in the interviews, I asked the residents what meaning a car has for them as an indirect way to understand their motivations to live car-free. The most frequent answer was that the car has no particular meaning but is simply a practical or useful tool in certain situations, especially to transport material or reach certain destinations:

> *Das ist eigentlich ein Hilfsmittel, ein Mittel zum Zweck sich fortzubewegen.*
> Woman, 35, couple with children, Burgunder (B5: 38)

> *Das ist praktisch, in bestimmten Situationen praktisch, hat überhaupt gar keine Bedeutung. Es ist genauso wie der Toaster, ich habe einen Toaster, weil ich sonst kein Brot toasten kann.*
> Woman, 45, couple with children, Klein Borstel (K3: 16)

> *Das ist halt eine Blechkiste, die mal hilfreich ist um was zu transportieren [lachen] oder auch mal entlegenere Gebiete zu erreichen. Also manches ist ja mit öffentlichem Nahverkehr nicht ganz so gut, wenn man dann so mit Sack und Pack und Kindern unterwegs ist.*
> Woman, 50, couple with children, Klein Borstel (K5: 18)

> *Es ist einfach ein Mittel um von A nach B zu kommen, und eventuell Lasten damit oder irgendwas zu transportieren, aber emotional hängt da nicht wirklich irgendwas dran.*
> Man, 45, couple with children, Saarlandstraße (SA05: 24)

> *Es ist einfach ein Nutzobjekt quasi, also wenn man irgendetwas Schweres transportieren muss oder eine weite Strecke überbrücken muss, dann ist ein Auto gut, und sinnvoll, aber ansonsten braucht man das nicht.*
> Woman, 40, couple with children, Weißenburg (W3_F: 203)

The absence of a particular meaning is also shown by the fact that many respondents reported their indifference or disinterest regarding cars, illustrated for example by not recognising car brands:

> *Eigentlich nichts, wahnsinnig wenig. Ich kann mir auch nicht merken, wer in meinem Freundes-kreis welches Auto hat, wenn ich zum Beispiel auf jemanden warte, dann erkenne ich das nie, weil ich nicht mehr weiss, was die für ein Auto haben.*
> Woman, 50, living alone, Oberfeld (O6: 18)

> *Wenn jemand ein Faible hat für Autos, ja, das kann ich respektieren, das kann ich verstehen. Also ich mag Bilder, ich mag Bücher, das bedeutet mir was, und auf der Ebene kann ich verstehen, dass man Autos möchte. Aber aus Prestigegründen kann ich, also habe ich kein Verhältnis zu, ich kann auch Automarken nicht gut unterscheiden, also ich will jetzt nicht tiefstapeln, aber das ist mir völlig gleichgültig.*
> Woman, 65, childless couple, Weißenburg (W2: 22)

Several respondents also mentioned that a car is not a status symbol for them:

> *Das Auto war nie ein Statussymbol oder etwas Wichtiges für mich.*
> Man, 40, couple with children, Oberfeld (O4: 24)

> *Ein Auto ist für mich kein Statussymbol.*
> Man, 40, couple with children, Weißenburg (W7_M: 36)

Finally, several residents also addressed negative meanings of the car. In general, it is seen as mostly useless:

> *Ich finde es ist wirklich einfach ein nutzloses Teil meistens.*
> Man, 40, couple with children, Burgunder (B6: 12)

Or the negative meaning is related to specific aspects, mainly air pollution and the important land use in the city:

> *Das Auto, inzwischen [lachen] ist es eine CO_2-Schleuder für mich [lachen].*
> Woman, 75, living alone, Klein Borstel (K8: 14)

Ich erlebe für mich eher die negative Seite der Autos, in der Stadt nehmen sie viel Platz weg, sind gefährlich, verpesten die Luft, machen auch, dass die Aufenthaltsqualität ja zum Teil sehr schlecht ist, das finde ich sehr schade.
Woman, 50, living alone, Oberfeld (O6: 18)

Es stört mich in der Stadt [lachen]. Wenn ich, auch mit dem Fahrrad an der Ampel irgendwo, hinter den Autos stehe, und denke, Mensch, was muten die uns eigentlich zu, mit diesen Abgasen vor allen Dingen auch, mit Lärm und Platz.
Man, 60, living alone, Saarlandstraße (SA10: 25)

Ich finde es wirklich total ätzend, jeden Morgen hier mit Tausenden von Autos durch Hamburg zu fahren und diesen ganzen Scheiss einzuatmen, das geht mir wirklich auf den Wecker und ich bin natürlich als Radfahrerin auch wirklich noch mal viel mehr gefordert, weil ich keine Blechbüchse um mich rum habe, und es gibt viele gefährliche Situationen jeden Tag. [...] Wenn man sich vorstellt, diese Stadt platzt aus allen Nähten, und wir gönnen uns den Platz, diese ganzen Autos da draussen auf der Strasse abzustellen. Was das an Platz bringen würde, wenn die alle weg wären, das kann man sich ja gar nicht vorstellen, was für eine Bereicherung, toll [lachen]. Also ich persönlich habe eher eine ablehnende Haltung zum Auto, kann man so ganz klar sagen.
Woman, 55, living alone, Saarlandstraße (SA11: 40)

For some residents, the meaning of the car changed over their life course. There is especially one type of change: for residents grown up in a rural area, the car was an important transport mode and for some men even a "cool thing" when they were young. But their attitude changed later, when living in the city:

Ich fand das früher, also mit 18 auf dem Land war das schon so, also ich war jetzt nicht in der Tuning-Szene, aber Motorrad, Auto, das gehörte einfach dazu und fand man auch geil.
Man, 40, couple with children, Weißenburg (W3_M: 218)

7.2.8. Comparison and discussion of reasons to live car-free

Both the survey and the interviews provided rather clear results on the reasons for car-free living, emphasising that it represents a deliberate choice for nearly all households, even if voluntariness to live car-free represents a delicate topic and a simple distinction is often difficult to establish (Preisendörfer & Rinn, 2003, p. 37). Two important types of motivations appear: on the one hand, personal reasons, particularly (environmental) convictions, and, on the other hand, practical reasons (no need and availability of alternative mobility modes, mainly). Financial reasons are secondary and other reasons such as age or health do not apply for most residents. In line with the results on the residents' profiles, some differences between the car-free housing developments appear. The most important concerns environmental reasons to live car-free and financial reasons. Unsurprisingly, ecology is more essential in collaborative housing developments and the affordability of a car emphasised in subsidised housing.

Comparing these results to the literature on car-free households in general confirms the specificity of car-free housing residents that was found in former evaluations of existing developments (Brosig et al., 2015; Ernst, 2008; Foletta & Henderson, 2016; Mantau, 2010). Whereas the absence of a need and the quality of alternatives highlighted by car-free households confirm general findings, the affordability of a car and particularly age and health appear clearly less important for car-free housing residents than for the average carless household (O. Reutter & Reutter, 1996; Müller & Romann, 1999; Preisendörfer & Rinn, 2003; infas, 2018; Brown, 2017). Furthermore, unlike what the existing literature states, environmental reasons are not only approved when asked for, but appear as a significant motivation for many residents in car-free housing developments.

Different other motivations to live car-free were mentioned, as in other similar studies: no need to own a car when living in a big city (Kamargianni et al., 2018), feeling liberated from the burdens of owning a car, car-free living as a normal and self-evident part of a preferred lifestyle

(Lagrell et al., 2018) or the will to demonstrate that it is possible—*"propaganda through the example"* as the author of a study on residents of rural ecological cooperative housing calls it (Leblay, 2017).

For most interviewed residents, personal convictions are the primary motivation, as other studies on voluntary car-free households emphasise, too (Lagrell et al., 2018; Rigal, 2018; Sattlegger & Rau, 2016). In contrast, for many other residents, altruistic reasons would not be sufficient. They have a more pragmatic attitude, highlighting primarily practical reasons to live car-free, as it was also found in the study of households in central Lyon and Villeurbanne who had given up a car (Deleuil et al., 2017). Even if living car-free seems to be *"more a mental challenge than a purely practical one"*. (Thomsen & Löfström, 2011, p. 969), it was always different types of reasons that motivate residents to live car-free, mainly combinations of personal convictions and practical aspects such as available alternatives. Recent qualitative research on car-free households draws similar conclusions (Rigal, 2018; Sattlegger & Rau, 2016; Villeneuve, 2017).

The meaning of a car shows the same distinction as motivations, i.e. practical and personal aspects. A car is either seen as a useful tool in particular situations or residents relate it to its different negative impacts. On a more general level, the meaning car-free housing residents attribute to the car confirm the shift in personal preferences from ownership to usage, transforming the car from a status symbol to a simple object of utility: *"Rather than the meanings of freedom previously associated with the autonomous mobility of the privately owned car, freedom, for an increasing number of people, is derived from the absence of ownership."* (Kent & Dowling, 2013, p. 89). People are looking for autonomy, not automobility (Holzapfel, 1997, p. 85)[62].

Finally, as Holzapfel (1997) noted already more than 20 years ago, sacrifice ("Verzicht") is not helpful to attain a more ecological world[63]. Thus, it is not surprising that many interviewees confirm this and emphasise the various benefits of living car-free, in line with former qualitative research on carless households (Burwitz et al., 1992; Sattlegger & Rau, 2016; Villeneuve, 2017). Living car-free is not seen as a sacrifice, but as a gain in quality of life:

> *Ich würde das gar nicht als Verzicht, wir haben zwar kein Auto, aber das ist kein Verzicht, das ist ein Gewinn an Lebensqualität.*
> Man, 55, childless couple, Weißenburg (W6_M: 38)

7.3. Reasons to move to a car-free housing

This chapter addresses the residential motivations of the inhabitants of car-free housing developments. First, an overview based on the survey is presented. Second, the different types of reasons are detailed, drawing on the comments added in the questionnaire and, mainly, the interviews. Then, the combination of reasons and the importance of the car-freeness are addressed. Finally, the residential motivations are compared and discussed.

7.3.1. Overview of the residential motivations

In the survey, a list of nine residential motivations was given. All of them were rated "(very) important" by at least 50% of the respondents. Yet, there are significant differences (see Figure 27). Three motivations arrive on top with over 80% of "(very) important" answers each: the pos-

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[62] *"Autonomie statt Auto – es spricht viel (wenn nicht gar alles) dafür, durch die Wahl dieser Alternative den Menschen die realistische Chance zu eröffnen, zu sich selbst zu finden, statt mit Hilfe eines entfernungsintensiven Lebensstils irgendwo weit entfernt Motive und Antriebe zu suchen."* (Holzapfel, 1997, p. 85)

[63] *"Verzicht ist eine völlig falsche Vokabel, wenn eine andere, für Menschen und Umwelt verträglichere Zukunft diskutiert werden soll."* (Holzapfel, 1997, p. 8).

sibility to move by foot and bicycle in everyday life, the mobility offer (public transport, carsharing) and the characteristics of the new dwelling (e.g. plan, size, comfort, price). The two mobility-related reasons reach even over 50% of "very important" answers and all three nearly any "not (at all) important". Just behind, in fourth position, is the location of the development, closely linked to mobility issues, too. Its characteristics (e.g. ecological construction standard, design, common rooms), the residents and the car-freeness of the development also attain over 50% of "(very) important" answers each. The two remaining factors are just below this mark: proximity to the workplace and surroundings suitable for children. They also reach the highest shares of "not (at all) important" answers, as they do not concern all residents. Interestingly, the car-free-ness was also rated (rather) unimportant by about 30%.
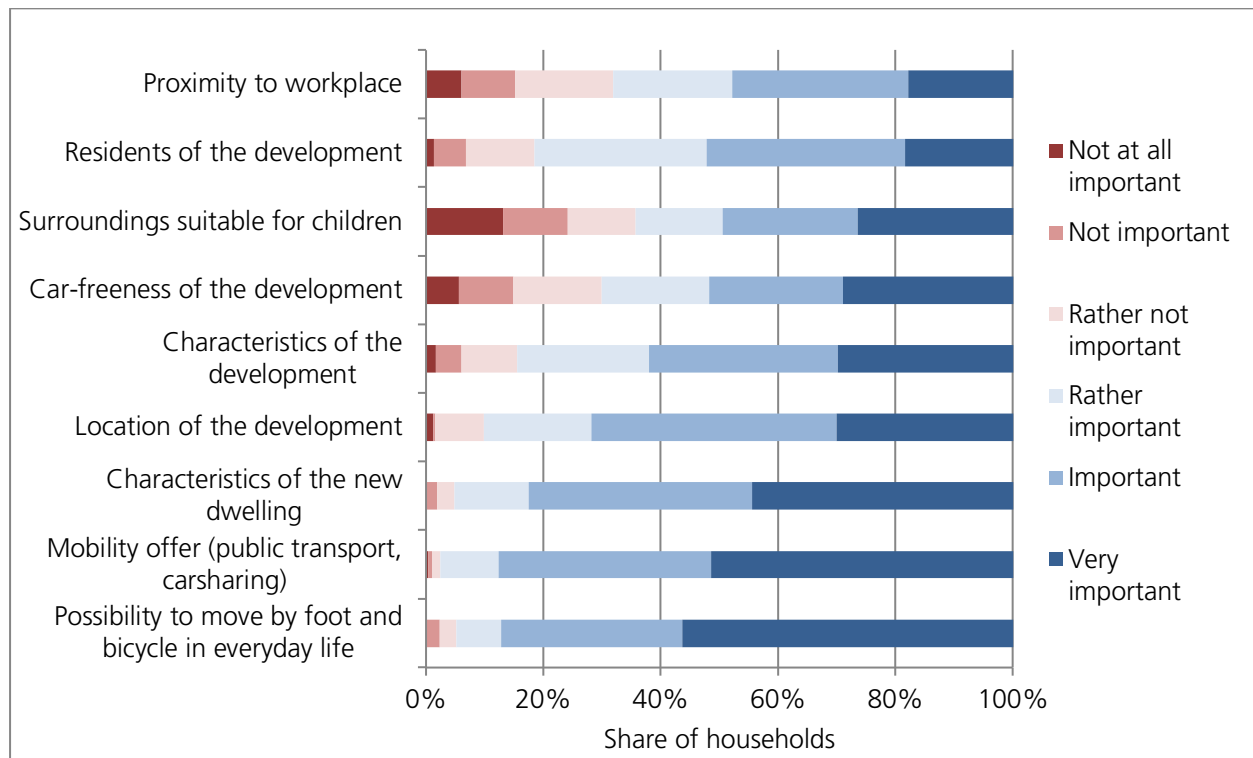
Figure 27: Importance of housing choice reasons (N=466 to 486)

Once again, Sihlbogen stands out in the comparison of the different developments (see Table 69 in the Appendix). Its residents considered the characteristics and the residents in the development less important and only 2% of the residents rated the car-freeness as "very important" but 51% as "not (at all) important". On the opposite, car-freeness reaches the highest importance in the following projects: Saarlandstraße (49% "very important", 27% "important"), Weißenburg (44%/21%) and FAB-A (38%/19%).

In collaborative housing, the characteristics of the development are more important than in the others, as well as, to a lesser extent, those of the residents. Thus, the will to live in a car-free housing project can be considered more important than, for example, the characteristics of the dwelling. This seems logical as in these housing projects residents share and collaborate more, whereas in other developments with more individual living, the neighbours' and the developments' characteristics are less crucial. In the cooperatives and housing projects, the location is also less important. This is especially the case in the three least centrally situated developments: Klein Borstel (23% of "very important"), Giesserei (14%) and Oberfeld (13%) where the shares of "rather not important" are also higher (12 to 20%).

7.3.2. Types of reasons to live in a car-free housing development

Based on the survey comments and principally the interviews, five types of residential motivations are found which are detailed in the following sections:

– Dwelling characteristics
– Development characteristics (including residents)
– Neighbourhood and city characteristics
– Personal motivations
– Reasons related to the residential choice process

In the comment box in the questionnaire, additional reasons (N=297) were mentioned by about 200 households. More than half concern characteristics of the development (162 mentions, including 68 related to the residents), followed by those of the dwelling (70) and the wider spatial context (55)[64]. The most frequently stated motivation, overall, is the importance of community living (31), followed by the wish to live in a cooperative or "housing project" ("Wohnprojekt") (22), participation in or self-administration of the development (21), and a balcony/garden/terrace (21). In the interviews, similar reasons appear most frequently (see Figure 28). Development characteristics are by far the most often addressed motivation type, too, followed by the wider spatial context, the dwelling characteristics, personal motivations and reasons related to the residential choice process.

Figure 28: "Code cloud" showing the importance of residential motivations mentioned in the interviews (size corresponds to the frequency a code was attributed, source: MAXQDA)

7.3.2.1. Dwelling characteristics

While the characteristics of the dwelling appeared to be an important motivation in the survey comments (see Table 45), they were less mentioned in the interviews. Only about half of the respondents referred to this type of reason, while the others did not mention the dwelling characteristics at all.

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[64] The remaining ten comments contain various topics such as "*simply find a dwelling in a difficult housing market*" or the need to leave the former dwelling.

Characteristic	Mentions
Balcony/garden/terrace	21
Properties (light, plan, etc.)	17
Price	15
Barrier-free	7
Size	4
Other	6
Total	**70**

Table 45: Dwelling characteristics mentioned in the survey comments

Nonetheless, the interviewees mentioned different characteristics important for their housing choice: particular properties such as parquet floors, exposed concrete walls, a washing tower in the flat, or the presence of an elevator:

> *Es war Neubau und guter Standard, es hat uns gefallen, Parkette, Decke Sichtbeton, 5,5 Zimmer.*
> Woman, 40, couple with children, Burgunder (B4: 4)

> *Die Wohnung auf einem Stockwerk, Waschturm, ein eigener, war mir wichtig.*
> Man, 70, living alone, Sihlbogen (SI2: 2)

> *Ich wohne hier in einer der wenigen Wohnungen, die an den Fahrstuhl angebunden sind, das war für mich damals ganz ganz wichtig.*
> Woman, 70, living alone, Saarlandstraße (SA12: 111)

Another reason for some residents in the participative developments was the possibility to co-create the properties of their future dwelling:

> *Das hier ist wirklich so meine Wohnung, weil ich sie mir halt selbst gestalten konnte. Den Wohnungsschnitt, ich hab ein Zimmer wo man durchgeht, vom Schlafzimmer durch das Kleiderzimmer ins Bad, ich hab riesengrosse Südfenster, das sind so die Ideen, die ich immer mal hatte für mich, wie ich wohnen möchte, und genau das ist da verwirklicht.*
> Woman, 55, living alone, Saarlandstraße (SA01: 13)

The price of the dwelling, or its price/performance ratio, was highlighted, especially the fact that it was affordable or cheaper than other dwellings, not only in the subsidised housing developments:

> *Es hat dafür gesprochen, dass der Preis relativ OK war, verglichen mit dem was man gegenüber auf der Strasse gehabt hätte [in a conventional housing development], deutlich grösser aber mehr als doppelt so teuer.*
> Man, 40, couple with children, Klein Borstel (K9: 8)

> *Auch weil der Preis nicht ganz so hoch ist und weil, einfach auch für den Preis den sie kostet, ist sie relativ grosszügig.*
> Man, 35, childless couple, Sihlbogen (SI3: 4)

Lastly, another price-related aspect is the financial or legal status of the dwelling—to be the owner or tenant, or where this is the case, to have access to subsidised housing or not:

> *Wir wollten gerne damals Eigentum erwerben.*
> Woman, 50, couple with children, Klein Borstel (K5: 4)

> *Das war auch für mich das einzige, was in Frage gekommen ist, Eigentum wollte ich nicht, hätte ich wahrscheinlich auch die Mittel nicht gehabt.*
> Woman, 65, living alone, Saarlandstraße (SA08: 8)

> *Dann war's natürlich auch eine relativ günstige Wohnung, wir hatten gerade in der Situation wegen Elternzeit und Teilzeitbeschäftigung einen Wohnberechtigungsschein.*
> Man, 50, couple with children, Weißenburg (W8_M: 11)

7.3.2.2. Development characteristics

The characteristics of the development appear to be the most important residential motivation, as most comments in the questionnaire relate to them (see Table 46) and all respondents mentioned them during the interviews.

Characteristic	Mentions
Community living	*31*
Cooperative/"housing project" ("Wohnprojekt")	22
Participation, self-administration	21
Construction	14
Multi-generational living	*11*
Energy efficiency	11
Friends/relatives living there before	*10*
Outdoor spaces	10
Calm	7
Children	*5*
Common or shared rooms	3
Other	17
Total	**162**

Table 46: Development characteristics mentioned in the survey comments (italic = related to the residents of the development)

In Klein Borstel, Oberfeld and Saarlandstraße, collaborative housing represents a very important residential motivation:

> *Der Grund hierher zu ziehen wer einmal das Wohnprojekt.*
> Woman, 50, single-parent family, Klein Borstel (K1: 2)

> *Das primäre ist das genossenschaftliche, gemeinschaftliche Wohnen, das von der Architektur her möglich ist.*
> Woman, 55, living alone, Oberfeld (O5: 4)

A closely related aspect has a similar importance: participation or self-administration. There are two stages: participation during the planning and construction period:

> *Erstmal so der Projektgedanke, dass einfach man zusammen das Ganze hochzieht und plant und baut.*
> Man, 40, couple with children, Klein Borstel (K9: 8)

The second stage is participation or self-administration after completion, also present in the development of Burgunder. This was often more important than the car-free aspect:

> *Das ganze Konzept der teilweisen Selbstverwaltung, das war fast das, was uns mehr angesprochen hat als das autofreie. Also mehr ist schwierig, aber das war etwas, wo wir fanden das ist toll, da kannst du mit den Leuten zusammen die Siedlung gestalten, weiterentwickeln, dich eingeben.*
> Man, 40, couple with children, Burgunder (B6: 8)

> *Was mich mehr fasziniert hat, war Selbstorganisation und Selbstverwaltung, das hat mich gereizt.*
> Woman, 70, living alone, Saarlandstraße (SA12: 45)

The benefits of self-administration, even if it includes responsibilities such as participating in snow removal in winter, are highlighted, particularly compared to the anonymity of many urban neighbourhoods:

Was ich auch cool finde ist die ganze Selbstverwaltung, die wir haben, mittels Verein. Gibt irgend-wodurch Mitspracherecht, gleichzeitig hast du auch Pflichten, es gehört auch dazu, dass man mit-macht, wie zum Beispiel jetzt wenn es schneit, Schneeräumen, dann gibt's den Plan, in dem du dich einträgst. Ich finde das positiv, nicht die Anonymität, die man manchmal hat.
Man, 35, childless couple, Burgunder (B3: 10)

Shared or common rooms and outdoor spaces also played a role for housing choice:

Ich habe vom Konzept her die Siedlung so cool gefunden, weil ich fand [...] man hat so viel auch gemeinsame Räume, die man brauchen kann, wenn wir grössere Feste gemacht haben oder Einla-dungen, haben wir ja zwei Gemeinschaftsräume, die wir dann gemietet haben.
Woman, 35, single-parent family, Oberfeld (O8: 12)

Es war ja auch ein bisschen angedacht oder angekündigt, dass wir so einen Gemeinschaftsgarten haben und eine Gemeinschaftswohnung, in der man auch feiern oder wo man die Küche nutzen kann, das war natürlich auch reizvoll, wenn man sozusagen den etwas begrenzten Wohnraum hat, dass man dadurch auch profitiert, dass viel Gemeinschaftsfläche genutzt werden kann.
Woman, 50, single-parent family, Saarlandstraße (SA03: 13)

Construction properties such as an ecological building standard or energy efficiency were men-tioned in the questionnaire comments as well as in the interviews:

Ich war damals auch in der Energiewende-Gruppe schon seit 10 Jahren. Das ist hier der erste sozi-ale Wohnungsbau im Niedrigenergiestandard, Bodenfenster, Architektur nach Süden orientiert. Das war für mich eine Steilvorlage.
Man, 55, childless couple, Weißenburg (W6_M: 18)

Another important reason stated in the interviews is the child-friendliness of car-free housing. First, due to the absence of cars that permit children more autonomy and safe spaces to play:

Ich finde gerade mit Kindern, das ist ja auch ein Hauptaspekt gewesen, autofrei zu leben, dass man mehr in seinem Umfeld das nutzen kann, das ist mit Kindern total super, dass man einfach hier von da vorne bis runter zum andern Kanal laufen kann.
Man, 45, couple with children, Saarlandstraße (SA05: 80)

Es gab noch den Punkt, dass wir das sehr begrüsst haben, dass hier die Kinder so frei spielen können, also dass man nicht immer mit zum Spielplatz gehen muss, sondern dass die Kinder sich hier irgendwann verabreden, weil sie nicht über die Strasse müssen, können die einfach frei auf die Strasse laufen, sich frei bewegen, ohne dass man aufpassen muss. Klar, ab einem bestimmten Alter erst, aber das war für uns so eine Aussicht, dass es hier völlig unkompliziert ist Kinder aufwachsen zu lassen, in der Stadt.
Woman, 50, couple with children, Weißenburg (W8_F: 10)

More specifically, in collaborative housing, the presence of other children and community living were also important motivations:

Ich fand das total gut auch mit Kindern in ein Projekt zu ziehen
Woman, 45, couple with children, Klein Borstel (K3: 4)

Der gemeinschaftliche Aspekt war schon wichtig mit den Kindern.
Man, 40, couple with children, Oberfeld (O4: 36)

Mit Kind habe ich gefunden, sind es andere Faktoren, die wichtiger sind, eine offene Nachbar-schaft, ein schöner Lebensraum, wo sich Kinder beschäftigen können, Ecken haben, wo sie spielen können und trotzdem sind sie nahe.
Woman, 35, single-parent family, Oberfeld (O8: 10)

The outdoor spaces that appeared in ten questionnaire comments were also mentioned by several interviewees, especially the space available due to the absence of cars:

Und vor allem auch, dass man eine schöne Umgebung hat. Ich habe das Gefühl, das ist etwas, was mir viel Wert ist, dass es ein freundlicher Umschwung ist, das fällt mir auf bei sehr vielen Neubau-siedlungen, dass es schreckliche Aussenräume gibt.
Woman, 35, couple with children, Burgunder (B5: 4)

Erstens haben wir viel mehr grün hier, man muss ja nur ins Nachbar-Wohnprojekt kucken, die alle ihren Stellplatz haben, die haben halt diese ganze, wir haben da unsere kleinen Gärtchen, wir haben da hinten noch unsere Fussballwiese, unsere Streuobstwiese, das haben die alles nicht, das wäre alles platt, wenn wir Parkplätze gebaut hätten.
Woman, 50, couple with children, Klein Borstel (K5: 112)

Ich glaube bei uns oder bei mir persönlich spielt auch so ein bisschen der freiraumplanerische Gedanke mit, wenn man sich halt mit Planung, Freiraum, Aussenraum beschäftigt, merkt man irgendwann, wenn man so einen Wohnblock plant, da geht wahnsinnig viel Platz für Autos drauf.
Man, 45, couple with children, Saarlandstraße (SA05: 4)

The calm due to the absence of cars was also mentioned in both the survey comments and the interviews:

Wir wollten auch gerne was, wo wir von Autos ein bisschen verschont sind, wo es lärmtechnisch ein bisschen ruhiger ist.
Man, 40, couple with children, Klein Borstel (K9: 6)

Furthermore, the financial benefit of a car-free development was mentioned in several interviews. It can be used to reduce the costs of the dwellings but also for higher building standards and to make accessible urban residential areas for residents who could otherwise not afford them:

Dass man keine Parkplätze baut hat auch einen Einfluss auf die Preise der Wohnungen, dass man günstig, relativ günstig wohnen kann.
Woman, 35, couple with children, Burgunder (B5: 46)

Die haben gleich alle 100'000 mehr bezahlt, die drüben haben alle Tiefgaragen, so haben wir Passivhäuser und haben am billigsten gebaut von allen, weil wir eben nicht diese blöden Autos unterbringen mussten. [...] Dass wir mitten in Hamburg wohnen und der Quadratmeterpreis hier teuer ist, haben wir eben damit auch massiv Geld gespart und uns möglich gemacht, in diesem relativ teuren Stadtteil leben zu können.
Woman, 50, couple with children, Klein Borstel (K5: 114)

Besides these infrastructural characteristics of the development, various aspects related to the residents of the development were essential for the respondents' housing choice. Community living is the most often mentioned motivation for different reasons. In general, it means the wish to live together, not anonymously as it is often the case in cities, and share at least certain activities with neighbours who form a community. This appeared especially in the developments where future residents already knew each other before and participated in the planning process:

Ich find's einfach schön, in einer Siedlung zu wohnen, wo man die Nachbarn von vornherein kennt. [...] Der Wohnprojekt-Gedanke, die Fortsetzung der WG aus unserer Jugend mit anderen Mitteln. Also weniger eng, aber nicht völlig anonym, auseinander. [...] Verbundenheit mit den Nachbarn.
Man, 60, living alone, Saarlandstraße (SA04: 2/6)

Hier ist das alles was uns gefehlt hat vereint: eine kleine Gesellschaft oder Gemeinde zu bilden, wo man einander unterstützt, zusammen Ziele verfolgt.
Man, 40, couple with children, Oberfeld (O4: 6)

As the last citation already showed, moving to a car-free housing development was also a reason because residents imagined to find a community of like-minded neighbours who help each other:

Was uns überzeugt hat, ist, dass es eine Siedlung ist, wo man auch so etwas unter Gleichgesinnten ist.
Woman, 35, couple with children, Burgunder (B5: 4)

Neben dieser Autofreiheit war's der Motor, dass wir in einer Grossstadt möglichst mit vielen Nachbarn leben wollten, die wir kennen. Und die ein Anliegen schon mal gemeinsam hat und wo sich dann auch zeigt, dass meistens auch viele andere Anliegen, also wer aufs Auto verzichtet freiwillig, da gibt es noch mehr Überschneidungspunkte.
Woman, 55, couple with children, Klein Borstel (K7: 98)

Und dass ich mir einfach von einer Genossenschaft erwartet habe, generationendurchmischt, Nach-barschaftshilfe, Anlässe, dass das dazu gehört, eine offene Lebenseinstellung vorausgesetzt.
Woman, 65, single-parent family, Oberfeld (O3: 6)

Different groups of residents mentioned the neighbours as a residential motivation. For families, especially for single-parents, it seems attractive for their children to grow up in a community, and neighbourly help can be very useful to take care of children:

Wir finden das einfach ganz attraktiv, mit anderen Menschen zusammen zu leben. Wir haben frü-her auch in Wohngemeinschaften gelebt, dass man auch so ein bisschen füreinander da ist. Wir ha-ben auch in Hamburg keine Familie, keine Omas und Opas.
Woman, 50, couple with children, Klein Borstel (K5: 4)

Es ist eine absolut ideale Wohnform für ganz viele Leute aber insbesondere auch gerade für allein-erziehende Mütter oder Väter, weil es halt nicht so eine anonyme Nachbarschaft ist, weil man sehr viel, wirklich, wenn man spontan auch auf Hilfe angewiesen ist, meistens jemanden findet, der da ist. Die Mehrheit der Leute, die hierhin zieht ist auch hierhin gezogen mit dem Ansatz, dass sie offen sind für Nachbarschaftshilfe. [...] Man hat hier wirklich eigentlich mehr als Nachbarn auch Freunde gewonnen, es ist eigentlich wirklich ein Wohnen unter Freunden fast etwas [lachen].
Woman, 35, single-parent family, Oberfeld (O8: 8)

For persons living alone—now or in the future, when children will have left the household—as well as for couples without children, the community was also an important motivation in order to prevent social isolation:

Ich bin hier, weil ich vorausgesehen habe, ich bin alleinstehend, irgendwann ist dann die Tochter auch gegangen, dann bin ich ganz alleine.
Woman, 65, single-parent family, Oberfeld (O3: 4)

Gleichzeitig haben wir halt das Grossstadtproblem auch kennengelernt in der alten Wohnung, dass man, grad wenn man berufstätig ist, relativ wenig soziale Kontakte kennen lernt, morgens aus dem Haus kommt und abends zurück, man hat nicht so die Nahtstellen wie Kinder auf dem Spielplatz wo man automatisch die Nachbarn sieht. Und diese relative Anonymität, die dadurch entsteht, die wollten wir auch überbrücken.
Man, 55, childless couple, Saarlandstraße (SA02: 4)

Wohnprojekt, war mein ganz grosser Wunsch, weil ich ledig bin und gerne in einer Gemeinschaft eingebunden sein wollte.
Woman, 65, living alone, Saarlandstraße (SA08: 8)

Often, this is also related to the age of the person—the older, the more some residents were look-ing for a community:

Ich glaube, was auch noch eine Rolle spielt, das ist eine Frage nach Altersgruppen. Bis dahin wa-ren mir meine Nachbarn immer völlig egal, es reichte, dass im Haus jemand wohnt, dem ich den Schlüssel geben kann, wenn ich in Urlaub, Post und Blumen. Und dann fand ich es aber plötzlich reizvoll, eine Nachbarschaft zu haben, mit anderen Leuten gemeinsam etwas zu entwickeln.
Woman, 70, living alone, Saarlandstraße (SA12: 4)

This leads to another motivation, multi-generational living, especially for elderly residents who did not want to live only with other retired people:

Mir war's immer wichtig ein Wohnprojekt zu haben, das gemischt ist, mit Familien und Senioren. Ich wollte auf keinen Fall irgendwo nur mit Leuten meiner Altersgruppe zusammenwohnen die dann alle nur noch mit dem Kopf wackeln und sich von ihren Krankheiten erzählen [lachen].
Woman, 65, living alone, Klein Borstel (K2: 2)

Lastly, several residents had friends or relatives already living in the car-free development:

Wir kannten auch schon Leute, von dem Projekt, die immer noch im ersten Haus wohnen.
Woman, 55, childless couple, Saarlandstraße (SA06: 2)

7.3.2.3. Neighbourhood and city characteristics

A third type of housing choice motivations are the characteristics of the surrounding neighbourhood and the whole city, including the development's location and access to different places of everyday life. In the survey comments, only part of them appear (see Table 47), as in the question the most important were already given (see above). In the interviews, they were detailed and new aspects emerged, too.

Characteristic	Mentions
Proximity to nature	12
Proximity to relatives or friends	9
Shops	9
Neighbourhood	8
Proximity to city centre	5
Other	12
Total	**55**

Table 47: Neighbourhood and city characteristics mentioned in the survey comments

The mobility offer (i.e. public transport and carsharing) and the possibility to walk and cycle in everyday life, the two most important motivations according to the closed question in the survey, were stressed in many interviews:

> *Was auch ganz wichtig ist, die Anbindung an die Stadt, wie schnell ist man am HB [main station]. Und einfach die Verbindungen auch während den Hauptverkehrszeiten, morgens hast du alle 10 Minuten einen Zug, das ist sehr sehr gut.*
> Man, 35, childless couple, Sihlbogen (SI3: 4)

For location, proximity to the city centre was highlighted to allow cycling in everyday life or ensure good public transport:

> *Die Lage finde ich gut, dass es nicht so sehr viel weiter draussen ist, dass man schnell, also 4,5km zum Hauptbahnhof, Fahrrad oder mit der Bahn, dass man schnell auch in der Innenstadt ist.*
> Man, 60, living alone, Saarlandstraße (SA10: 11)

> *Für mich ist es schon wichtig, zentral zu wohnen. Ich finde es einfach toll, also ich fahre jeden Tag mit dem Fahrrad hier zur Arbeit.*
> Woman, 55, living alone, Saarlandstraße (SA11: 10)

Even if in the survey, proximity to the workplace appeared to be the least important residential motivation, different residents mentioned it. It plays a role particularly for parents:

> *Mit der Familie umso mehr, da wird es unglaublich kompliziert, wenn man noch eine lange Anreise hat. Und ich finde es ist wirklich auch im Sommer eine extreme Lebensqualität, wenn man schnell 10 Minuten aufs Velo sitzen kann und man ist zu Hause.*
> Woman, 35, couple with children, Burgunder (B5: 82)

Proximity to other places of everyday life that were not detailed in the survey, such as to cultural institutions, were also mentioned:

> *Dass wir jetzt nicht in den Speckgürtel gezogen sind, hat wie ich eben schon sagte damit zu tun, Weg zur Arbeit. Es ist auch mehr los, wir sind jetzt nicht die, die Nightlife suchen, aber ab und zu dann die Möglichkeit haben, um die Ecke was Kulturelles zu erleben.*
> Man, 55, childless couple, Saarlandstraße (SA02: 22)

For some families, proximity to their children's former school or more generally to the former place of residence played a role:

Wir hatten schon wie gesagt in der Nähe gewohnt. Wir wollten auch nicht weit weg, die Schule unseres Sohnes war um die Ecke, das war ein Kriterium.
Woman, 55, childless couple, Saarlandstraße (SA06: 4)

Proximity to several other specific places are mentioned both in the interviews and the survey comments: to shops, to relatives or friends and, most often, to nature, particularly where it is immediately besides the development (such as the canals surrounding the development of Saarlandstraße or the river and forest next to Sihlbogen):

Was halt hier natürlich noch ein Bonus obendrauf ist, ist die Lage: der Kanal ist hintenraus, es ist ruhig, wir sitzen hier im Innenhof mitten in der Grossstadt und Kaninchen hoppeln hier [lachen] durch den Garten, das ist einfach eine Toplage.
Man, 45, couple with children, Saarlandstraße (SA05: 8)

Ich finde es hier super, weil du bist auch nahe an der Stadt und gleichzeitig in der Natur, also ich gehe relativ viel noch joggen und so.
Man, 35, childless couple, Sihlbogen (SI3: 2)

As in the last citation, for many residents, the location of the development was important for a combination of proximities, including nature and the city centre with its diverse infrastructure:

Weit draussen genug, dass es einigermassen grün ist, Alster ums Eck, Friedhof ums Eck, relativ dünn besiedelt. Aber eben auch noch nah genug, wir beide arbeiten noch in der Stadt, die ganzen Infrastruktursachen, den Geschäften. Das ist insofern eigentlich eine nette Lage.
Man, 40, couple with children, Klein Borstel (K9: 10)

Finally, some residents mentioned a general wish to live in the city, for mobility-related but also other reasons such as political activities:

Für uns war auch klar, dass wir in der Stadt bleiben, erstens mal weil ich hier politisch tätig bin und zweitens weil es uns überhaupt nicht aufs Land gezogen hat.
Woman, 35, couple with children, Burgunder (B5: 40)

One of the underlying motivations of the importance attributed to the neighbourhood's and the whole city's characteristics is the will to be independent of a car in accessing places of everyday life—leading over to the personal residential motivations presented in the next section:

Wir wollten einfach kein Auto mehr, das hatten wir vor 20 Jahren aufgegeben, dann ist es praktisch, wenn es so nahe ist. Das war Bedingung für einen neuen Wohnort, dass er gut erschlossen ist.
Man, 70, childless couple, Burgunder (B2_M: 10)

Hier haben wir alles, also wir brauchen das nicht so viel, aber so kulturell, man kann ins Kino, wenn man will, wir haben Beizen, man findet alles, Einkaufen, in 10 Minuten bin ich in der Stadt und finde dort alles. Also ich glaube, ich würde mich jeden Tag aufregen, wenn ich auf dem Land wohnen würde und brauche etwas und muss mit dem Auto.
Woman, 40, couple with children, Burgunder (B4: 38)

Ich wollte kurze Wege, Fahrrad fahren und nicht mit dem Auto immer fahren müssen.
Woman, 65, childless couple, Weißenburg (W2: 6)

7.3.2.4. Personal residential motivations

Similar to the motivations to live without a private car (see 7.2.4.1), several residents mentioned personal convictions to move to a car-free housing development. Ecology plays an important role:

Dann gab es dieses autofreie Wohnprojekt, wo meine Freundin damals sagte, da musst du hin, das ist genau deins, und das stimmt auch [lachen]. Also dass das doch sozusagen über die Jahrzehnte dieser Wunsch, es darf nicht so viele Autos geben, sich in so Steinen hier ausgebildet hat, und eine Struktur gebildet hat, die 100 Jahre halten kann, so ein Haus, das ist also schon auch ein bisschen eine Erfüllung, von einem alten Streben, das ich eben hatte. [...] Ich glaube, das ist so mein Stil, den ich hier leben kann, den ich auch leben will [lachen].
Man, 60, living alone, Saarlandstraße (SA10: 2-3)

Wenn man Kinder hat oder überhaupt in einer Stadt lebenswert leben möchte, muss man Platz ha-
ben. Und dieses Konzept ist von Grund auf ja auch so gedacht, dass man wirklich auf ein eigenes
Auto verzichtet und damit mehr Platz ist und eben weniger Emissionen, weniger Strassenverkehr
ja letztendlich auch, und es ist eigentlich eher ein Projekt das auch Pilotprojekt sein soll [...] da
sollten sich alle, andere ein Beispiel dran nehmen, weil man kann die Stadt sonst nicht irgendwie
lebenswert halten, das ist einfach zu viel Autoverkehr, zu viele Emissionen, es ist eine Frage von
Umweltschutz, Lebensqualität, eine ganz klare Sache. Also es hat auch eine programmatische
Ebene, hat es auch, da stehen wir zumindest insofern voll dahinter.
Man, 50, couple with children, Weißenburg (W8_M: 14)

As the last citation showed, the quality of life is an important motivation. This is, of course, sub-
jective and different for each individual. For car-free housing residents, even if it was not always
mentioned explicitly, it often appears in the reasons detailed before, e.g. related to the green
spaces in the development, the calm or the safety for children:

Wir konnten durch diesen grossen Innenhof, seit die Kinder zwei waren, Tür auf, Kinder raus, und
alle kucken so ein bisschen mit. Sie können auch auf den Strassen relativ gut hier spielen, mitten in
der Stadt. Wir wohnen in Hamburg, also ist das schon einfach echt Lebensqualität.
Woman, 50, couple with children, Klein Borstel (K5: 112)

Dass hier innerhalb der Siedlung autofrei ist, das ist einfach eine Lebensqualität für Jung und Alt,
einfach Klasse.
Man, 55, living alone, Weißenburg (W4: 28)

Ruhe, Erholung, Gesundheit, Lebensqualität. Wenn Sie hier durch die Siedlung gehen, Sie können
sich jederzeit, von Wohnung zu Wohnung, im Treppenhaus, auf dem Gehweg, im Garten, am Zaun,
an der Hecke mit Leuten unterhalten ohne von Verkehrslärm gestört zu werden. Die Kinder hier
können spielen von morgens bis abends, bis der Arzt kommt oder bis die Mutter sagt «Abendessen».
Und das ist für ein innerstädtisches Wohnquartier absolute Lebensqualität.
Man, 55, childless couple, Weißenburg (W6_M: 52)

7.3.2.5. Reasons related to the residential choice process

Finally, there is a series of reasons related to the process of housing choice. First, the comments
and interviews showed that many households had or wanted to move out of their former dwelling.
Following Clark and Onaka (1983), there are three different types of moves: forced movements,
induced movements and adjustments. In the survey, three households reported a forced move-
ment due to the loss of their former dwelling. It is not clear how many other households were in
that case too, but without more comments on that topic, we can consider that most chose to move
house. Induced movements were explained by reasons such as a new job in another city, the birth
of a child, or the opposite, children moving out, as well as after a divorce. Adjustments occurred
in response to a general discomfort with the characteristics or the location of the former dwelling.
Age, or predictable older age, was another adjustment reason cited by elderly residents and im-
plying infrastructural as well as social aspects:

Da haben wir gedacht, es wäre langsam Zeit, umzuziehen, nicht gerade eine Alterswohnung zu
suchen, aber eine die Rollator-tauglich ist [lachen].
Man, 70, childless couple, Burgunder (B2_M: 2)

Wir haben auch keine Kinder. Wenn wir mal wackelig werden, oder irgendwas los ist, können wir
mal den Nachbarn Bescheid sagen, kannst du mal kommen und helfen, wir kennen uns seit 20
Jahren.
Woman, 75, childless couple, Saarlandstraße (SA09: 122)

Several residents mentioned *"coincidence"* or *"accident"* as a reason for their housing choice, in
the sense that they were not looking for a car-free housing development:

Es war keine bewusste Suche, sondern Zufall, hat sich so ergeben im Suchprozess einer neuen Wohnung und nicht einer autofreien Siedlung.
Man, 40, couple with children, Burgunder (B1: 4)

Dann sind wir per Zufall hier drauf gekommen, wir haben nicht explizit nach autofrei oder möglichst ökologisch gesucht, das war wie noch das Tüpfchen auf dem i.
Man, 45, couple with children, Oberfeld (O7: 4)

But for all these residents, a certain predisposition already existed that made them consider moving to a car-free or collaborative housing:

Ich bin schon länger wohnprojektaffin, ich habe vorher eine Zeit lang in [university city in Northern Germany] gelebt und da auch studiert und hatte mich da schon mit einer Gruppe zusammengetan, die einfach zusammenleben wollten und insofern war dieser Gedanke für mich, begleitete mich schon lange, auch wenn er sich noch nicht realisiert hatte.
Woman, 55, living alone, Saarlandstraße (SA11: 6)

Finally, for many persons potentially interested in car-free housing, an advertisement in a specific shop (an organic bakery for instance) or a press article often induced a future moving:

Im Biobäcker hing der Zettel von [founder of the project], dass hier noch vier Wohnungen frei sind und Leute gesucht werden.
Woman, 55, couple with children, Klein Borstel (K4: 4)

Dann habe ich in der VCS-Zeitschrift ein Inserat gesehen, dass es es so eine Planung gibt für eine autofreie Siedlung mit ökologischen Standards und gewissen sozialen Ideen, dann habe ich gefunden, das interessiert mich, das Projekt, dann bin ich etwas reingerutscht.
Woman, 50, living alone, Oberfeld (O6: 4)

Da habe ich in der Zeitung gelesen, kleine Anzeige, Neandertal e.V. will autofrei in der Stadt bauen, Interessenten dann und dann. Und da habe ich gedacht, ist ja interessant, autofrei in der Stadt, da bin ich hin.
Woman, 75, childless couple, Saarlandstraße (SA09: 4)

Ich habe das dann immer in der Zeitung gelesen, dass hier was geplant ist, und so war ich auch von Anfang an, spätestens ab 2000, bei den ganzen Planungen dabei.
Woman, 60, living alone, Weißenburg (W5: 2)

7.3.2.6. Combination of reasons

Similar to the motivations for living without a private car, a housing choice is rarely due to a single reason. Nearly all respondents mentioned at least two different types of motivations, many of them even more:

Ich würde eher sagen, dass es ein Blumenstrauss an verschiedenen Gründen ist. Bei mir würde ich fast den Freiraum und das Finanzielle an die erste Stelle setzen, dass man halt mehr Platz hat, das Geld spart. Am zweiten natürlich auch Umweltaspekte wie Lärm, also hier in der Stadt ist es natürlich speziell, Lärm und Gestank, der Staub halt, die Emissionen. Letztendlich haben wir eigentlich ein Wohnprojekt gesucht und dass das jetzt hier gerade autofrei war, war für uns keine Barriere, zu sagen, wir können uns gar nicht bewerben.
Man, 45, couple with children, Saarlandstraße (SA05: 6)

An often-mentioned combination was the one between car-free (or more generally ecological) and social aspects such as community living, collaborative housing or self-administration:

Die Gemeinschaft, das Verbindende, das war wichtig. Autofrei und eine Gemeinschaft, die sich das vorstellen kann, um mehr Überschneidungspunkte noch zu haben.
Woman, 55, couple with children, Klein Borstel (K7: 126)

Das war mir natürlich ein wichtiger Aspekt natürlich, die ganze Philosophie, unter anderem die Autofreiheit, die ökologische Bauweise, die Wärme, Solarenergie, das ganze Projekt in dem Sinn, auch das Soziale ein bisschen, das genossenschaftliche [...] Auch der Altersdurchschnitt, die Durchmischung der Bevölkerung vom Alter her.
Man, 70, living alone, Oberfeld (O2: 8)

Das sind glaub ich beide Aspekte, die Autofreiheit explizit, die zum Motto zu machen, und halt mit Nachbarn zusammen zu wohnen, die man von Beginn an des Projekts kennen gelernt hat.
Man, 60, living alone, Saarlandstraße (SA04: 2)

Ich glaube bei uns hier in der Genossenschaft ist das eine das autofreie, aber mindestens genau so wichtig ist die Selbstorganisation und Selbstverwaltung.
Woman, 70, living alone, Saarlandstraße (SA12: 4)

A particular case appeared in Klein Borstel and Oberfeld, the two developments located in the outskirts of urban areas: several households chose to move to the car-free housing development despite its location, because the housing project or community living (not available anywhere else) was more important for them:

Wo wir auf jeden Fall nicht hinziehen wollten war in diesen Stadtteil [lachen]. [...] Es gibt natürlich viele viele Leute, die hier wohnen, für die ist das ein Traumstadtteil, die sind genau andersrum hierhergezogen, weil sie den Stadtteil wollten und haben das autofrei in Kauf genommen. Wir haben mehr den Stadtteil in Kauf genommen, weil wir das Projekt wollten.
Woman, 45, couple with children, Klein Borstel (K3: 4)

Es haben sich aber viele schwergetan, weil viele sind aus der Innenstadt oder zentrumsnäher dann hierher gezogen. Es war eine Umstellung [...] Komisch vielleicht irgendwie so wenn man das eher schätzte, dass es so heterogen war, ist es hier relativ homogen. Das ist eine grosse Veränderung finde ich, das städtische Flair, das fällt so ein bisschen weg. [...] Dann haben wir die Lage in Kauf genommen, es fanden alle hier auch schön, es ist wirklich schön mit dem Alstertal, diesen Parkfriedhof hier zu haben, das ist es überhaupt nicht gewesen, und eine gute Anbindung, dann haben wir da so ein bisschen in den sauren Apfel gebissen.
Woman, 55, couple with children, Klein Borstel (K7: 24 - 30)

Was wir uns lange etwas überwinden mussten, nach Ostermundigen, rein von der Gemeinde her, aber uns hat das Konzept hier so gut gefallen, das umfassende, nachhaltige, ökologische, neben dem Wald, dass wir uns dann entschieden haben für das. [...] Einmal ist es nicht in der Stadt, doch recht weit aussen, der öV-Takt ist gut aber sonst ist es einfach nicht so angenehm, Ostermundigen hat nicht so einen guten Ruf.
Man, 45, couple with children, Oberfeld (O7: 4 - 5)

7.3.2.7. The importance of car-freeness for housing choice

In the survey, the car-freeness was among the less important motivations. The interviews allowed to better understand what role it played in the housing choice. Five aspects appeared:

– High importance of car-freeness for housing choice (this was the case for 13 households)
– Positive attitude towards car-freeness in the housing choice (16)
– Indifference towards car-freeness in the housing choice (11)
– Accept car-freeness to live in the housing development (7)
– Car-free household before (23; 15 other interviewed households were car-free before but have not mentioned it in relation to housing choice)

For a first important group of residents, car-freeness was a key motivation for housing choice, either the respondent was looking for a car-free development or found this characteristic very interesting and important:

Ich möchte im Sinn der 2000-Watt-Gesellschaft anders wohnen, um die Ziele besser zu erreichen, da gehört natürlich in dem Sinn das Auto auch dazu.
Man, 40, couple with children, Oberfeld (O4: 6)

Primär autofrei, weil das halt etwas ist, was wir auch, so eine ökologische Grundmotivation bei uns beiden, primär bei mir ist.
Man, 55, childless couple, Saarlandstraße (SA02: 4)

For some of these residents, supporting the idea to demonstrate that it is possible to live car-free as a whole community of neighbours, and especially the fact that a car-free development makes this visible, was an important motivation:

Ein bisschen Ausschlag gegeben hat natürlich auch für die Entscheidung, dass wir einfach gesagt haben, wir wollen sowas unterstützen oder möchten Teil davon sein, von einem grösseren Projekt, was wirklich auch sichtbar macht, autofrei geht.
Man, 40, couple with children, Klein Borstel (K9: 94)

Was für uns attraktiv war, war diese Autofreiheit. Nicht nur, dass man irgendwo wohnt und kein Auto hat, sondern auch, dass man das, die Idee unterstützt, so ein Projekt in dem man daran teilnimmt.
Woman, 55, childless couple, Saarlandstraße (SA06: 4)

Der Gedanke der Autofreiheit soll auch nach aussen getragen werden. So sind wir hier in die Siedlung gekommen. Ich war natürlich dann Feuer und Flamme, da ich damals schon überzeugter Umweltaktivist war und das war dann sehr passend.
Man, 55, childless couple, Weißenburg (W6_M: 18)

Another group of residents has a positive attitude towards the car-free aspect, but was not initially looking for it, or it did not play a decisive role in their choice:

Dass es autofrei ist, war nicht unser Ziel, aber es war ein angenehmer Nebeneffekt.
Man, 70, childless couple, Burgunder (B2_M: 2)

Dass es autofrei ist, das lag mir sehr. Aber ich glaube, ich wäre auch da, wenn wir Autos hätten.
Woman, 55, living alone, Oberfeld (O5: 4)

Ich wäre nie auf die Idee gekommen, in eine autofreie Siedlung zu ziehen, also das als Voraussetzung zu machen. Wir haben sofort eingesehen, dass das ein gutes Konzept ist und das genau unseren Bedürfnissen auch entspricht.
Woman, 65, childless couple, Weißenburg (W2: 8)

For a third group of residents, car-freeness did not play any role, they are indifferent towards it:

Der Grund wieso ich hierhin gezogen bin ist nicht der autofreie Aspekt gewesen. Es hat mich aber auch nicht abgeschreckt, so.
Man, 35, childless couple, Burgunder (B3: 4)

Autofrei hatte nichts zu tun mit unserer Entscheidung.
Man, 30, couple with children, Sihlbogen (SI4: 4)

A small group of residents accepted car-freeness because they wanted to live in the housing development for other reasons (e.g. social), even if they were not car-free before or not especially looking for a car-free housing:

Ich habe vorher auch ein Auto gehabt. Ich sag mal wir sind hierher gezogen nicht wegen der Autofreiheit, sondern trotz der Autofreiheit. Wir machen viel mit dem Fahrrad, immer schon, unser ganzes Leben. Aber für mich war das schon beruflich eine ziemliche Herausforderung.
Woman, 50, couple with children, Klein Borstel (K5: 6)

Autofrei, ich hatte dann ein Auto, bin zur Arbeit gefahren und sonst ein Auto gebraucht. Aber es hat mich wie gedünkt, wenn nichts besseres oder anderes kommt, und das ist ja politisch absolut korrekt, also mache ich das. Es wäre blöd, wegen einem Auto nicht zu kommen.
Woman, 65, single-parent family, Oberfeld (O3: 4)

Finally, a last aspect often mentioned in the interviews is that the household was already car-free before, and therefore it did not play a major role:

> *Das autofreie ist für uns keine Einschränkung, weil wir sowieso kein Auto haben und keins anschaffen wollten.*
> Woman, 35, couple with children, Burgunder (B5: 4)

> *Wie ich dann hiervon hörte, dass es autofrei ist, das war ein Selbstgänger, weil ich hatte da schon lange bewusst kein Auto mehr.*
> Woman, 65, living alone, Saarlandstraße (SA08: 15)

7.3.3. Comparison and discussion of reasons to move to a car-free housing

The residential motivations of car-free housing inhabitants showed that the developments' car-freeness is not very important in itself, confirming results of previous evaluations of car-free housing (Bürgi & Hari, 2013; Ernst, 2008; Mantau, 2010; Ornetzeder et al., 2008). The closely related alternative mobilities—public transport, carsharing and particularly walking and cycling—as well as the access of the development are, instead, among the most important motivations. The location seems to play a more important role in the bigger cities, because in the smaller ones, nearly every location is within cycling distance to the city centre and all possible places of everyday life.

Except in Sihlbogen and for some particular aspects, the dwellings' characteristics are much less important than the housing developments' characteristics. Besides infrastructural aspects such as the importance of green spaces due to the absence of cars, social aspects and the other residents are central motivations. Overall, and particularly in collaborative housing, community living and self-administration were among the most important residential motivations. These aspects are in line with former research on car-free housing (Brosig et al., 2015; Ernst, 2008; Mantau, 2010; P. Moser & Stocker, 2008; Scheurer, 2001b) and also similar to research on collaborative housing in France which stressed that sharing practices, environmental awareness and citizen participation are their common defining features (Bresson & Denèfle, 2015). In contrast, they differ from studies on urban residential motivations where the dwellings' characteristics often play a more important role than neighbourhood and location (Gebhardt, 2012b, p. 82), even if several studies reported similar results regarding accessibility by public transport and possibility to walk and cycle in everyday life (Beckmann et al., 2006; Hjorthol & Bjørnskau, 2005; Jarass & Heinrichs, 2014; Rérat et al., 2013; Rérat & Lees, 2011; Sandfuchs, 2009).

Drawing on Stanbridge's (2007) "residential relocation timeline", I found that all households considered mobility issues in an early stage of the residential choice process. Former car-free households wanted to continue to live independently of a private car, whereas former car-owning households needed to decide early to take into account giving up their car. Finally, my results show that "residential self-selection"—the choice of a housing where the preferred transport modes can be used (Cao et al., 2009)—plays a role, but is not the only factor to explain the residents' housing choice.

Moreover, the other residents who are often highlighted as an important housing choice motivation, and particularly the wish for a community of like-minded neighbours indicates a certain "club effect" (Bourdieu, 1993, p. 260) which appears particularly in the collaborative housing projects. There is no restriction by financial aspects, as most developments are not part of the free housing market, but subsidised or cooperative housing, and thus not particularly expensive. However, collaborative housing developments are often not easy to access as one needs to have local knowledge or even personal contacts to learn about their existence, particularly if the future residents already plan the project together.

Therefore, personal motivations based on ecological or social values often also played a role for residential choice, emphasising the particularity of car-free residents. They have a different definition of housing than the average, more individualist urban inhabitant. For them, quality of life—which represents the most important underlying motivation—is related to a calm, green environment, adapted to children and where a community lives together, shares spaces and amenities and self-administrates the housing development. These residents perceive quality of life to be higher without owning a car, not only in their residential environment (where green spaces replace parking lots) but also when travelling within the city. The values presented in the last chapter shine through this conception of quality of life and, thus, residential motivations in general.

Furthermore, car-free housing developments are perceived as particularly adapted environments for children and a motivation for many families to move there. This appeared especially for families living in more central inner-city districts which have moved to car-free housing at the outskirts of the city in Oberfeld or Klein Borstel. The birth of a child represents an important "key event" leading to residential relocation. Two other "key events" were mentioned: retirement (or in some cases also anticipating retirement) particularly in collaborative housing projects, whereas a new job in a new city appeared in rental developments available on the conventional housing market.

"Coincidence" mentioned by several residents needs to be relativised. As a study on different housing fields in Amsterdam and Copenhagen showed, *"the experience of coincidence"* mentioned by middle-class households depends on the types of capital they have at their disposal (Boterman, 2012). In the case of car-free housing cooperatives, even if residents were not particularly looking for this type of housing, their social or cultural capital only allowed them to hear about this type of housing and then consider moving there.

8. How to live without a (private) car

This part answers the third research question: how do car-free households live without a (private) car? Following my theoretical framework, first, the residents' mobility capital is presented. Then, their actual daily mobility practices are analysed. Finally, three examples are presented which illustrate practices and also address the mobility capital: shopping, leisure activities and holiday travels. In most chapters, results of the survey and of the interviews are combined.

Chapter	Dimensions		Subdimensions

8.1	Mobility capital	Mobility access	Bicycles, e-bikes and cargo bikes
			Other two-wheeled vehicles
			Public transport passes
			Cars (driving licences and carsharing)
			Changes in mobility access:
			    Car given up before move-in
			    Grown up in a car-free household

		Mobility skills	Types of mobility skills Difficulties related to car-free life

8.2	(Mobility) practices	Daily mobility	Mobility to go to work/school
			General daily mobility
			Changes in daily mobility:
			    Changes in use of transport modes
			    Mobility biographies

8.3		Shopping practices	Shopping destinations Mobility modes used for shopping Shopping strategies to live car-free
8.4		Leisure activities	Types of leisure activities Mobility modes used for leisure activities
8.5		Holiday travels	Types of holiday travels Mobility modes used for holiday travels

Table 48: Overview of mobility capital and practices' dimensions

8.1. Mobility capital

As explained in section 3.1.2, I use the concept of mobility capital to better understand the car-free residents' mobility practices. The two elements constituting mobility capital are presented consecutively, first, access to transport modes and, second, mobility skills.

8.1.1. Mobility access

The first element of the mobility capital contains access to the different transport modes. They can be divided into three types: two-wheeled vehicles, public transport and cars (including driving licences and carsharing subscriptions). The access to a private car is, of course, excluded for the residents. Changes in car ownership and the presence of a car in the household during childhood and youth are analysed at the end of this chapter.

Access needs to be addressed not only for transport modes on the personal or the household level, but also related to the spatial context, i.e. the location of the development and the different services and infrastructures available, such as public transport, shops and services in the neighbourhood. They were, on the one hand, presented in part 5 and will, on the other hand, be analysed in part 10 analysing the territory's hosting potential. The results presented in this chapter mainly rely on the survey, with some additional data from the interviews.

To start, we look at two-wheeled vehicles. Considering their importance, the results are sub-divided into two sections: first, the different forms of bicycles, including electric bicycles and cargo bikes, are presented and, then, the other types of two-wheelers.

8.1.1.1. Bicycles, e-bikes and cargo bikes

91% of the households in car-free housing developments own at least one "normal" bicycle (see Figure 29). In nearly half of the households there is even more than one bicycle per person (including 12% where there are more than four). About a quarter have fewer than one bicycle per person and 19% just one. On average, a household owns 1.7 "normal" bicycles per person.

In FAB-A, 25% of the households have no conventional bicycle (but this share represents only four households), in Oberfeld 19% and in Klein Borstel 12% (probably at least partly due to the high numbers of e-bikes in both of them). In Burgunder, Sihlbogen, Saarlandstraße and Weißenburg, instead, less than 5% do not have any bicycle.
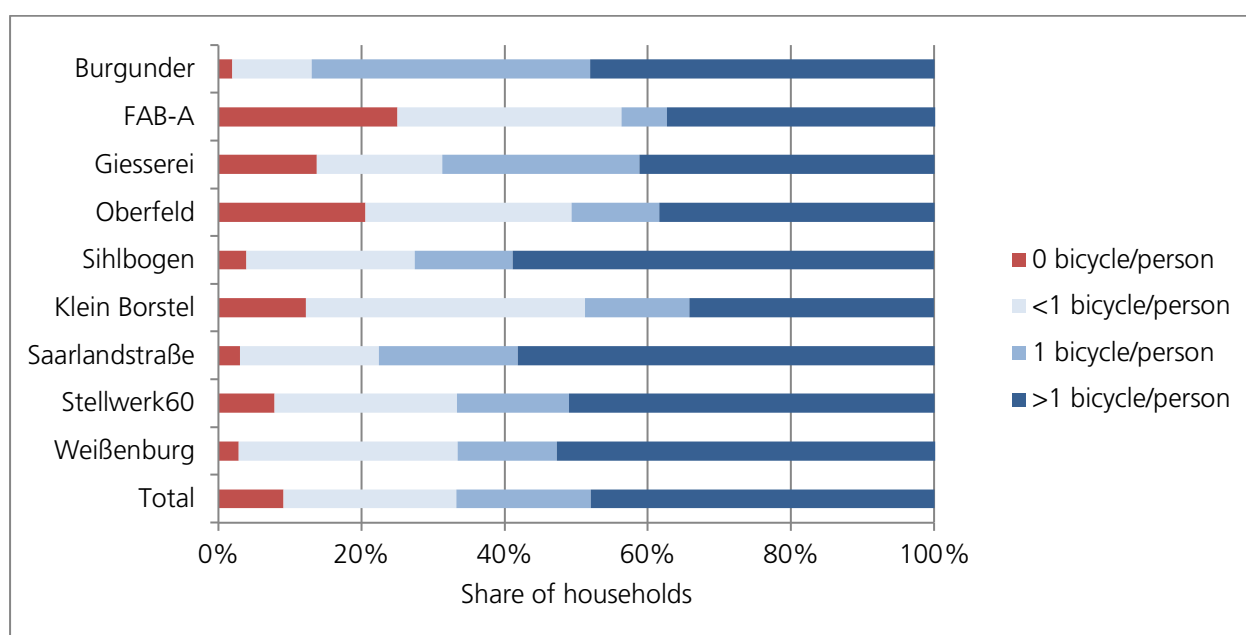
Figure 29: Number of bicycles per person (N=485)

In the interviews, different residents emphasised the importance of high-quality bicycles for living without a private car:

> *Wir haben natürlich gute Fahrräder, hochwertige Fahrräder, haben nicht alle hier in der Siedlung, aber wir haben wirklich dafür auch gespart und das ist uns ganz wichtig, weil wir längere Radtouren mal machen.*
> Woman, 50, childless couple, Weißenburg (W6_F: 68)

Other answers allow to understand why some residents have so many bicycles: they own different types, for different uses:

> *Ich habe zwei Fahrräder, ein kleines so zum Einkaufen und ein grösseres Tourenrad.*
> Woman, 65, living alone, Klein Borstel (K2: 38)

> *Ich habe vier Fahrräder, für verschiedene Zwecke: ein Faltrad, seit kurzem ein Pedelec, ein schönes gefedertes, ein altes Museumsstück.*
> Man, 60, living alone, Saarlandstraße (SA10: 23)

> *Ich habe mehrere Fahrräder: ein normales Zweirad, wenn ich alleine schnell irgendwohin möchte, ich habe mein Lastenrad, ich habe sogar noch ein Rennrad zum reinen Sportfahren.*
> Man, 40, couple with children, Weißenburg (W7_M: 113)

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As in the last citation, a particular bicycle type appeared: folding bikes were mentioned by three respondents as an important vehicle to combine public transport and cycling:

> *Ich habe mir so ein Brompton gekauft, so ein Faltrad, damit kann ich in den Zug und in den Bus und überall rein, muss auch keine Extrafahrkarte kaufen. Das Ding wiegt 12kg, immerhin, ein normales Fahrrad krieg ich nicht mehr die Treppe raufgetragen, diese Kraft habe ich nicht mehr. Es gab ja lange keine Fahrstühle oder ganz wenige an den U-Bahnen.*
> Woman, 75, childless couple, Saarlandstraße (SA09: 88)

E-bikes are less common than normal bicycles. For this reason, the results are presented at the household level. Only 11%, overall, have one and 2% two e-bikes (see Table 49). Three developments stand out: in Klein Borstel and Giesserei, about 30% of the households have an e-bike, and nearly 20% in Oberfeld. In Weißenburg and FAB-A, instead, only one household has an e-bike. These differences may at least partly be explained by the distances between the housing developments and the city centres.

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
1 e-bike	11%	6%	24%	15%	6%	29%	5%	4%	3%	**11%**
2 e-bikes	0%	0%	8%	1%	0%	5%	0%	2%	0%	**2%**
1 cargo bike	4%	6%	2%	1%	4%	7%	8%	8%	6%	**5%**
2 cargo bikes	0%	0%	0%	0%	0%	0%	0%	1%	0%	**0%**

Table 49: Households with e-bikes and cargo bicycles (N=487)

In the interviews, several, primarily older, residents mentioned the importance of an e-bike as an alternative to a car, to continue cycling or to ride longer distances:

> *Jetzt mit dem Pedelec hat sich der Radius erweitert, das ist schon auch ein ganz schönes Gefühl, das geniesse ich auch, wie schnell, oder gar nicht mal schnell aber auf längere Distanzen, oder bei Gegenwind, oder bergauf.*
> Man, 60, living alone, Saarlandstraße (SA10: 27)

> *Mit dem Flyer [e-bike] kommt man dann doch auch noch erstaunlich schnell irgendwo hin, manchmal vielleicht schneller als das Auto. Oder ich bin ins Muribad noch am Abend, Abendessen oder noch schwimmen und habe mir vorgestellt, das sei dann viel schwieriger ohne Auto, das ist eigentlich mit dem Flyer auch möglich.*
> Woman, 65, single-parent family, Oberfeld (O3: 16)

> *E-Bike ist für meine Seite Erleichterung, vor allem als Transportmittel. [...] Mit Anhänger ist schon einiges an Gewicht dran, das geht auf die Knie. E-Bike ist schon eine ganz geile Alternative für Pkw.*
> Man, 55, living alone, Weißenburg (W4: 32)

In contrast, some interviewees are negative towards motor-assisted bicycles. They highlight their sufficient physical abilities, even with children in a bicycle trailer, the higher costs or the energy needed for e-bikes:

> *Auch das Elektrovelo kommt für uns nicht in Frage, das schaffe ich ja knapp noch, so einen Veloanhänger [lachen]. Wenn man Kinder hat ist man einigermassen fit, sonst kann man ja den Zug nehmen.*
> Woman, 40, couple with children, Burgunder (B4: 65)

> *Elektrorad kaufe ich mir nicht, das wäre offiziell gestattet, aber das will ich gar nicht. Wenn ich schon Fahrrad fahre, will ich mich auch anstrengen, und ausserdem ist so ein Ding schweineteuer*

Cargo bikes are even less frequent than e-bikes, but rather popular given their general importance. Overall, 5% of the households have one or two (see Table 49). In the German developments, they are more common and reach shares above the average. In Stellwerk60, 9% have such a freight bicycle, in Hamburg (both in Klein Borstel and Saarlandstraße) about 7% of the households own one. The interviews showed that cargo bikes are often shared, generally informally between residents. Thus, many more households have access to a cargo bike in most developments. In some cases, they have been bought by a group of residents:

Das ist auch cool hier, das Sharing-Denken, Lastenvelos teilen.
Woman, 35, single-parent family, Oberfeld (O8: 20)

In der Siedlung haben wir neu noch so Elektro-Cargobikes, einzelne im Privatbesitz, die man nutzen kann und eins wurde angeschafft, wo wir uns auch beteiligt haben.
Man, 40, couple with children, Burgunder (B6: 34)

Cargo bikes are often explicitly seen as an alternative to a car:

Mit unserem Lastenrad brauchen wir mit Sicherheit kein Auto, weil wir sind wesentlich flexibler. Ich habe in dem Lastenrad mehr Platz als in einem Kleinwagen, also ich kann Grosseinkauf und kleine Kinder transportieren, was in einem Kleinwagen dann echt schon eng werden würde [lachen].
Woman, 40, couple with children, Weißenburg (W3_F: 90)

As the last citation indicates, the interviews also revealed the main reasons to own and use a cargo bike: transport children, shopping or material, e.g. for professional activities:

Wir haben ein Lastenrad, ein dänisches Christiania-Rad, und transportieren damit viel. [...] Wir haben lange Zeit jeden Tag fast zwei Stunden, die Kinder morgens damit zum Kindergarten gebracht, der eine halbe Stunde von hier war, halbe Stunde hin, halbe zurück.
Woman, 45, couple with children, Klein Borstel (K3: 16)

Wir haben immer draussen Training angeboten, von vornherein, und sind dann mit all unserem Equipment draussen in den Park gefahren. Dafür haben wir ein Lastenrad, bzw. jeder von uns hat ein eigenes Lastenrad, damit wir auch wirklich unsere ganzen Sachen zu den Kunden in den Park bringen können.
Man, 40, couple with children, Weißenburg (W7_M: 2)

An important equipment related to the bicycle appeared in the interviews: rainwear. Several residents mentioned the importance of good clothing to be able to cycle in any weather:

Ich bin einfach gut ausgerüstet, das ist ja so, wenn man viel Rad fährt, dann komme ich auch trocken überall an, das ist völlig unproblematisch.
Woman, 55, living alone, Saarlandstraße (SA11: 54)

Unser Motto ist: gibt kein Schlechtwetter, nur schlechte Kleidung. Dementsprechend sind wir auch ausgerüstet, das ist ja klar, logisch.
Man, 55, childless couple, Weißenburg (W6_M: 113)

8.1.1.2. Other two-wheeled vehicles

Two more types of two-wheelers have been surveyed (for details see Table 70 in the Appendix). First, motorbikes, scooters and mopeds. They are forbidden in some developments, while in others there is no explicit rule. However, only very few households answering the survey own such a motorised two-wheeler (one each in Burgunder, Giesserei, Oberfeld, Sihlbogen, Stellwerk60 and three in Weißenburg). Second, nearly 20% of the households responded to own "other two-wheelers", 11% have one, 4% two and 3% three or more. In most developments, more than 20% of the respondents declared to own at least one, while in Sihlbogen 96% do not have any. They include

various types (see Table 50): about 40% relate to different children's vehicles (scooters, walking bikes, etc.), one third are bicycle trailers, one quarter special bicycles (e.g. tandems), four households mentioned their shopping trolleys and two an electric wheelchair.

Type of other two-wheeler	n	Share
Children's vehicles (scooters, walking bikes, etc.)	45	38%
Bicycle trailers	42	35%
Special bicycles	27	23%
Shopping trolleys	4	3%
Electric wheelchairs	2	2%

Table 50: Types of other two-wheeled vehicles and share of all indicated answers (N=120)

These results emphasise the importance of the bicycle for many residents. Trailers and special bikes extend the range of cycling, especially for families, and for example for shopping. The interviews confirmed this, particularly for bicycle trailers. The reasons of using them are similar to those for cargo bikes, and they are often shared between residents, too:

> *Ich habe aber auch zwei Anhänger, verschiedene, fürs Velo. Ich habe mir das auch eingerichtet, das alles möglich ist, von Grosseinkauf bis allem mit dem Velo.*
> Man, 40, couple with children, Burgunder (B1: 24)

> *Ich habe auch einen Fahrradanhänger, wo ich die Umzüge mit gemacht habe oder die Entsorgung, zum Recyclinghof.*
> Man, 55, couple with children, Saarlandstraße (SA07: 14)

> *Der Kinderanhänger ist inzwischen unser Einkaufs-Fahrzeug hier, also das wir dann natürlich auch wieder Sachen mitbringen. Das ist unserer, aber den stellen wir auch der Gemeinschaft zur Verfügung, wir haben auch Gemeinschaftsräder mit Kupplungen dran und alle möglichen Anhänger, so dass man auch eine Waschmaschine transportieren kann. [...] Mein Mann fährt alles, Bretter bis 2 Meter, im Hänger, wo die Leute im Baumarkt: „Wie, mit dem Fahrrad, wie wollen Sie das denn mitkriegen?" Das ist so ein bisschen dieser sportliche Ehrgeiz, wir kucken mal was geht, in der Fahrradwerkstatt werden dann halt noch stabilere Hänger gebaut. Also das sind natürlich Sachen, die hätte man früher mit dem Auto gemacht, klar, aber es geht alles.*
> Woman, 50, couple with children, Klein Borstel (K5: 62/66)

There are also other types of bicycles, e.g. tandems, especially to cycle with children in the city:

> *Bei unserem Sohn ist es manchmal etwas schwierig, weil er nicht so sicher ist im Verkehr, da haben wir ein Tandem gekauft, dass er hinten draufsitzen kann, brauche ich manchmal auch mit der Tochter, weil es halt im Stadtverkehr manchmal auch etwas gefährlich ist und wenn wir schnell irgendwohin müssen. Früher hatten wir auch ein Schattenvelo, das man hinten dranhängen kann.*
> Man, 40, couple with children, Oberfeld (O4: 18)

8.1.1.3. Bikesharing

A last type of cycling is bikesharing. When the interviews were conducted in 2017, only Hamburg had a bikesharing system in operation (called "StadtRAD"). Therefore, this appeared only in interviews in Klein Borstel and Saarlandstraße. While some mention it as a possible alternative they do not use already, others use it frequently or only in specific situations:

> *Finde ich hochpraktisch, die Fahrradständer von der Bundesbahn, die sind ja überall, StadtRAD. Habe ich selber noch nicht benutzt, also steht noch vor mir.*
> Man, 60, living alone, Saarlandstraße (SA04: 46)

> *Was ich immer ganz viel nutze ist StadtRAD. Dann fahre ich in die Stadt mit der Bahn und dann nehme ich mir das StadtRAD und fahre kreuz und quer und stelle es wieder ab. Ich habe noch nie was bezahlt, innerhalb einer halben Stunde, das mach ich dann ganz oft, das ist gut.*
> Woman, 50, single-parent family, Klein Borstel (K1: 82)

8.1.1.4. Public transport passes

Now we switch to mobility access on a clearly individual level, as bicycles and other two-wheelers can—at least potentially—be shared. Furthermore, bicycles are—except for bikesharing—owned vehicles, whereas this section addresses access to mobility services.

Public transport passes are very common among car-free household members aged 16 and more (see Figure 30). There are two types: the first are discount cards, the Swiss half-fare card or the German BahnCard 25 or 50. These passes entitle holders to get a discount of 25% or 50% on railway tickets (and in Switzerland also a discount on urban public transport tickets). They are very common, reaching a share of about 60% overall and 40% to 70% depending on the development. The second type are national or regional "flatrate" passes, allowing unlimited travel either in the whole country (only on railway lines in Germany, on most public transport services in Switzerland) or within a city or region. Overall, 21% of the residents own a Swiss GA travelcard or a German BahnCard 100 and 39% a regional monthly or annual ticket. Taken together, 60% of the residents aged 16 and older own a "flatrate" pass. The minimum is 20% (Weißenburg) and the maximum 90% (Sihlbogen). The two extremes can be explained by the cities they are located in. Münster has an important cycling culture and a limited public transport system (only busses and a few regional train lines), whereas Zurich is known for its very dense and developed public transport network with S-Bahn trains, trams and buses.
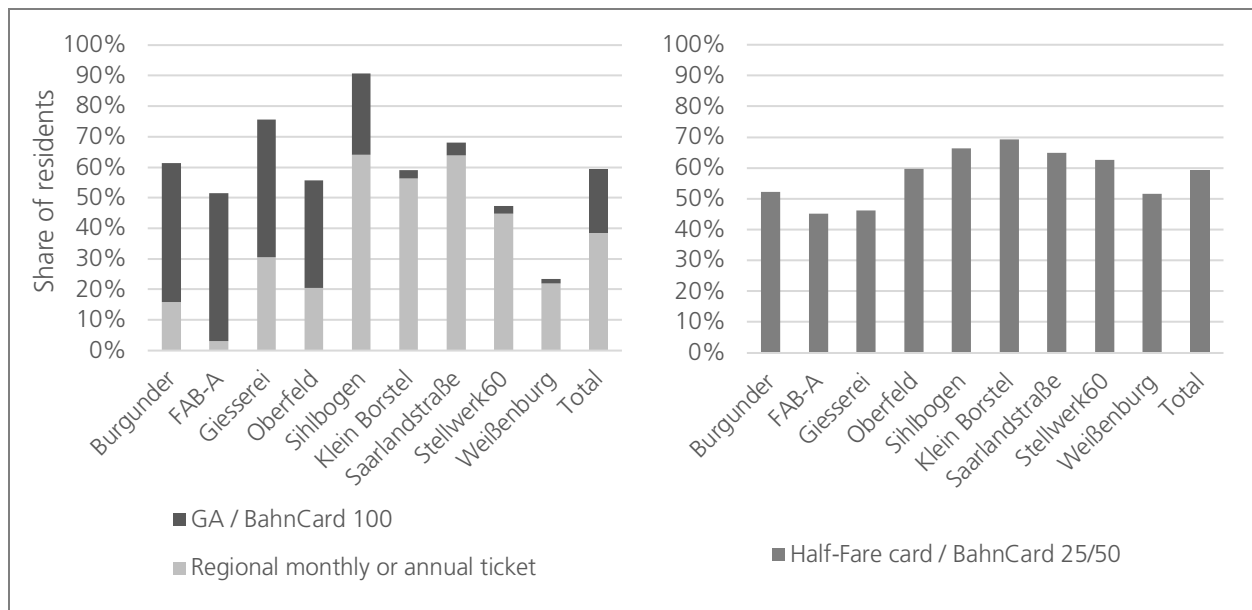
Figure 30: Household members (aged 16+) with public transport passes (N=808)

The importance of regional passes is very different: in FAB-A only 3% have one and in Burgunder 16%, whereas in Sihlbogen and Saarlandstraße, over 60% of the residents have such a monthly or annual ticket. Furthermore, there are differences between the two countries. The national annual pass (GA/BahnCard 100) is clearly more common in Switzerland: 40% or more of the residents in Burgunder, FAB-A and Giesserei do have one and still 27% and 35% in the two other Swiss developments. In Germany, they are less than 5% everywhere. Instead, the discount passes are popular everywhere: between 45% (FAB-A) and 69% (Klein Borstel) own one. The lower shares in Switzerland are, of course, explained by the high shares of the "flat rate passes". Overall, nearly all residents own a public transport pass, highlighting the importance of trains and buses for car-free living.

In the interviews, public transport passes were indeed mentioned as an important alternative to the car, to facilitate access to buses and trains, for some all year and for others only in winter when cycling is less convenient:

Dafür leiste ich mir ein 1.Klass-GA wenn ich schon kein Auto mehr habe.
Man, 70, living alone, Oberfeld (O2: 12)

*Ab November, ab dem Moment wo ich sage jetzt wird's mir zu kalt und zu dunkel und zu gefähr-
lich, kaufe ich mir dann ein Libero-Monatsabo [regional monthly ticket], meistens ab November bis
und mit März oder so, bis ich das Gefühl habe, jetzt fühle ich mich wieder wohl zum Velo fahren.*
Woman, 50, living alone, Oberfeld (O6: 36)

*Ausserdem habe ich ein Abo, für den Gesamtbereich. Ich kann überall einsteigen und muss nicht
viel zahlen, ich zahle 50€, auch weil ich alt bin, das ist super bequem, ich kann in jeden Bus
steigen.*
Woman, 75, childless couple, Saarlandstraße (SA09: 66)

8.1.1.5. Car access

Even if the residents do not own private cars, nearly all of them could use a car as 84% of the
residents answering this question in the survey hold a driving licence. There are some small dif-
ferences between the developments (see Figure 31). In Stellwerk60 there are 93% of licenced driv-
ers, in Weißenburg only 75% and in Giesserei 69%. This is probably due to the presence of more
young adults and elderly people, as well as to financial reasons.
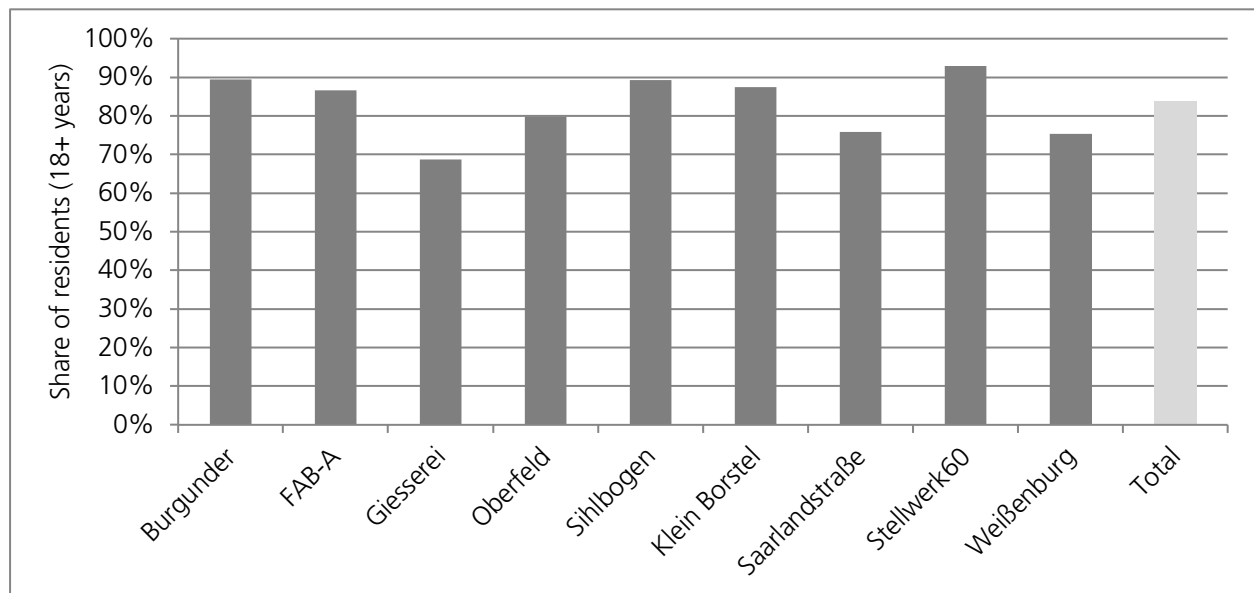
Figure 31: Driving licence holders (18+ years old) (N=765)

The shares of driving licence holders for different age groups show these differences (but the
number of persons in the young (n=35) and old (n=81) categories are very small): only 29% of the
18-24-year-olds hold a driving permit, but 70% of the residents aged 65 and older and 88% of
those 25–64 years old (see Table 51).

Age	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
18–24 (n=35)	0%	50%	100%	20%	0%	0%	22%	100%	20%	**29%**
25–64 (n=649)	92%	89%	74%	87%	91%	94%	80%	93%	87%	**88%**
65+ (n=81)	50%	100%	58%	56%	50%	100%	92%	92%	100%	**70%**

Table 51: Driving licence holders in different age groups

Most of the interviewed residents hold a driving licence, too, but highlighted interesting nuances. An important part of the licensed drivers has only in theory access to a car, but did not drive for a long time and would not do it anymore—an elderly man even gave back his driving licence:

> *Wir haben beide einen Führerschein, aber wir hatten auch nie den Drang, das auszuleben. Also ich könnte glaube ich noch, wenn ich wollte, sie wohl nicht mehr. Aber ich bin seit 16, 17 Jahren selber gar nicht mehr gefahren.*
> Man, 55, childless couple, Saarlandstraße (SA02: 26)

> *Ich habe dann sogar den Führerschein abgegeben. Die Kinder haben zwar gesagt, willst du das wirklich, im Notfall wärst du froh. Dann habe ich gesagt grad im Notfall oder wenn man lange nicht gefahren ist, man ist nervös, da kommt ein Taxi 10 Mal billiger.*
> Man, 70, living alone, Sihlbogen (SI2: 2)

While most respondents passed their driving licence at the age of 18 or in their early twenties, some learned to drive lately. Living longer without a personal access to a car probably facilitates car-free living:

> *Ich habe auch sehr spät die Autoprüfung gemacht, kurz bevor wir nachher in die autofreie Siedlung gezogen sind [lachen] weil ich gemerkt habe, die Kinder kommen, dann sind wir mal nach Südfrankreich in die Ferien und nur meine Partnerin konnte fahren. Dann dachte ich, das ist auch ein Mist.*
> Man, 40, couple with children, Burgunder (B6: 18)

> *Relativ spät, ich überlege, glaube erst so mit 23 oder so, da habe ich gedacht, es wäre doch mal praktisch. [...] Nicht mal, das hatte ich nie, was andere haben, ich will mich frei fühlen, mit dem Auto, jederzeit überall hin, in der Nacht, das hatte ich nie. Mehr einfach, dass es praktisch ist, dass man etwas transportieren kann. So, wie wir es heute auch brauchen, für Spezialsituationen.*
> Man, 45, couple with children, Oberfeld (O7: 54 - 55)

For the reasons to get a driving licence, the most frequent is that it was normal at the time the respondent was 18 or in the (rural) place he or she lived then. Of course, this is even more important for residents who passed their driving licences as soon as possible:

> *Da wohnte ich in einer Kleinstadt [...] Das gehörte dazu, wenn man 18 war, wenn die finanziellen Möglichkeiten da waren, dann haben alle eigentlich einen Führerschein gemacht.*
> Woman, 55, couple with children, Klein Borstel (K7: 14)

> *Das gehörte damals zum Erwachsenwerden. Und mein erstes Auto, das war auch damals typisch, habe ich zum Examen geschenkt gekriegt. Das waren so Initiationsriten. [...] Das gehörte dazu wie Abitur machen.*
> Woman, 70, living alone, Saarlandstraße (SA12: 24 - 26)

> *Jeder in meiner Klasse, ich war da in der Fachmittelschule, dass das jeder macht mit 18. Da hat man untereinander gesagt, machst du auch die Autoprüfung, ich lerne gerade. So hat es mich auch angesteckt, und war wie klar, das gehört zur Ausbildung, das gehört dazu.*
> Woman, 30, flat share, Sihlbogen (SI5: 16)

For many residents, work-related reasons (or often more in the sense of a potential future need) played a significant role to get a driving licence, too:

> *Es kann auch mal sein, dass du einen Job hast, ich hatte schon Jobs, wo ich Auto fahren können musste. Darum habe ich gefunden, ich mache das.*
> Woman, 35, couple with children, Burgunder (B5: 26)

For some women, passing their driving licence was an emancipative act, a key to independence at a time when driving was not already normal for women:

> *Ich hab '68 Abitur gemacht [lachen] und das war ja eine sehr bewegte Zeit. Und ich war auch in der Schule und auch nachher, als ich Hausfrau war, politisch etwas aktiv und für mich gehörte das einfach für eine feministisch angehauchte Frau dazu [lachen] auch Auto zu fahren und nicht immer davon abhängig zu sein, dass ihr Mann sie irgendwo hin kutschiert. Das war für mich ein*

Stück Selbstverständnis auch damals.
Woman, 65, living alone, Klein Borstel (K2: 14)

Others mentioned practical issues, the possibility to drive a car to transport things, go on holiday or in general, the driving licence as an important access as other skills for life:

Weil er [driving licence] einfach dazu gehört, wie schwimmen lernen, das ist wie Ski fahren, schwimmen. Man muss vorbereitet sein, um Gelegenheiten wahrnehmen zu können im Leben und wenn eben man darauf angewiesen ist, einen Führerschein zu haben, weil man sonst eine bestimmte Tätigkeit nicht machen kann, dann ist es blöd, wenn man erst den Führerschein machen kann. Deswegen lernt man ja auch Fremdsprachen, um vorbereitet zu sein.
Man, 50, couple with children, Klein Borstel (K6_M: 28)

Die Möglichkeit zu haben, etwas selbst transportieren zu können, mit mehreren vielleicht noch günstig in Urlaub fahren zu können, sich abzuwechseln beim Fahren.
Woman, 55, couple with children, Klein Borstel (K7: 16)

A minority of residents never got a driving licence, one resident for anxiety or convenience reasons, the others primarily for personal (environmental) convictions:

Also Umweltbewegung 70er-Jahre hat mich sehr geprägt, Friedensbewegung hat mich sehr bewegt. Ich hatte dann auch, das ging in der Schule los, Kriegsdienstverweigerung, vorm Abitur die Jahre mit den Mitschülern so gesprochen, da war ein ziemlich starkes ethisches Bewusstsein, Alternativbewusstsein da. Da kam auch die Diskussion auf mit dem Autofahren. Ich habe keinen Führerschein gemacht, habe gesagt, wenn's mal nötig ist so beruflich oder so, dann mach ich das. Aber sonst will ich diese Autos nicht haben.
Man, 60, living alone, Saarlandstraße (SA10: 2)

Ich habe aus ökologischen Gründen keinen Führerschein gemacht, gar nicht erst den Führerschein gemacht.
Woman, 50, childless couple, Weißenburg (W6_F: 20)

Holding a driving licence is one thing, to drive, a car-free resident also needs access to a car. A very convenient way is carsharing. It is a bit less popular than public transport but still widely available: 44% of the household members aged 18 and older have a carsharing subscription. It has a rather variable importance in the different developments (see Figure 32). In Saarlandstraße, only 19% of the residents have access to this transport mode, whereas in Stellwerk60 more than 60% do and in Burgunder, Oberfeld and Weißenburg about half of the residents.
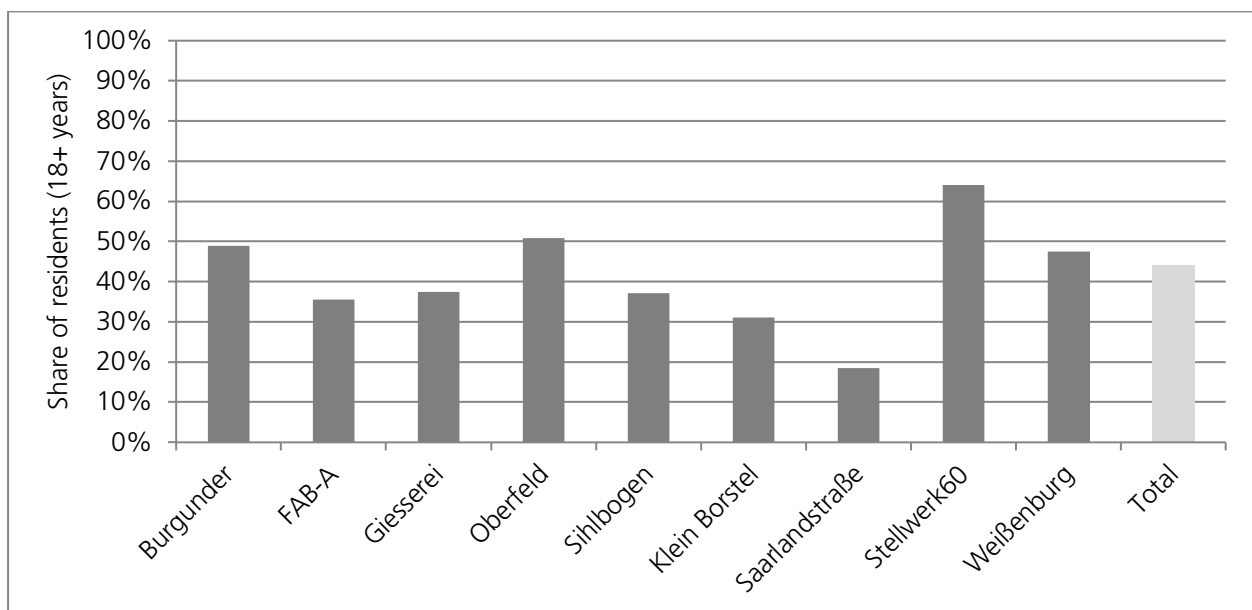
Figure 32: Residents (aged 18+) with carsharing subscriptions (N=791)

The reasons for these differences do not seem very clear. Some developments in central urban areas have lower shares (Saarlandstraße, FAB-A), but there are others with very high shares (Stellwerk60, Weißenburg). The city size seems not explaining it neither, nor the age of the development. In the discussion after the presentation of my first results in Saarlandstraße in autumn 2017, the hypothesis of a withdrawal after a certain time was proposed: the longer households live without a private car, the less they will use cars, and, finally, not even subscribe to carsharing anymore. A citation from an interview confirms this:

> *Ich bin Mitglied hier bei dieser Carsharing-Firma, die das Auto hier stehen hat, bezahle dafür 5 Euro im Monat. Es war mir ein beruhigender Gedanke, dass wenn ich tatsächlich mal ein Auto schnell brauche, dann auch zur Verfügung zu haben. Ich habe das von Anfang an gemacht, aber die Praxis zeigt, wenn ich's ein, zwei Mal im Jahr benutze [lachen] dann ist das viel. Ich trag mich mit dem Gedanken, das auch aufzugeben [lachen].*
> Woman, 65, living alone, Klein Borstel (K2: 30)

This is different in Switzerland with Mobility carsharing, organised as a cooperative. As explained above, members can pay once a cooperative share and then use carsharing cars without paying a subscription anymore, as a resident highlighted in the interview:

> *Dann kann ich ein Mobility-Auto nehmen, wenn ich eins brauche, es wieder hinstellen. Alles andere schaut Mobility. Da bin ich auch Genossenschafter und habe gar keine laufenden Kosten, und bin schon lange Genossenschafter, schon bevor wir hierhin gezogen sind. Manchmal brauchen wir's auch drei, vier Monate gar nie, dann kostet es uns auch nichts, weil wir es nur dann bezahlen, wenn wir eins brauchen.*
> Man, 45, couple with children, Oberfeld (O7: 10)

However, carsharing, also the free-floating model (in Hamburg, only Saarlandstraße is located within its operative area), constitutes an important alternative to owning a car:

> *Da stehen ja jetzt auch 1'000 Autos davor, dieses Car2Go. Man ist sehr schnell dabei, wenn man mal irgendwo was abholen will, dann kann man sich für kurze Zeit ein Auto auch mieten, das ist so. Also die stehen hier zur Verfügung, von daher braucht man wirklich kein eigenes vor der Tür.*
> Woman, 55, living alone, Saarlandstraße (SA01: 6)

Other residents have no carsharing subscription, because they do not even rarely use a car:

> *Ich habe mir auch Mobility überlegt, aber das war bis jetzt auch gar nicht nötig, dort beizutreten. Ich brauche es einfach nicht, ein Auto.*
> Woman, 55, living alone, Oberfeld (O5: 4)

> *Ich brauche auch das Mobility-Auto nicht. Ich habe kein Abo, ich hatte früher mal eins, aber inzwischen sage ich, ich kann alles mit dem öV machen.*
> Man, 35, childless couple, Sihlbogen (SI3: 4)

Finally, one reason for this can also be private carsharing, the possibility to borrow a car from friends or relatives:

> *Letzte Woche habe ich mir grad mal wieder eins geliehen von einer Freundin, weil ich brauchte einfach grosse Blumentöpfe, da steht man dumm da mit dem Fahrrad. [lachen] Also für solche Anlässe leihe ich mir dann einfach mal was. [...] Von Freunden, genau, ich bin nicht irgendwo im Carsharing Mitglied, weil ich's nicht brauche regelmässig, dann macht es keinen Sinn.*
> Woman, 55, living alone, Saarlandstraße (SA11: 32 / 34)

8.1.1.6. Changes in mobility access

In this section, some biographical aspects regarding mobility access are presented, especially car ownership during the respondents' life course. First, car (non-)ownership biographies are addressed. The results of two survey questions provide an overview and data from the interviews more details. Then, further biographical aspects regarding other modes of transport mentioned in the interviews are analysed.

Overall, 17% of the residents aged 18 and older have grown up in a car-free household. In Klein Borstel, Sihlbogen and Stellwerk60 they are only 12% whereas they are 30% in Giesserei (see Figure 33). In two other developments, the proportions reach about one fourth, 26% in Saarland-straße and 23% in Weißenburg. This may be due to elderly people who grew up at a time when cars were not already as frequent as in the second half of the 20th century. Or it reflects the higher shares of young adults still living with their parents in the car-free development. Finally, it is also explained by the socio-economic characteristics of the household: Saarlandstraße and Weißenburg being (partly) subsidised housing, financial reasons may also explain why more residents grew up car-free. However, the important point is that a large majority of residents in all developments has grown up in a car-owning household.
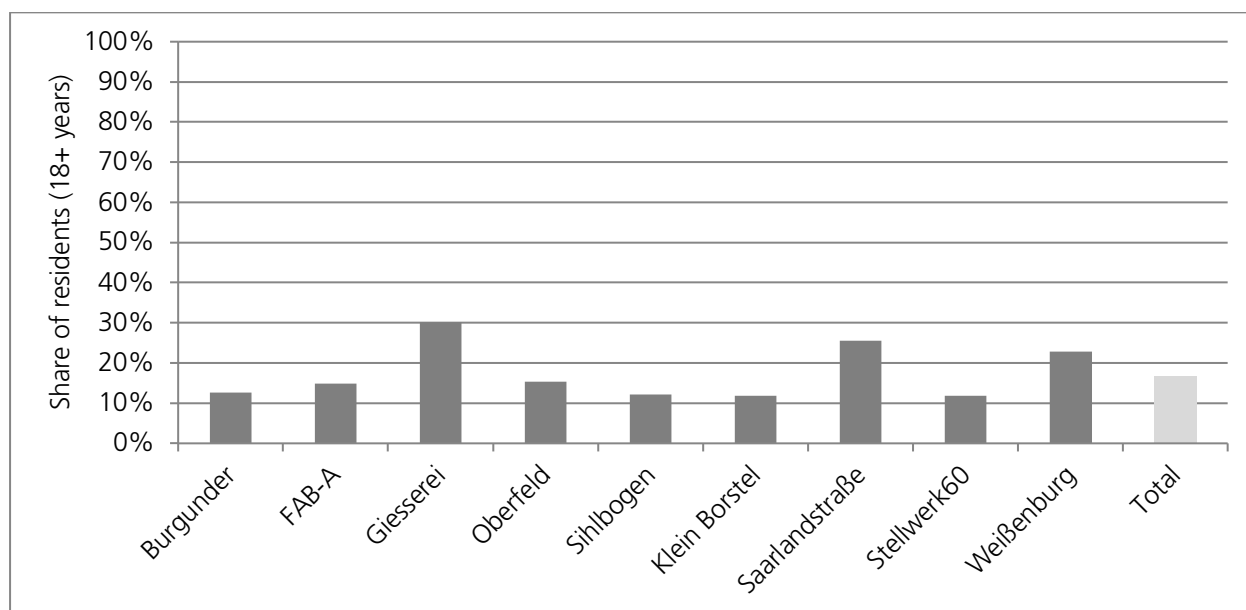
Figure 33: Residents aged 18 and older grown up in a car-free household (N=748)

The interviews revealed that the presence of a car in the household may have changed, some residents grew up in a family who gave up a car:

> *Unsere Familie, wir haben auch mal aus Überzeugung eben das Auto abgeschafft. Wir wohnten aber auch sehr stadtnah, in der Innenstadt oder auch am Stadtrand, so dass wir wirklich mit dem Fahrrad fahren konnten.*
> Woman, 50, childless couple, Weißenburg (W6_F 27)

> *Ich bin in einem autofreien Haushalt aufgewachsen. Wir hatten ein Auto bis ich sieben war, dann sind wir von [canton in eastern Switzerland] nach [canton in the southeast] gezogen, da haben die Eltern ein Haus gekauft und sich das Auto nicht mehr leisten können [lachen] einerseits, und andererseits wirklich auch aus ökologischen Gründen, das war 80er-Jahre, Umweltthemen, die aufgekommen sind, auch etwas ein Statement gewesen. Wir haben nicht in der Stadt gewohnt […] und nicht Viertelstundentakt gehabt, sondern Stundentakt und den Bahnhof zuunterst im Dorf.*
> Man, 40, couple with children, Burgunder (B6: 10)

Such experiences facilitate staying car-free later in life. Of course, the same is true for residents grown up entirely without a car:

> *Meine Familie hatte gar kein Auto, also ich bin bei meiner Mutter aufgewachsen und die hatte keinen Führerschein. Von daher bin ich trainiert.*
> Woman, 65, childless couple, Weißenburg (W2: 20)

> *Ich komme aus einer autofreien Familie, dann habe ich hier gemerkt, keiner kannte das, keiner ist so gross geworden. Ich bin in West-Berlin gross geworden.*
> Woman, 55, couple with children, Klein Borstel (K4: 4)

The last citation shows that these residents represent a small minority and most grew up with a car (or two) in the household, in a traditional, car-friendly atmosphere:

> *Da hatten wir auch immer ein Auto. Das merke ich schon, bei meinen Eltern war das sehr fest drin* [...] *Es war wie kein Thema, man hatte einfach ein Auto. Auch als Kind, wir haben viel mit Autos gespielt, das war wie Teil des Lebens, wir haben weniger mit Zügen gespielt, wir hatten schon eine Brio-Eisenbahn aber dann eher noch grössere Autos oder Traktoren oder so.*
> Man, 40, couple with children, Oberfeld (O4: 28)

> *Also mit zwei Autos, es war eine sehr klassische Situation, der Vater hat natürlich das Auto gebraucht zum Arbeiten, wir waren vier Kinder, die Mutter hat das Auto gebraucht zum Einkaufen.*
> Woman, 50, living alone, Oberfeld (O6: 12)

> *Ich bin so klassisch aufgewachsen, mit einem Haus und Garten, Papa hat ein Auto, Mama erzieht, so ganz das klassische Familienmodell. Und war auch so, dass das Auto dann einen Namen gekriegt hat, das war schon emotional überhöht, hat aber auf mich nicht abgefärbt.*
> Man, 55, childless couple, Saarlandstraße (SA02: 38)

In other households, there was a more critical distance towards the car that may have prepared future car-free living:

> *Es ist letztendlich auch ein bisschen die Einstellung meiner Eltern, die hatten einen Passat Kombi, weil da viel reingeht, der wurde gekauft, runtergeleiert, bis 250, 300'000 km drauf waren und dann wurde der zweite Wagen gekauft, wenn's dann kaputt war. Ohne Emotionen und ohne irgendwas. So vermute ich mal, dass das schon auch auf die Kinder ausstrahlt.*
> Man, 45, couple with children, Saarlandstraße (SA05: 26)

> *Ich bin in einer Familie gross geworden, wo immer Wert darauf gelegt wurde, möglichst nah an seiner Arbeitsstätte zu leben* […] *oder dass Einkaufsmöglichkeiten fussläufig in der Nähe waren.* […] *wir hatten nur einen Pkw, was wegen Pendelei zur Arbeit vorhanden sein musste. Aber das war in unserer Familie auch wirklich nur so, es musste vorhanden sein, weil anders ging's nicht, und es war eher eine Last. Und wenn wir alle in den Urlaub gefahren sind, sind wir alle mit dem Zug in Urlaub gefahren* […] *Also ich bin selber auch schon damit gross geworden, dass ein Auto, naja, eher so ein Mittel zum Zweck ist, aber mehr auch nicht. Aber wir hatten früher auch nur einen Lada gehabt, worüber sich die halbe Welt kaputtgelacht hat, wo noch der Autoboom so war, grösseres Auto, schickeres Auto und alle Leute legten Wert darauf, jetzt wenn ich noch mehr Geld habe, noch teurere Autos habe. Und meine Familie tuckert da mit dem Lada in der Gegend herum [lachen].*
> Woman, 40, couple with children, Weißenburg (W7_F: 55)

As we saw before, socialisation effects seem to play an important role. Residents growing up in a car-centred household often only changed later, but think that their children will be different, as they experience the feasibility to live car-free:

> *Ich glaube, das hat auch was mit dem Elternhaus zu tun, wie die Kinder gross werden. Also in dem Umfeld war es eine logische Konsequenz ein Auto zu fahren. Aber ich sag mal, wenn wir unseren Kindern, also ich glaube, unsere Kinder würden anders denken, also ich glaube nicht, dass mein Sohn irgendwann noch auf die Idee kommt einen prolligen GTI aufgetunt irgendwie zu fahren, weil er das zu Hause anders kennt.*
> Man, 40, couple with children, Weißenburg (W3_M: 218)

For the period of life when the residents decided themselves to own a car or not, three types exist: respondents who never owned a car, those who owned a car earlier in life and households who gave up a car just before moving to the car-free housing development. For those who never owned a car, the reasons are various and similar to why they live car-free in general—personal and practical motivations:

> *Das war eigentlich schon immer so, von Kindheit an bei meiner Frau und mir, dass wir keine Autos gemocht haben und auch eigentlich uns von Kindheit an gesagt haben, wir brauchen keins, wir wollen keins. War auch nicht schwer, das durchzuhalten.*
> Man, 40, couple with children, Klein Borstel (K9: 18)

Am Anfang, das waren verschiedene Sachen, zum Teil auch das finanzielle, wir waren beide Stu-denten, dann eben dieser andere Faktor von wegen gut, wo kann man das parken, die paar Male wo man ein Auto ausgeliehen hatte, hat man gemerkt, das ist ein Problem. […] Wir sind damals auch sehr viel Rad gefahren. Ja, das spielte auch, diese Einstellung mit, das brauchen wir eigent-lich nicht hier.
Woman, 55, childless couple, Saarlandstraße (SA06: 52)

The residents who owned a car and gave it up earlier in their life course mentioned different reasons. The most common was that they had no use anymore, either because of a "key event" such as moving to a city or a new job:

Ich habe gedacht ich ziehe erst um nach dem Ende der Probezeit, so lange habe ich bei meinen Eltern in [neighbourhood at the outskirts of Hamburg] gewohnt, das ist ziemlich weit ausserhalb. Und als ich dann eine eigene Wohnung hatte, sehr viel näher, in Barmbek, da habe ich gesagt, so jetzt brauch ich das nicht mehr. Und hab's nie bereut.
Woman, 70, living alone, Saarlandstraße (SA12: 31)

Another frequent "key event" to become car-free was when an old car broke down and a new should have been bought:

1989 ging mein Auto kaputt, damals habe ich nicht so viel Geld verdient und wollte mir kein Neues kaufen und habe gedacht, jetzt kucken wir mal wie es mit Taxi und Fahrrad und Bus und Bahn geht.
Woman, 75, childless couple, Saarlandstraße (SA09: 4)

Ich selbst habe seit '85 kein Auto mehr. Das ist mir damals kaputt gegangen. Ich habe dann aber bewusst gesagt, ich versuche ohne Auto zu leben.
Man, 60, childless couple, Weißenburg (W1: 4)

Some other reasons were also cited, especially different types of financial reasons:

Während des Studiums hatte ich kein Auto, das Geld war ja auch gar nicht da, brauchte ich aber auch wirklich nicht, weil ich auch in Nähe U-Bahn gewohnt habe und mit der U-Bahn dann zur Uni gefahren bin.
Woman, 55, living alone, Saarlandstraße (SA01: 23)

Als ich nach Hamburg gekommen bin, habe ich noch ein Auto gehabt, weil ich das in [big city in North Rhine-Westphalia] einfach auch brauchte, das hatte ich. Dann kam was zweites dazu, ich war schockiert, dass in Hamburg alles teurer war als in [former place of residence]. Angefangen vom Liter Milch bis zur Kinokarte und habe dann überlegt, wo kann ich Geld sparen, ohne dass es wehtut. Also ich denke, wenn es damals sowas wie Carsharing gegeben hätte, wäre das meine Option gewesen, gab's damals nicht, und dann habe ich einfach das Radfahren ausgebaut.
Woman, 70, living alone, Saarlandstraße (SA12: 14)

Giving up a car was for some households also the result of a more diffuse process leading to realise that other transport modes were better adapted to their everyday life and the car not really needed and used anymore:

Irgendwann kam der Gedanke, brauchen wir überhaupt eins. Wir sind dann relativ schnell dazu gekommen, nein, eigentlich können wir auch leben ohne.
Man, 70, childless couple, Burgunder (B2_M: 12)

Der Moment als ich erkannt habe, dass ich in einem Jahr nur noch 900 km mit dem Auto gefahren bin, da dachte ich, wieso habe ich das eigentlich? Das Geld, das es kostet, da kann ich die 900 km auch mit dem Taxi zurücklegen.
Man, 70, childless couple, Oberfeld (O1: 104)

Finally, there are households who owned a car before move-in. The survey results show that a quarter of them gave up their car before moving to the car-free housing development (see Figure 34). In Oberfeld (16%) and Giesserei (18%) this share is lower, whereas in Klein Borstel (42%), FAB-A (38%) and Stellwerk60 (36%) it is significantly higher. FAB-A is small, so one household has an important weight, in Klein Borstel, the importance of the collaborative housing project

and the location at the outskirts of the city may play a role, whereas Stellwerk60 as a car-reduced and largely conventional development may have less specifically attracted car-free households but led an important number of them to abandon a car.
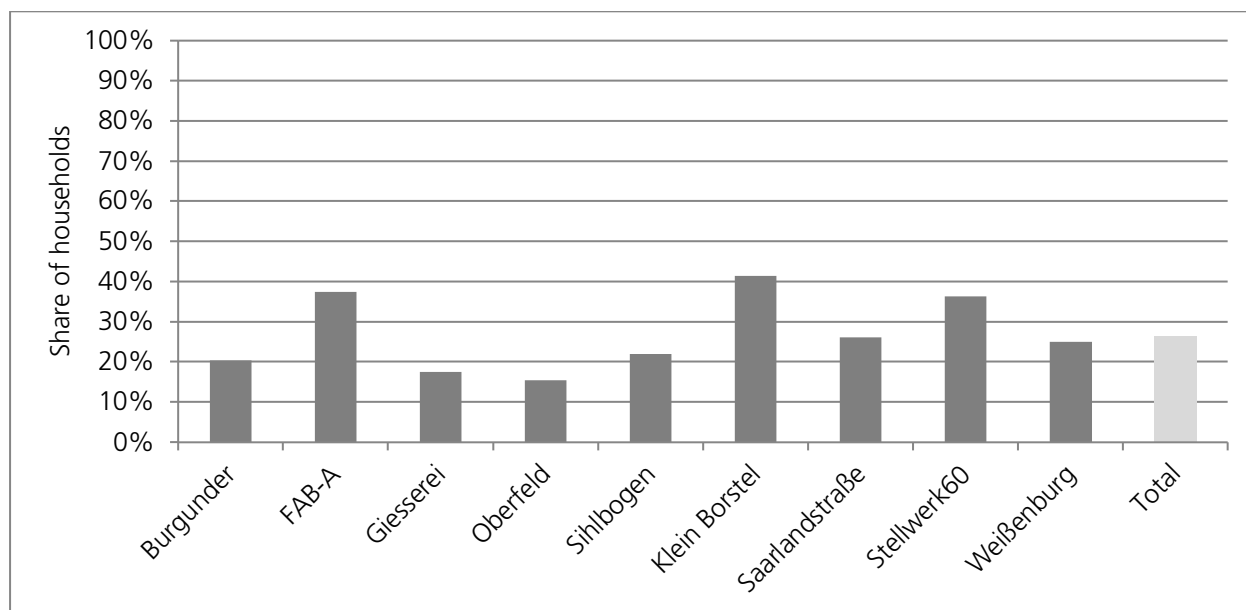
Figure 34: Households owning a car before moving to the car-free housing (N=482)

The interviews showed that not all of these households always owned a car before, some only did so for a short period of time and had already lived car-free before. They mostly owned a car for professional reasons. For some, their working situation changed when they moved to the car-free housing development and others just organised their transport issues differently.

Finally, some other biographical aspects related to mobility access were mentioned in the interviews. Respondents also highlighted access to public transport or particular bicycle equipment they had before in their life course:

> *Da bin ich lange gependelt, da hatte ich ein GA, das hatte ich schon, das, was viele mit dem Auto haben, so wegen der Freiheit und Unabhängigkeit, das fand ich schon cool. Wenn du ein GA hast, steigst du einfach ein und fährst irgendwo hin. Das ist psychologisch wertvoll, das gibt auch etwas ein Freiheitsgefühl.*
> Man, 45, couple with children, Oberfeld (O7: 84)

> *Ich habe immer, so lange ich denken kann, schon als 20-Jähriger habe ich einen Fahrradanhänger gehabt.*
> Man, 55, childless couple, Weißenburg (W6_M: 38)

8.1.2. Mobility skills

The other element constituting mobility capital are mobility skills. A question with a series of competences was part of the survey questionnaire. In the interviews, it was more implicit, it was generally addressed when talking about particular mobility practices and what lies behind them, i.e. how trips are organised or planned.

8.1.2.1. Types of mobility skills

In the survey, seven items with different skills related to mobility were tested. The residents seem to have important mobility competences, overall (see Figure 35). A large majority agrees with the competences asked for (or disagrees, according to the formulation of the item). For example, only very few residents are physically restricted in their mobility (e.g. walking impedi-

ments) or have difficulties to orientate in space. Still 77% do "not agree (at all)" to feel restricted without their own car. On the positive side, nearly all respondents at least "rather agree" with the other skills asked for, including "the internet facilitates me to plan my mobility", "from my home, I reach all activities I'd like to without a car" and "public transport timetables are easy to understand". This last item showed some differences between the two countries. Either this means that Swiss timetables are easier to understand, either the residents of the Swiss developments do have more experiences and, thus, competences related to them[65].
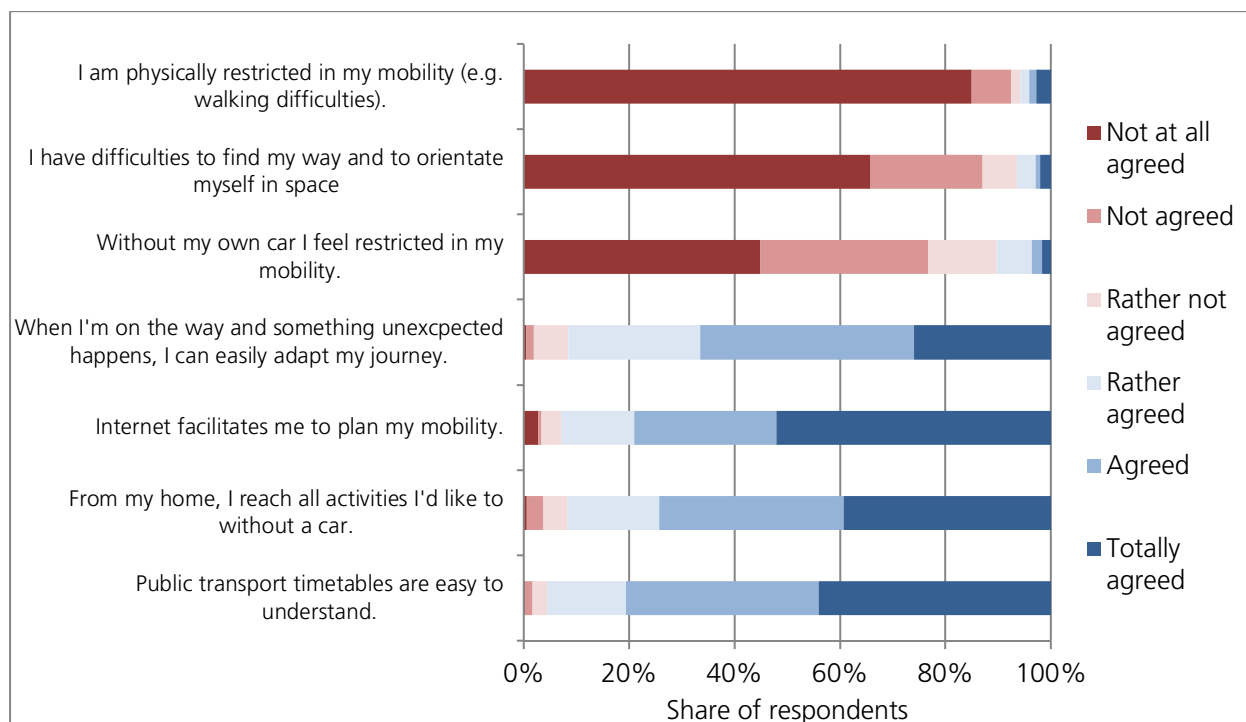
Figure 35: Mobility skills of the residents (N=469 to 483)

In the interviews, timetables were mentioned by several residents, e.g. the fact to have them in mind (eased by regular-interval timetables):

> *S-Bahn, da hat man den Plan natürlich so ein bisschen im Kopf, weil die Bahn hier ohnehin alle 10 Minuten fährt, braucht man nicht speziell zu kucken, mann weiss, dass sie auf der 5 immer fährt und 22 Minuten zum Hauptbahnhof braucht.*
> Man, 40, couple with children, Klein Borstel (K9: 72)

Additional skills related to public transport were also cited, especially knowledge about tickets and fares or the different lines of the network:

> *Vieles braucht man gar nicht so sehr stark planen, das Verkehrsnetz, S- und U-Bahn das kenne ich ziemlich. Wenn's tagsüber ist, dann fahre ich da einfach so spontan, und weiss da krieg ich die Anschlüsse und da ist ein dichter Takt.*
> Man, 60, living alone, Saarlandstraße (SA10: 47)

> *Ich kenne jetzt schon relativ viele Strecken des Nahverkehrs, viele Buslinien, S-Bahn-Linien, U-Bahn-Linien. Also ich kenne mich von der Infrastruktur ganz gut aus. Und kucke natürlich immer nach, im Internet irgendwie so wie ich da am besten hinkomme und wie lange ich brauche.*
> Woman, 55, couple with children, Klein Borstel (K7: 60)

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[65] Dubois (2017) found the same differences in his thesis on the the trinational region of Basel.

The last citation indicates a very important transversal skill, reaching 52% of "totally agree" in the questionnaire and mentioned by many residents in the interviews: use the internet for planning and organising mobility, primarily by public transport:

> *Am Sonntag muss man vielleicht mal kucken, da fahren die Busse vielleicht nur alle halbe Stunde. Dann kuck ich vorher im Internet nach dem Fahrplan und such mir die Verbindung raus, dass ich nicht so lange warten muss.*
> Woman, 65, living alone, Klein Borstel (K2: 110)

> *Es gibt ja irgendwie wunderbare Planungstools inzwischen von der deutschen Bahn oder vom HVV, da geben Sie zwei Orte ein und dann sucht der Routenplaner. [...] Das ist schon praktisch und gut, dass es die gibt. Also ich nutze die hier mit dem PC, ich habe kein Smartphone, das wäre praktisch, das finde ich gut, richtig und wichtig. Ich kann mich durchaus auch noch an Methoden erinnern, wo ich den kompletten HVV-Fahrplan hatte und dann halt meine Routenplanung individuell selber gemacht habe.*
> Man, 60, living alone, Saarlandstraße (SA04: 72 - 76)

As the last citation shows, it was more complicated to plan journeys by public transport before the digital era. The resident also mentioned a tool he does not have, but would be practical: a smartphone with applications such as timetables (and the option to buy tickets, too) or maps and navigation apps. They are frequently used by others:

> *Ich habe seit einiger Zeit ein Smartphone [lachen] aber davor hab ich's auf dem Laptop gemacht. Da habe ich diese Sache vom HVV [...] Genau, App ist das Wort [lachen] das ist unwahrscheinlich praktisch [...] jetzt kann ich's unterwegs sogar benutzen.*
> Woman, 75, living alone, Klein Borstel (K8: 26 - 30)

> *Die HVV-App natürlich, das ist schon standardmässig irgendwie, wenn man irgendwo hin will, den und den besuchen, wie fahr ich da hin. Die ist total super, ich glaube das ist die vermutlich am meisten benutzte App auf meinem Handy. War ein Grund auch, mir ein Smartphone anzuschaffen.*
> Man, 45, couple with children, Saarlandstraße (SA05: 86)

> *Zuerst mal auf Google Maps, dann schaue ich wo ist die nächste Haltestelle, die umliegenden Haltestellen und übers SBB-App schaue ich dann, was ist am schnellsten. So habe ich Zürich kennengelernt. [...] So Apps? Mega wichtig, ich brauche das extrem viel, oder auch wenn ich von der Arbeit irgendwohin […] Unverzichtbar, wirklich, ohne das geht's nicht, wirklich nicht!*
> Woman, 30, flat share, Sihlbogen (SI5: 143 - 147)

> *Wir planen sehr viel über eine App, Outdoor Active, oder als Internetportal genauso nutzbar, und dann für die öffentlichen Verkehrsmittel [...] Also da muss ich sagen, das Smartphone ist eine total coole Geschichte für wenn man kein Auto hat.. [...] Und mit Open Street Map Fahrradtouren zu planen oder so, da sind wir einfach vielfältig unterwegs und planen unsere Sachen so. Das ist schon so normal, dass ich überhaupt nicht daran denke. Das macht natürlich eine Erleichterung.*
> Man, 40, couple with children, Weißenburg (W7_M: 144 - 152)

A respondent mentioned the wish that these skills should not be that important anymore in future, access to public transport should be facilitated—as this section shows, different skills are necessary to successfully use trains and buses:

> *Was ich mir wirklich wünsche, dass das Ganze noch etwas vereinfacht würde beim öV. Beim Auto ist halt schon praktisch, du hast einen Schlüssel, öffnest das Auto und steigst ein. Beim öV ist schon viel drumherum, es gibt zwar gute Apps für Fahrpläne, aber es ist alles zerstückelt. Klar, du kannst einen Fahrplan abrufen, aber dann musst du noch überlegen, ich habe noch ein Libero [regional pass], dann brauche ich ein Anschlussticket. Mobility [carsharing] muss ich doch noch separat. Dort fände ich es noch bequemer, wenn es eine Lösung gäbe, wie die SBB auch pilotiert, es gibt ja die App, wie heisst die, LezzGo, wo du gar nicht mehr sagst, ich will ein Ticket von da nach da, sondern du checkst ein und wenn du irgendwo aussteigst wieder aus, gibst ein, dass du ein Libero-Abo hast. In die Richtung muss es wirklich gehen, dass der öV noch attraktiver wird.*
> Man, 45, couple with children, Oberfeld (O7: 84)

Another important application, particularly for cyclists, is the weather forecast and more specifically also the rain radar:

> *Eine Regenradar-App auf dem Handy ist total praktisch, um einfach zu kucken. Oh, ich muss das und das noch erledigen, ich fahre jetzt, nicht erst in einer halben Stunde, weil ich sehe den Satelliten-Wolkenfilm und sehe Wolken kommen, dann erledige ich das schnell. Münster ist aber so klein, dass ich das auch eben schnell erledigen kann, zur Post, was wegbringen. Oder ich sehe das und sage, oh ich bleib noch 20 Minuten entspannt sitzen, dann hört der Regen wieder auf.*
> Man, 40, couple with children, Weißenburg (W7_M: 136)

Furthermore, some other bicycle-related skills appeared, the ability to plan cycle routes separated from motorised traffic, for example:

> *Ich habe auch so etwas meine Wege rausgefunden, wie ich zum Beispiel nach Bern in die Stadt komme, wo ich den Verkehr umgehen kann, da gibt es so mehrere Möglichkeiten, wohin muss ich genau. Das passt mir noch, wenn ich etwas schauen kann, wo genau, welche Route. Da habe ich noch Spass, auch Varianten rauszufinden, die möglichst weg von der Autostrasse natürlich.*
> Woman, 50, living alone, Oberfeld (O6: 34)

The skill to read maps was also mentioned as important, despite the era of smartphones:

> *Aber manchmal plane ich einfach tatsächlich auch Touren, setze mich an den Stadtplan und kucke mir das raus, wie ich am besten ankomme. Ich fahre nicht mit dem Smartphone, das könnte man ja auch machen.*
> Woman, 55, living alone, Saarlandstraße (SA11: 60)

> *Ich habe immer die neuste App auf dem Smartphone und [my wife]: „ich habe da wo wir in Urlaub fahren schon mal Karten bestellt". Wir sind nie ohne gute geographische Karte.*
> Man, 40, couple with children, Weißenburg (W7_M: 158)

Some residents also mentioned orientation skills making maps superfluous:

> *Wie man von der Haltestelle zum Ort kommt, habe ich meistens im Gedächtnis. Ich habe ein relativ gutes Orientierungsvermögen, ich muss mir dann nicht noch Karten ausdrucken.*
> Man, 70, childless couple, Oberfeld (O1: 36)

Knowledge of the city, which already appeared in some citations, was explicitly another important skill to live without a private car. It is generally facilitated by many years of experience:

> *Schlimmstenfalls habe ich auch einen Stadtplan, aber ich kenne mich ganz gut aus, nach 50 Jahren kenne ich mich aus in Hamburg.*
> Woman, 75, childless couple, Saarlandstraße (SA09: 80 / 82)

> *Wenn es ein Termin in Hamburg ist, dann muss ich wirklich sagen, habe ich im Grunde genommen die meisten Strecken einfach richtig im Kopf.*
> Woman, 55, living alone, Saarlandstraße (SA11: 60)

> *Die meisten Wege kennt man ja, einfach dadurch, dass man ja schon so lange hier lebt.*
> Woman, 40, couple with children, Weißenburg (W3_F: 102)

In general, planning and organisation skills are often highlighted, compared to a car, more information is needed on the different alternatives:

> *Dass man eine Alternative hat, das muss man erst mal aufzeigen. Man muss sich sehr viel mehr informieren, als wenn man ein Auto hat.*
> Woman, 50, single-parent family, Klein Borstel (K1: 78)

Another point that already appeared above, e.g. related to sharing mobility tools, is the importance of the community of residents for car-free living. A specific aspect is the benefit in collaborating for transport issues when someone drives to shops like Ikea, for example:

> *Es gibt natürlich auch mal sowas, dass irgendwer ein Auto geliehen hat und sagt ich fahre am Wochenende zu Ikea, braucht jemand irgendwas. Da ist man immer auch sehr gemeinschaftlich denkend, weil man weiss, dass für alle die Wege schwer sind. [...] Wir haben einen Blog. Für alles, Be-*

stellungen und so, da kuckt man das man das zusammen macht.
Woman, 50, couple with children, Klein Borstel (K5: 79 / 81)

Es gibt ja viele, die sagen, wir müssen ab und zu mal zu Ikea fahren. Da gibt's dann halt eine Fahrgemeinschaft, kann ich dir was mitbringen, ich fahre mit dem grossen Transporter zu Ikea. Da gibt's dann hier so einen Nachbarschafts-E-Mail-Verteiler wo man dann so eine Frage reinwerfen kann, wer braucht was.
Woman, 50, couple with children, Weißenburg (W8_F: 43)

Other types of neighbourly help were mentioned, too. Living without a car means sometimes more complicated transport, children for example cannot always just be taken as easily as by car when parents have to go somewhere. Then, neighbours can play an important role:

Was natürlich auch ganz toll ist, unsere Projekt-Omis. [...] Es sind ja sonst überwiegend so Familien mit Kindern, aber wir haben drei ältere Damen von denen zwei sich auch sehr um die Kinder kümmern. Das sind so unsere Ersatzomas, also die dann bei den Familien wo keine Omas und Opas da sind schon auch wenn Engpässe sind, wo man immer fragen kann, kannst du mal kommen.
Woman, 50, couple with children, Klein Borstel (K5: 93)

Another important skill for car-free living is to choose activities and their locations based on the accessibility without a car:

Mein Leben ist so organisiert, dass wir das alles wie gesagt ohne ein eigenes Auto, das man auf ein Mittel manchmal zurückgreifen muss, das ist was anderes, aber das sind die Ausnahmen, nicht die Regel.
Woman, 55, childless couple, Saarlandstraße (SA06: 60)

The accessibility of different places of everyday life was mentioned, e.g. of the workplace:

Ich habe zum Beispiel meine Arbeitsstelle so ausgesucht, dass ich mit den öffentlichen Verkehrsmitteln hinkomme.
Woman, 50, single-parent family, Klein Borstel (K1: 60)

Nach dem Studium bin ich hier geblieben und habe mir meine beruflichen Tätigkeiten so zurecht gelegt, dass es auch ohne Auto geht.
Man, 55, childless couple, Weißenburg (W6: 30)

More fundamentally, of course, the accessibility of the place of residence to satisfy the wish to be independent of a car is also crucial:

Mir war immer klar, ich wollte nirgendwo wohnen, wo ich vom Auto abhängig bin. Auch als wir eins hatten, ich will nicht davon abhängig sein. Ich will mit dem Velo, dem Bus, weiss ich was arbeiten gehen.
Man, 70, childless couple, Burgunder (B2_M: 76)

Was ich in Hamburg dann auch gemacht habe, dass ich immer gekuckt habe, wenn ich umgezogen bin, dass halt eine Bahn in der Nähe war, dass ich nicht nur auf den Bus angewiesen war. [...] Immer so fünf Kilometer zum Hauptbahnhof. Das war sicher ein Zugeständnis sozusagen an diese Situation. Ich dachte, da brauch ich wirklich kein Auto.
Man, 60, living alone, Saarlandstraße (SA10: 33)

8.1.2.2. Difficulties with car-free living

On a more general level, both in the survey and in the interviews, difficulties (or not) with car-free living were addressed. Only about 20% of the households responding to the survey stated to have difficulties related to car-free living (see Figure 36). In the Swiss case studies (except in Sihlbogen) they are clearly less than in the Germans, only one household in FAB-A and about 15% in the others. In Klein Borstel, instead, nearly one third of the households agreed. Overall, the geographic situation of the projects seems not helpful to understand the differences: e.g. the distance to the city centre does not explain the high share of Sihlbogen or the low share of Ober-

feld. The same is true for the proportions of households owning a car before move-in, even if for some developments they may provide an explanation.
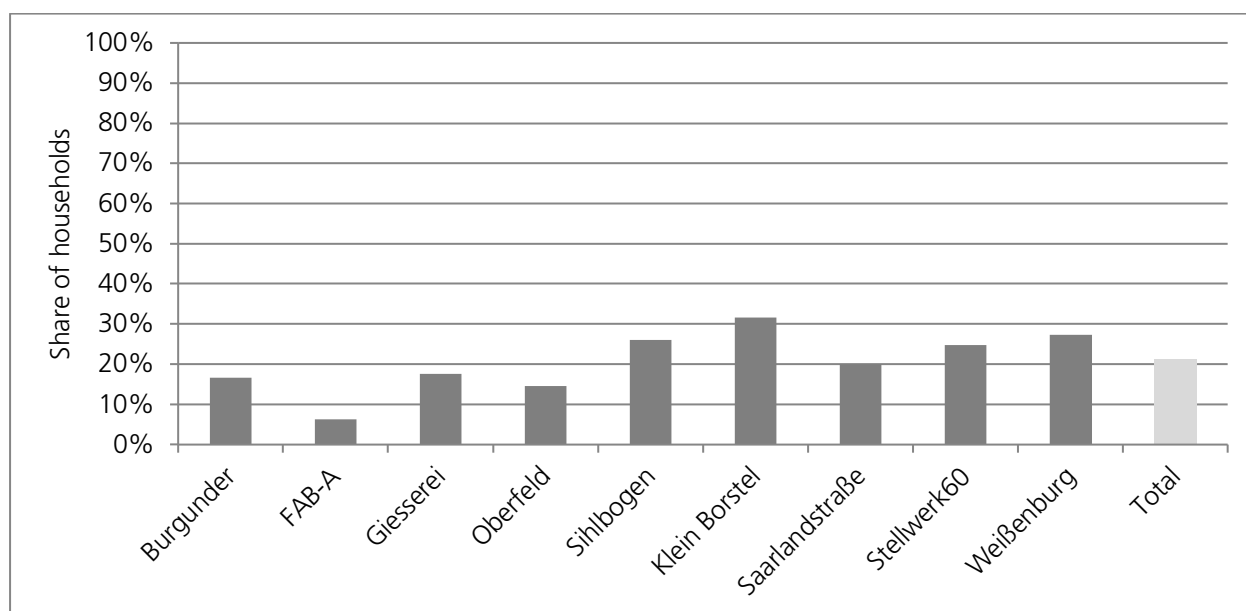
Figure 36: Households having difficulties related to car-free living (N=480)

The interviews shed light on this question. For most residents, it cannot be answered easily or clearly with yes or no—this is a potential explanation of the differences resulting in the survey questionnaire where respondents had to choose between two options. In the interviews, all residents mentioned at some moment that they have no problems or difficulties living without a private car. Some even talked about various advantages this implies. Simultaneously, many residents reported particular problems they have or once had because of living car-free. The principal difficulties are situations where a car is needed (either because it is not possible to reach a place without a car, or for convenience reasons), holidays are often mentioned, an activity for which carsharing is not adapted:

> *Wir haben jetzt angefangen seit zwei Jahren, dass wir einfach von der Schwiegermutter das Auto nehmen für die Ferien oder eins mieten, weil wir einfach so viele Sachen mitnehmen wollen. Der Wunsch kommt auf, dann gehst du noch Klettern, auf den Gletscher, dann füllt sich das, wie bring ich das in den öV. Das ist ein Grund, eine Schwierigkeit, wo wir einfach gesagt haben, jetzt mieten wir einfach ein Auto oder leihen eins. Aber sonst haben wir ja Mobility.*
> Man, 40, couple with children, Burgunder (B1: 24)

> *Für Urlaub und Freizeit vermisse ich's auch am ehesten. Oder da leihen oder mieten wir uns auch mal ein Auto, um zum Ski fahren in den Harz zu fahren, das ist einfach sehr beschwerlich ohne Auto.*
> Woman, 50, couple with children, Klein Borstel (K5: 18)

Specific leisure activities (of children, too) are another difficulty, especially when the alternative mobility modes are not available to reach a destination:

> *Hier merkt man so, wenn man Sport macht, braucht man ein Auto. Also wenn die jugendlich sind, ist das schon für die hart, muss ich sagen.*
> Woman, 50, single-parent family, Klein Borstel (K1: 2)

> *Ich würde schon manchmal gern, es gibt ja auch so Orte, die man nicht mit öffentlichen Verkehrsmitteln erreicht, aber auch wieder Zeitfrage, es gibt genug Leute mit Autos, wo man das gemeinsam machen kann.*
> Woman, 65, living alone, Saarlandstraße (SA08: 29)

Another reason to miss a car are health issues or disabilities, especially for elderly relatives that are restricted in their mobility:

Die einzige Phase, wo ich dachte, jetzt wäre ein Auto schön, war wie meine Mutter zum Schluss wie sie noch lebte, sehr immobil war. Und da hätte ich sie gerne rumkutschiert.
Woman, 65, living alone, Saarlandstraße (SA08: 19)

Letztes Jahr hatte ich einen Unfall und konnte monatelang kein Fahrrad fahren und konnte vor allen Dingen auch überhaupt nicht laufen, aber ich hätte Autofahren gekonnt. Da haben wir oft das Greenwheels-Auto geliehen, da hat mein Mann mich am Anfang gefahren.
Woman, 50, couple with children, Klein Borstel (K5: 42)

Es ist schon als beispielsweise meine Schwiegermutter krank wurde, die in [big city in Lower Saxony] lebt, dass wir mit dem Auto hingefahren sind, weil sie auch ein bisschen im Randbezirk wohnt. Aber das ist, schwierig ist das nicht. Das hat sich, es ist so schnell, ein Auto zu mieten und auch zu verblüffend günstigen Preisen. Das ging innerhalb eines Tages, wir haben uns am Abend entschieden, wir fahren am nächsten Morgen.
Woman, 55, couple with children, Klein Borstel (K7: 74)

As this last citation shows, it is interesting to note that these difficulties—with some exceptions—are not a major problem for the residents, often the solution is easy: carsharing, rental car or private lent cars. This is also the case for some other difficulties mentioned, travelling with another mode often needs more planning and means less flexibility. Or, in public transport, the presence of strange people can be annoying and transporting large or heavy things is not always easy. But these problems are then compared to all the problems owning a car would include:

Mit öV musst du halt voraus planen, schauen wohin wir gehen, fährt etwas zurück. Oder man hat irgendwo abgemacht und den Zug verpasst. Im Auto müsstest du auf solche Sachen nicht schauen und einfach gehen. Das nervt manchmal etwas, aber ich finde die Vorteile von keinem Auto überwiegen immer noch bei Weitem. Mit dem Auto musst du manchmal irgendwohin und Parkplatz suchen, dann hast du Pannen, das hast du alles nicht mit öV.
Man, 45, couple with children, Oberfeld (O7: 62)

Wenn ich keinen Sitzplatz finde oder viele Koffer dabeihabe, das ist manchmal mühsam. Oder wenn die Leute betrunken sind im Zug, man weiss nicht so recht, wie reagieren, wenn sie einen anpöbeln, um Geld fragen, das mag ich nicht so. Aber das ist wirklich der einzige Nachteil den ich sehe.
Woman, 30, flat share, Sihlbogen (SI5: 117)

As signalled before, besides these difficulties, all interviewees mentioned that they have, generally, no problems living without a private car:

Es gab wirklich noch nie eine Situation, wo wir uns überlegt hätten, ein Auto anzuschaffen. Und ich glaube, wir sind beide in Bereichen tätig, wo wir nie ein Auto haben müssen fürs Arbeiten, vielleicht mal eins brauchen oder so, aber nicht ständig.
Woman, 35, couple with children, Burgunder (B5: 48)

Ich vermisse das Auto überhaupt nicht erstaunlicherweise, fast 45 Jahre Auto gefahren und dann plötzlich von einem Tag auf den andern fast. [...] Ich war dann froh, als ich es los war.
Man, 70, living alone, Oberfeld (O2: 4 - 6)

Wenn sich nie ein Problem auftut, von zu viel, zu nass, zu schwierig, das Fahrrad ist dauernd platt, wenn es keine Probleme gibt, sondern das Glücksempfinden überwiegt, dann bleibt man dabei. Dann gibt es auch kein Argument zu sagen, das klappt jetzt nicht mehr.
Woman, 50, single-parent family, Saarlandstraße (SA03: 17)

Für mich ist es so, dass ich mich jetzt seit über drei Jahrzehnten darauf eingestellt habe und mein Leben darauf ausgerichtet habe. Und ich kann mich an keine Situation erinnern, wo ich dachte, verdammt, jetzt hätte ich mal gern ein Auto.
Man, 55, childless couple, Weißenburg (W6_M: 97)

Several residents said they do not have real difficulties, it is more a matter of organisation and planning—emphasising the importance to have this type of skill:

Echte, ernsthafte Schwierigkeiten: Nein. Definitiv nicht. Weil es ist alles anders händelbar.
Woman, 55, living alone, Saarlandstraße (SA01: 39)

Man wird mal nass, wenn man halt mit dem Fahrrad irgendwo hinfährt, es dauert eventuell mal länger, ab und zu ist es bestimmt, dass eine Wegstrecke länger dauert, man kann sie nicht so spontan antreten. Man muss ein bisschen mehr im Voraus planen, aber jetzt wirklich Probleme, also ich sag mal das einzige was man vielleicht nicht so macht sind spontane Ausflüge ins Umland oder so.
Man, 45, couple with children, Saarlandstraße (SA05: 44)

Some residents mentioned that they do not have difficulties in their specific phase of life:

Das ist wie gesagt eigentlich kein Problem. Es bedeutet halt immer nur wieder mit einer Situation, die einem vorgesetzt wird, klarkommen zu müssen und im Moment können wir das, weil wir jung sind und keinen Kinderwagen mehr haben.
Woman, 45, couple with children, Klein Borstel (K3: 24)

Ich bin in der Situation, dass ich pensioniert bin. Wenn ich noch in der Arbeitszeit wäre, mit einer Familie wäre es wahrscheinlich noch mal anders. Ich bin überhaupt nicht mehr darauf angewiesen, darum vermisse ich es gar nicht. Und wenn das Bedürfnis da ist, haben wir ein Mobility vor der Haustüre.
Man, 70, living alone, Oberfeld (O2: 16)

As the last citation shows, carsharing—or being able to use a car when it is needed—is a significant reason to see no difficulties in not owning a private car. The same applies for other services (e.g. delivery) where a car is typically needed for:

Unter der Bedingung, dass man sich so ein Ding einfach mal leihen kann, habe ich überhaupt kein Problem damit, kein Auto zu haben.
Woman, 55, living alone, Saarlandstraße (SA11: 42)

Es hat sich ja auch total geändert, durch eben Sachen wie Carsharing, oder Lieferdienste. Also man lebt heute sehr viel bequemer ohne eigenes Auto als früher, denke ich.
Woman, 70, living alone, Saarlandstraße (SA12: 37)

Furthermore, a cargo bike or a bicycle trailer can have the same effect and resolve the need for a car, e.g. for transport issues:

Ich habe zurzeit drei Anhänger: einen Reiseanhänger, so einen einspurigen Mitläufer, so mit einer wasserdichten Tasche hinten dran und zwei Anhänger, die selbst gebaut sind, die Lattenanhänger, die jeweils einen Elektromotor haben, sich selbst fahren und grösser sind als ein Kofferraum. Insofern habe ich auch dieses Problem, falls es ein Problem sein sollte, schon gelöst. Mit diesem Fahrradanhänger mache ich alles, ich fahre damit zu Infoständen, hole damit für den Flohmarkt 300 Würstchen, mache damit Grosseinkäufe oder schleppe damit auch Schränke.
Man, 55, childless couple, Weißenburg (W6: 38)

Finally, negative aspects of the car or related to car use, e.g. when one did not drive anymore for a long time, are mentioned:

Es wäre sogar eher problematisch mit Auto, mit Parkieren und so. Also ich sehe überhaupt kein Problem, das dazu führen würde, ein Auto zu kaufen.
Woman, 35, couple with children, Burgunder (B7: 84)

Mittlerweile, emotional ist es nicht so, dass man sagt, jetzt hätte ich gerne ein Auto, weil damit verbunden ist, oh, dann müsste ich das Ding ja fahren. Das hat man seit Jahrzehnten nicht gemacht, dann ist das erstmal Stress, Anstrengung. Das fängt an mit den neuen technischen Einrichtungen im Auto, die man sich dann irgendwo erarbeiten müsste.
Man, 55, childless couple, Saarlandstraße (SA02: 46)

8.1.3. Comparison and discussion of mobility capital

The following sections compare the mobility capital of car-free housing residents to the one of the (car-free) population of the cities in which they live, and discuss it.

8.1.3.1. Mobility access

The car-free households have high access levels to all types of transport modes, including shared cars. This is even more striking when they are compared to data of the overall urban population. In Bern and Zurich, it can also be compared to the car-free households, for the other Swiss cities these numbers were too small to get significant results (see Table 52). For the German case studies, data on the city-level was available only for Hamburg. Cologne and Münster are compared to the type of area they belong to, i.e. metropolis and regiopolis (see Table 53).

The comparison shows that equipment with bicycles and e-bikes is clearly higher in all car-free developments than in the cities in which they are located. Car-free households own even less bicycles than all households, probably due to the presence of more elderly people and lower incomes in this category.

Access to public transport shows some differences: in most Swiss developments, the proportion of residents with regional passes is only about half the share in the respective city, except in Giesserei and Sihlbogen, in the latter it is even about 50% higher. GA travelcards, in contrast, reach much higher scores in the car-free housing developments, also compared to car-free households in Bern and Zurich. The differences for half-fare cards are only small in most cities. In Hamburg, the shares of car-free housing residents holding a regional pass are higher than those of the whole urban population but correspond to the one of the car-free population. In Cologne and Münster, the proportions are rather similar to the overall population in metro- and regiopolises and therefore significantly lower than the car-free population. This may be due to the importance of the bicycle in these developments.

	Burgunder	Bern (car-free)	FAB-A	Biel/ Bienne	Giesserei	Winterthur	Oberfeld	Oster- mundigen	Sihlbogen	Zurich (car-free)
At least one bicycle	98%	68.3% (64.5%)	75%	58.8%	86%	74.9%	81%	72.9%	96%	67.3% (61.7%)
At least one e-bike	11%	6.0% (4.0%)	6%	5.8%	31%	6.3%	17%	9.3%	6%	4.4% (3.1%)
Regional monthly or annual ticket (16+ years)	16%	31.0% (37.6%)	3%	17.9%	31%	24.2%	21%	36.4%	64%	42.6% (47.4%)
GA travelcard (16+)	46%	25.1% (32.1%)	48%	18.2%	45%	16.1%	35%	10.6%	27%	17.0% (25.0%)
Half-Fare card (16+)	52%	51.2% (52.2%)	45%	34.0%	46%	46.1%	60%	50.2%	66%	50.3% (54.1%)
Driving licence (18+)	90%	77.9% (63.9%)	87%	75.4%	69%	74.7%	80%	72.2%	89%	75.2% (61.7%)
Carsharing sub-scription (18+)	49%	12.4% (23.7%)	36%	8.3%	38%	7.9%	51%	4.2%	37%	14.8% (30.1%)

Table 52: Comparison of mobility access and equipment in Switzerland (Source: own calculations, data for the cities: 2015 Mobility and transport microcensus)

	Klein Borstel	Saar-landstr.	Hamburg (car-free)	Stell-werk60	Metropolises (car-free)	Weißen-burg	Regiopolises (car-free)
At least one bicycle	89%	97%	81% (69%)	92%	72% (65%)	97%	70% (60%)
At least one e-bike	34%	5%	4% (2%)	6%	3% (1%)	3%	5% (2%)
Regional monthly or annual ticket (16+ years)	56%	64%	43% (64%)	45%	40% (61%)	22%	26% (50%)
BahnCard 100 (16+)	3%	4%		3%		2%	
BahnCard 25/50 (16+)	69%	65%		63%		52%	
Driving licence (18+)	88%	76%	80% (63%)	93%	81% (63%)	75%	84% (60%)
Carsharing sub-scription (18+)	31%	19%	17% (21%)	64%	12% (18%)	48%	3% (9%)

Table 53: Comparison of mobility access and equipment in Germany (Source: own calculations, data for Hamburg, metropolises and regiopolises: MiT 2017, 2018)

Finally, data on access to cars reveals that the share of driving licence holders is higher than the urban average in all developments except in Giesserei, Saarlandstraße and Weißenburg (probably due to higher shares of elderly residents or financially restricted households). It is, thus, also significantly higher than the shares of car-free urban inhabitants holding a driving licence in all cities where these data are available—another argument for the particularity of the population living in car-free housing developments. It may partly be explained by the low shares of young adults and elderly people compared to the overall car-free population. The high shares of carsharing subscriptions emphasise the residents' access to cars: between 31% and 64% of them are carsharing members, except in Saarlandstraße (19%). These shares are significantly higher than the 3% to 17% at the city levels, but the difference is smaller compared to car-free households (between 9% and 30%). As mentioned above, some residents proposed the hypothesis of a "dehabituation": the longer one lives without a private car, the more one does not use it at all anymore. Similarly, a resident made the analogy with smoking:

> Ich habe es so etwas erlebt, wie das Entwöhnen vom Rauchen. Am Anfang hat man etwas Mühe, jetzt ist das Auto nicht mehr da, jetzt muss ich etwas anderes organisieren. Das ging relativ schnell, nach wenigen Wochen. Rauchen war wahrscheinlich schwieriger [lachen] aber auch so einen ähnlichen Effekt, die ersten paar Tage und Wochen waren schwierig, und beim Auto war es relativ schnell dann weg. Heute wüsste ich gar nicht, was ich mit einem Auto machen würde, also schon lange nicht mehr.
> Man, 70, childless couple, Burgunder (B2_M: 14)

Having access to a car does not necessarily mean that a car is often used (see next chapter). And even this access may only be theoretical: as the interviews showed, several residents have a driving licence, but did not drive for years and would not do it anymore.

However, this comparison shows that car-free housing residents have indeed important accesses to public transport and cars and are well equipped with bicycles, including cargo bikes and bicycle trailers to "upgrade" cycling and facilitate transport of children or goods. It also appeared that these simple things were not always available and only spread during the last decades, with cargo bikes being the last significant development. Furthermore, bicycles are often considered as substitutes of a car:

Wir haben nachher ein Cargobike angeschafft, als unser Sohn auf die Welt kam. Mit dem, das ist eigentlich wirklich ein Autoersatz, um Sachen zu transportieren, einzukaufen.
Woman, 35, couple with children, Burgunder (B5: 6)

Das ist halt unser Auto. Wenn man sich kein Auto leistet, dann kann man auch richtig vernünftige Fahrräder anschaffen.
Man, 50, couple with children, Klein Borstel (K5_M: 111)

While they differ from the overall urban and car-free population, my results are in line with previous studies on car-free housing residents reporting high shares of carsharing members (Brosig et al., 2015; Bürgi & Hari, 2013; Ernst, 2008)—except Scheurer who found in 2001 a high rate in Floridsdorf, but only very low ones in GWL-terrein and Slateford Green, perhaps because, at that time, carsharing was less developed than nowadays. The high presence of bicycles is also confirmed (Bürgi & Hari, 2013; Mantau, 2010; G. Moser, 2009; Scheurer, 2001b) as well as the general availability of public transport passes (Bürgi & Hari, 2013; Ornetzeder et al., 2008). Broader studies on new-build urban housing developments in Swiss or German cities also highlighted the importance the residents put on mobility capital: they seek access to various mobility modes, including cars, public transport, bicycles and walking (Jarass & Heinrichs, 2014; Rérat & Lees, 2011).

The survey also showed that a quarter of all households owned a car before moving to the car-free housing development and the interviews revealed that many more residents once owned a car during their life course. Similar results were found by previous surveys in Munich, Cologne and Münster: between 27% and 49% of the households abandoned a car a long time ago and 11% to 28% just before move-in (Ernst, 2008; Mantau, 2010). Scheurer (2001b) found a relative change in car ownership of -10% in GWL-terrein, -21% in Slateford Green and even -62% in Floridsdorf, whereas Moser and Stocker (2008) found that only 24% of this development in Vienna owned a car before move-in.

The importance of socialisation for car-free living during childhood and youth needs to be relativised: fewer than 20% of the residents, overall, grew up in a car-free household. Thus, car-free living is not necessarily "inherited" but can also be acquired later during the life course—emphasising the importance of a biographical approach in mobility studies. All in all, many residents once owned a car while others always lived car-free since they left their parents' home. Besides moving to the car-free housing, different "key events" to give up the car found in the literature on mobility biographies were mentioned (Müggenburg et al., 2015): move to a city, a new job or the more diffuse discovery that alternative transport modes are better adapted to daily mobility. Instead, the most often mentioned "key event" to get car-free has not been found in the literature: an old car breaking down which is not replaced.

8.1.3.2. Mobility skills

The residents also have various mobility skills that enable them to live successfully without a private car, meaning without major difficulties. Generally, a large majority of the residents do not feel restricted without a private car:

Wir fühlen uns auch nicht in der Mobilität eingeschränkt, dadurch, dass wir kein Auto haben. Im Gegenteil, also ich glaube, wir sind sogar flexibler als früher, als wir ein Auto besessen haben
Woman, 40, couple with children, Weißenburg (W3_F: 168)

Nearly all residents have no physical restrictions to move, which is not surprising given their age. They can reach their destinations mainly without a private car and have different competences they can rely on to assure their mobility, especially planning and organisation skills play an essential role. The residents highlighted the importance of the internet to live car-free and particularly of some smartphone applications. This relates to use of ICTs addressed in previous studies

on transport and mobility. They found, for example, that these technologies allow to coordinate activities and to cope with uncertainties of activity and travel scheduling (Line, Jain, & Lyons, 2011) or, more generally, that mobile technologies facilitate spatial mobility and reduce travel constraints (Dal Fiore et al., 2014).

Another competence is to consider the accessibility of places of everyday life such as the workplace. The importance of *"accessibility by proximity"* was also highlighted by other research on car-free households (Lagrell et al., 2018, p. 220).

As mentioned before, living car-free is generally considered more complicated than satisfying mobility needs only with a car. Therefore, car-free households need to develop a whole set of skills in order to not be restricted in their mobility. I will come back to this at the end of this thesis.

8.2. Daily mobility practices

The last chapter showed that the residents have a distinct and diversified mobility capital, including access to all mobility modes and skills allowing them to be mobile without a private car. But is this capital really transformed into spatial mobility? And if so, how? This chapter presents daily mobility practices, beginning with the mobility to go to work or school and daily mobility in general. Then, car use is addressed, to understand how car-free households use, or not, this transport mode and for what reasons. Finally, a biographical aspect is addressed: changes in these practices, either due to residential relocation or before, over the whole life course.

8.2.1. Mobility to go to work or school

The survey asked for the transport modes used by every household member to reach his or her place of work or education. Multiple answers were possible, thus, when several transport modes were checked in the questionnaire, it is not clear if it is an intermodal or multimodal practice—if the different modes are combined in one journey or used alternatively, e.g. in different seasons. Nonetheless, the results show clear tendencies: the high importance of cycling (including a small part of e-bikes) and public transport as well as all combinations of these two modes (see Figure 37).
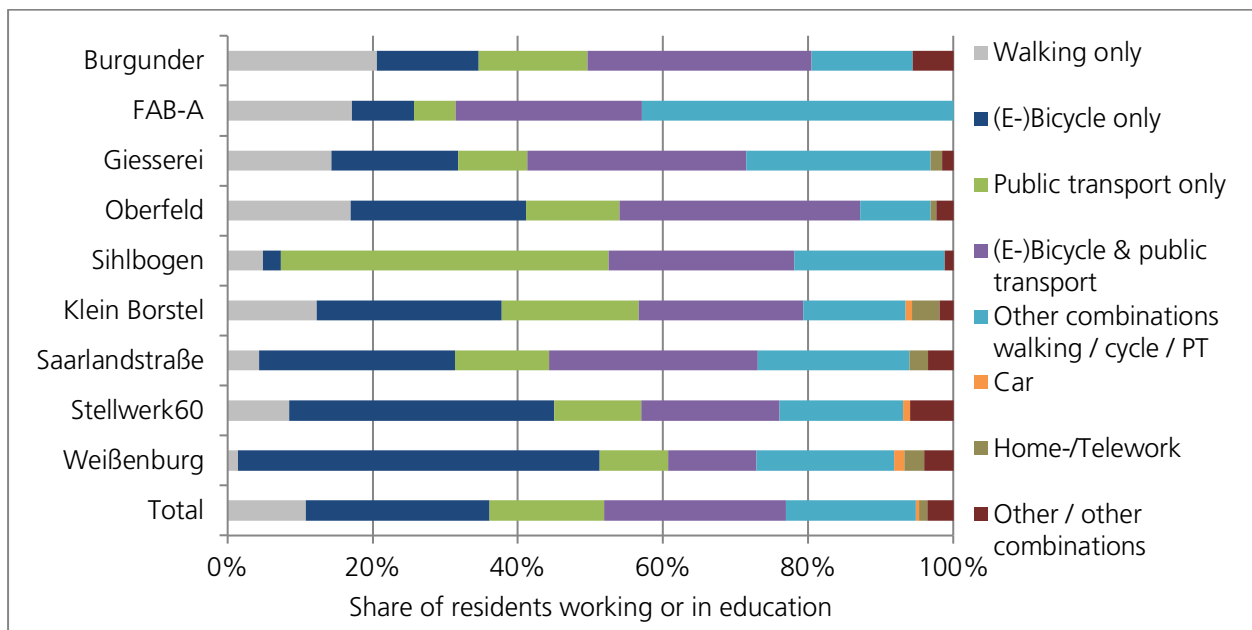
Figure 37: Mobility modes used to reach the place of work or education (N=906)

High shares of inter- or multimodal mobility practices are not surprising in light of the mobility capital characterising the residents. They have the necessary skills and accesses which allow them and facilitate combining different modes to satisfy mobility needs at best.

In contrast, about half of the residents use only one mode, in most developments particularly a bicycle (up to 50% in Weißenburg in the "cycling city" of Münster), except in Sihlbogen, where 45% exclusively use public transport (in the "public transport city" of Zurich). There are several other differences between the developments, only 1% walk in Weißenburg, but 21% in Burgunder. Interestingly, several residents noted in the "other" response field to work (partly, for most of them) at home. Telework is another indication of the importance of digitalisation. In the interviews, another aspect appeared: a person having a second home in the city she works.

The transport modes used to go to work or school also depend on the location of these places, the further they are, the smaller the potential of cycling or walking is. There are differences between the two countries. The residents of the Swiss developments are much less numerous to work or go to school in the city in which they live: in Oberfeld, only 14% do so in the suburban municipality of Ostermundigen and in Giesserei, they are only 37%. On the opposite, in all German developments more than 85% work or go to school in the same city, in Hamburg they are even more than 95% (see Figure 38). On the other hand, in Switzerland there are between 9% and 14% of commuters leaving the canton in which they live.

These results seem to be consistent with the general situation in the cities, and the structures of the regions in which they are situated. In Bern, for example, 23% of the residents work outside the city (BFS, 2016c). This difference can be explained by the size of these cities as well as by the scale or the different spatial structures, with rather small municipalities in Switzerland and larger ones in Germany, where suburbs were often incorporated by the core cities during the 20th century. The shares of persons working or going to school in the same city region including the core city reach similar shares in the big Swiss agglomerations of Bern and Zurich than in the German ones. In the smaller cities of Biel/Bienne and Winterthur, the labour market is more restricted but they are closely linked to other cities by the railway network and, thus, an important number of commuters live there.
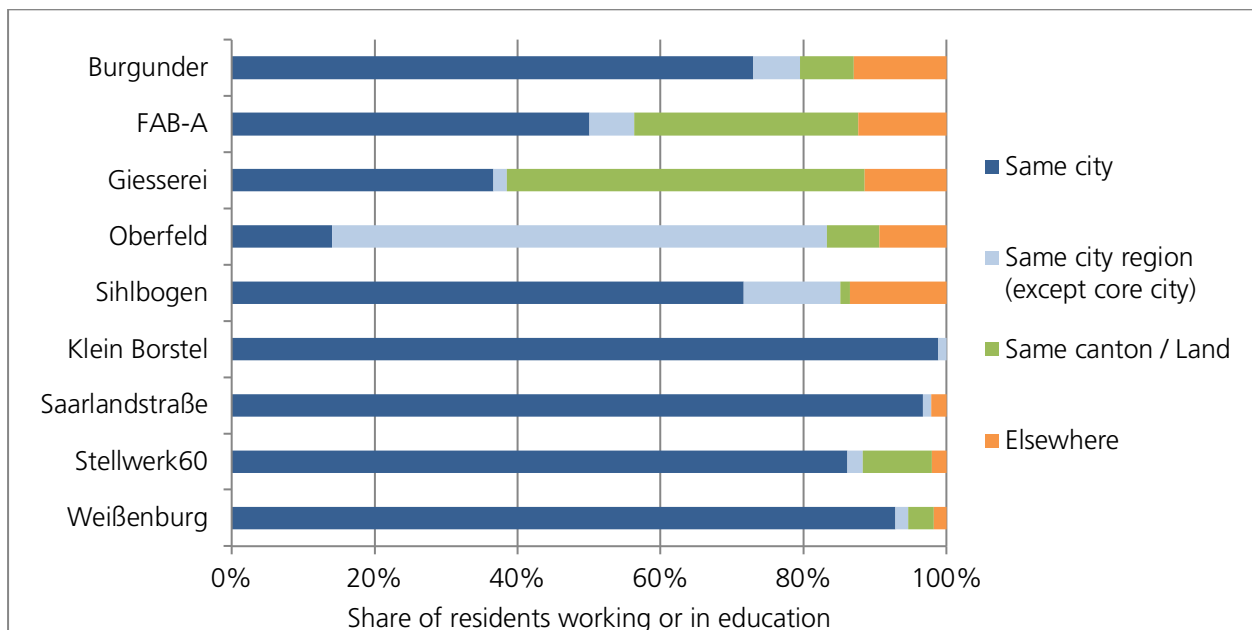
Figure 38: Place of work or education (N=738)

8.2.2. General daily mobility

After that particular example of daily mobility regarding the residents working or in education, this section focuses on daily mobility in general. In the survey, the household member answering the questionnaire was asked to indicate the frequencies of different mobility modes for his or her personal daily mobility, for all motives. These results demonstrate the high importance of active modes and public transport, too (see Figure 39). Approximately two thirds of the residents cycle (almost) every day and a bit less walk at least 10 minutes each day. Public transport is also used by more than half of the population (almost) daily, and no one never uses it. E-bikes are ridden by about 20%, including 7% using it daily.

In contrast, only a minority of residents uses cars more than once per month. Carsharing cars are a bit more popular than private lent cars, about 20% of the respondents use carsharing once or twice per month, 4% one or two times per week and only two residents "(almost) every day". Private lent cars are used more than once a week by only four respondents and by 3% one or two times per month. Finally, other modes are indicated by 60% of the residents, but they represent only 10% of all respondents, as 85% did not answer this question. The most frequently cited additional modes are: taxis (15 mentions, including two indications of "transport services"), other types of car use (13, including 6 rental cars), skateboards and similar (7) and other types of bicycles (3).
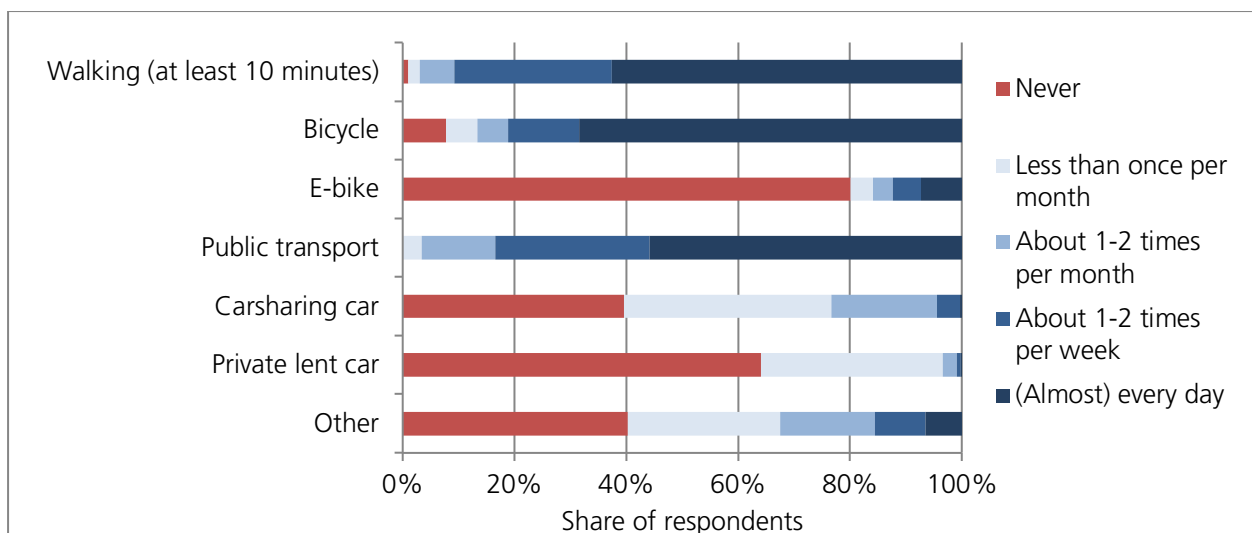
Figure 39: Daily mobility modes used (N= 453 to 478; 77 for "other")

For the differences between the developments (see Table 71 in the Appendix), regarding public transport, in Sihlbogen, even 89% use them "(almost) every day" while in Weißenburg only 27%, in Stellwerk60 37% and in FAB-A 44% do so. On the other hand, only 19% in Sihlbogen cycle each day, whereas in FAB-A (88%), Weißenburg (88%), Klein Borstel (83%) and Stellwerk60 (82%) a large majority daily rides a bicycle. Electric bicycles are more commonly used in Oberfeld, Giesserei and Sihlbogen (by about 40%). For carsharing, the two developments in Hamburg have a particularly high rate of "never" answers: 59% (Klein Borstel) and 69% (Saarlandstraße). In Stellwerk60 and Weißenburg, instead, about 40% use it at least once a month.

To sum up, three different types of car-free housing developments appear when the "(almost) every day" answers of the different developments are compared, based on cycling and public transport use (considering that everywhere walking is important and the other modes less used):

– **Bicycle-oriented developments**, with over 80% of the residents cycling (almost) every day and less than 50% using public transport (FAB-A, Stellwerk60 and Weißenburg).

- **A public transport-oriented development** where the other modes are not important (Sihlbogen).

- **Multi-/intermodal developments** where public transport and bicycles are both (almost) daily used by over half of the residents (Burgunder, Giesserei, Oberfeld, Klein Borstel, Saarlandstraße).

In the interviews, the same three types of mobility practices appeared on an individual level. About twenty of the interviewed residents each are bicycle-oriented or have multi- and/or inter-modal mobility practices, while a minority is focused on public transport. While in Sihlbogen, all interviewed residents use primarily public transport and in Weißenburg the bicycle, in the four other developments, all three types are present. The following sections present these different types of practices.

8.2.2.1. Bicycle-oriented mobility practices

Bicycle-oriented residents use their bikes whenever it is possible in the city. They use other modes only for too long distances:

> *In Bern eigentlich mit dem Velo wenn immer es geht, mit ihm [little son] mit dem Cargovelo.*
> Woman, 35, couple with children, Burgunder (B5: 10)

> *Also fast immer Fahrrad, im normalen Alltag, ich fahre damit zur Arbeit, ich fahr zurück, ich kaufe damit ein. Das ist so das dominierende Alltagsmittel.*
> Man, 55, childless couple, Saarlandstraße (SA02: 50)

> *Wir beide nutzen auch ganz ganz selten nur den öffentlichen Verkehr hier in Münster. Wir machen alles mit dem Rad und Transport mit Anhänger. [...] Nahbereich bis 6, 10 km Fahrrad und dar- über hinaus eben öffentlicher Verkehr.*
> Man, 55, childless couple, Weißenburg (W6_M: 67)

> *Wir fahren ja eigentlich in der Stadt nur Fahrrad, sind also so mobil wie's geht. Es gibt auch kein Wetter was es irgendwie verhindern kann.*
> Woman, 50, couple with children, Weißenburg (W8_F: 29)

As the last citation shows, the weather is not a reason to avoid cycling for most of these bicycle-oriented persons, they cycle in any weather and all year long. However, their cycling skills as well as their equipment differ: some are equipped for every situation, including icy roads, while others take public transport when the weather conditions are too extreme:

> *Wir fahren das ganze Jahr durch, also dann kennen wir jetzt eigentlich auch nichts. Im Winter kommen die Spikes drauf, dafür haben wir uns Zweiträder gegönnt, komplett ausgerüstet, machen wir alles in Hamburg mit dem Rad.*
> Woman, 50, couple with children, Klein Borstel (K5: 22)

> *Regen macht mir natürlich gar nichts, dafür habe ich natürlich meine Regensachen, das ist ja klar. [lachen] Aber wenn es zu unangenehm wird, oder es ist sehr kalt oder glatt, dann nehme ich halt die Bahn.*
> Woman, 55, living alone, Saarlandstraße (SA01: 45)

> *Mit wenig Schnee kommen unsere Fahrräder ganz gut klar. Es gibt so Spikereifen für Fahrräder, die sind ganz fantastisch, da kann man auch auf spiegelglatten Strassen fahren, sogar besser als mit Autos dann.*
> Woman, 40, couple with children, Weißenburg (W7_F: 44)

In some cases, children can also be a reason for not cycling, if a distance is too long, the infra-structure not secure enough or no adapted (cargo-)bike or trailer to transport children available:

> *Habe ich die Tochter dabei nehme ich den öV. Wenn ich weiss, dass wir noch gross einkaufen auf dem Rückweg, dann mach ich das lieber so.*
> Man, 40, couple with children, Burgunder (B1: 30)

Mit den Kindern eher die S-Bahn, die sind nicht so ganz so ausdauernd. Das macht mir auch bei den Hamburger Fahrradwegen nicht so richtig viel Spass, mit den Kindern richtig quer durch zu fahren, das ist ein bisschen zu gefährlich.
Man, 40, couple with children, Klein Borstel (K9: 40)

Elegant clothing for particular events can be another restriction to cycle:

Wenn etwas dienstlich Wichtiges ist wo man edel gekleidet hinkommen muss, fahre ich halt mit der U-Bahn, die hier um die Ecke ist.
Man, 55, childless couple, Saarlandstraße (SA02: 50)

An important reason to prefer the bicycle is the flexibility and independence compared to public transport, with timetables and stations, or car parking:

Das ist viel praktischer. Also ich muss nicht auf den öV warten, da habe ich keine Geduld. Ich bin viel flexibler, ich kann aufhören zu arbeiten und gerade gehen [...] und muss nicht auf einen Fahrplan [...] da muss man schauen, dass man es rechtzeitig schafft.
Woman, 40, couple with children, Burgunder (B4: 32)

Es ist das praktischste Verkehrsmittel in der Stadt. Man kommt einfach überall hin. Man muss nicht lange Parkplätze suchen wie jetzt mit dem Auto.
Woman, 50, childless couple, Weißenburg (W6_F: 74 - 76)

The bicycle is often also the fastest transport mode in the city, within a certain range:

Man ist in einer Stadt wie Münster meistens schneller, weil die Wege sind kurz, also man weiss ja, ich glaube etwa 3 km ist diese Marke wo man sagt man ist mit dem Fahrrad sowieso schneller in der Stadt.
Woman, 40, couple with children, Weißenburg (W3_F: 48)

Mit dem Fahrrad fahre ich, weil es einfach am schnellsten geht. Wenn ich eilig unterwegs bin, ist das die absolut schnellste Verbindung innerhalb von Münster zwischen A und B. Da geht's nicht was drüber geht glaube ich. Ich würde jedes Rennduell annehmen, weil ich glaube, dass man mit dem Fahrrad immer schneller ist.
Man, 40, couple with children, Weißenburg (W7_M: 80)

When I asked an interviewee in the cycling city of Münster *why* she cycles, she answered that everyone cycles in Münster and that she does not understand my question—which refers to the bicycle culture existing in this city:

Weil man das in Münster so macht [lachen]. Da verstehe ich die Frage gar nicht, weil das ist so.
Woman, 50, couple with children, Weißenburg (W8_F: 48)

Many cyclists also do not like to travel by urban public transport, especially in the developments served only by bus, for different reasons: costs, space, comfort or an insufficient transit network:

Weil ich mir das nicht antun will, die vollen Busse.
Woman, 35, single-parent family, Oberfeld (O8: 14)

Bus fahren ist mir viel zu teuer. Mich nervt das auch, immer dieses ewig da auf den Anschluss warten.
Woman, 60, living alone, Weißenburg (W5: 4)

A major reason for most cyclists is to move actively, to be outdoors, in the fresh air, not least because of health reasons:

Es tut mir gut, hat etwas mit Gesundheit zu tun noch, immer an der frischen Luft, Bewegung. Andere fahren mit dem Auto in den Fitnessraum und gehen sich dort bewegen, ich habe halt das Velo.
Man, 40, couple with children, Oberfeld (O4: 10)

Ein weiterer Grund, ist sportlicher Aspekt und gesundheitlicher. Ich mache sonst eigentlich keinen Sport. Von daher bin ich ganz froh, dass ich jeden Tag fahren muss so ein bisschen um mich überhaupt ein bisschen zu bewegen. Das ist auch ein wichtiger Grund.
Man, 60, childless couple, Weißenburg (W1: 84)

Personal (environmental) convictions or preferences are another important motivation:

> *Wir sind beide ja auch ökologisch überzeugt. Und da ist natürlich das Fahrrad auch das Verkehrs-mittel der Wahl, weil es das Null-Emissions-Fahrzeug ist.*
> Man, 55, childless couple, Weißenburg (W6_M: 81)

Finally, different cyclists mentioned it is fun for them to ride a bicycle:

> *Ich fahre einfach total gerne Fahrrad. Ich finde das ist eine grossartige Kombination aus Ent-spannung, Training, also sportlicher Betätigung. Ich fahre sehr gerne in der Stadt, ich hasse es auf dem Land zu fahren [lachen]. […] Mich stört auch der Verkehr überhaupt nicht, also als Fahrrad-fahrerin. Ich habe auch nicht so Animositäten, dass ich nicht mit denen auf der Strasse fahren will. Ich fahre natürlich auf der Strasse, ich sehe mich als gleichberechtigtes Verkehrsmitglied, ich bin natürlich auch ADFC-Mitglied [lachen].*
> Woman, 45, couple with children, Klein Borstel (K3: 30)

> *Das macht Spass. Da bin ich unabhängig. Ich fahre nicht gerne Bus, also ich sitze nicht gerne in so vollen, vor allen Dingen bei Regen ist das furchtbar, wenn das alles so humid ist. Aber ich fahre einfach gern Fahrrad, macht Spass. Es ist ja angeblich auch gesünder [lachen] aber das wäre mir ziemlich Wurscht, aber ich kann gut fahren. Man bringt alles drauf, man kriegt so viel Gepäck da unter.*
> Woman, 65, childless couple, Weißenburg (W2: 38)

These last citations show that, as seen before for other decisions, often a combination of reasons explains the choice to cycle, as any other modal choice:

> *Ich fahre an der Alster lang, das ist ein Privileg auch, so einen schönen Weg zu haben […] Also die Kombination, das ist die Bewegung, abends kann man sich den Stress rausradeln, am Morgen kommt man angeregt hin, man hat einen schönen Ausblick in der Regel, und wenn's dann mal win-det und regnet, dann lernt man, dass man nicht immer nur in klimatisierten Büros sitzt, sondern dass es eben auch so was wie Natur gibt.*
> Man, 55, childless couple, Saarlandstraße (SA02: 52)

8.2.2.2. Public transport-oriented mobility practices

A second type of residents use primarily buses and trains for their daily mobility trips. They also cycle, but only in specific situations, while walking is strongly correlated to public transport use:

> *Wir laufen sehr viel und ansonsten fahren wir auch gerne mit dem Fahrrad, aber das ist eher aus Spass, als dass wir das als Transportmittel betrachten. Gut, die Kinder fahren ja mit dem Fahrrad zur Schule. Ich erledige mal ab und zu einen Einkauf mit dem Fahrrad. Aber ansonsten sind das eher Ausflüge, die wir mit dem Fahrrad machen, wenn wir dann mal rauswollen aus Hamburg, dann kann man eine Fahrradtour machen. Also Fahrrad und öffentliche Verkehrsmittel vor allen Dingen. Aber öffentliche Verkehrsmittel im Vordergrund, für mich und für meine Frau was die be-rufliche Tätigkeit betrifft.*
> Man, 50, couple with children, Klein Borstel (K6_M: 34)

> *Ich brauche das Velo fast nie im Alltag, bin wirklich einfach mit Bus und Zug unterwegs.*
> Man, 45, couple with children, Oberfeld (O7: 14)

> *Wir machen alles mit öffentlichen Verkehrsmitteln. Meine Arbeitsstelle ist eigentlich zu Fuss, 700 Meter, da nehme ich nicht mal ein Fahrrad dafür, weil es sich nicht lohnt, bis ich das abge-schlossen habe, das ist viel zu kompliziert, sondern einfach zu Fuss.*
> Woman, 55, childless couple, Saarlandstraße (SA06: 2)

> *Vor allem mit dem öV. [...] Und im Sommer gehe ich ab und zu mit dem Velo.*
> Man, 35, childless couple, Sihlbogen (SI3: 8)

The residents mentioned different reasons why they prefer public transport. One is the possibility to use the travel time for other activities—professional or leisure:

> *Ich kann viel im öV auch, was ich auch einen grossen Vorteil zum Auto finde, dass du im Bus schon ein paar Mails beantworten kannst. Ich bin eher Spätaufsteher, meistens wenn ich ins Büro*

komme habe ich die ersten Sitzungen, dann kann ich vorher im Bus Mails beantworten.
Man, 45, couple with children, Oberfeld (O7: 16)

Es ist praktischer, ich kann unterwegs noch lesen.
Man, 35, childless couple, Sihlbogen (SI3: 10)

There are also personal preferences to ride trains or buses—or not cycling in the city—as well as comfort, to transport things for example, or even laziness:

Ich mag das nicht so, mit dem Velo im Verkehr drin, und auch etwas Bequemlichkeit, ist etwas beides.
Man, 45, couple with children, Oberfeld (O7: 24)

Ich finde auch gerade die U-Bahn hier ist sehr schön, diese Strecke, die älteste in Hamburg, das hat auch sehr viel Charme zum Teil.
Woman, 55, childless couple, Saarlandstraße (SA06: 28)

Meistens habe ich viele Sachen dabei, Schulsachen oder sonst irgendwelche Taschen, dann ist es praktischer, wenn ich in den Zug oder ins Tram steigen kann.
Woman, 30, flat share, Sihlbogen (SI5: 52)

Finally, the idea of mobility cultures, or the spatial context is important, too. For some respondents, the insufficient cycling infrastructure (and the good public transport network) influence their modal choice, in Zurich especially:

Hier in Zürich ist es ziemlich prekär, weil die Velowege sind nicht so gut. [...] Zum Teil hat es auch einfach keine Velowege oder sie brechen plötzlich ab. [...] Dann hast du permanent Fussgänger auf dem Veloweg, auf die Strasse kannst du nicht wirklich, da steht Auto an Auto. Ich finde es wirklich relativ mühsam in Zürich Velo zu fahren, das ist etwas der Grund.
Man, 35, childless couple, Sihlbogen (SI3: 10)

8.2.2.3. Multi-/intermodal mobility practices

Even if all residents are somehow multi- and/or intermodal, the third group of them is characterised by these practices as no transport mode prevails but the use of public transport and the bicycle is of similar importance. These residents use either different transport modes on different days (e.g. depending on the weather) or for different activities or destinations (depending on the distance or the route, for example). Physical abilities, due to age or other restrictions, can influence this:

Zu Fuss, mit dem Velo oder mit dem Zug im Normalfall. In der Stadt meistens mit dem Velo oder zu Fuss. Bei solchem Wetter [snowfall] dann auch manchmal mit dem Bus oder von uns aus meistens mit der S-Bahn, das kommt etwas drauf an wo ich hinmuss.
Man, 40, couple with children, Burgunder (B6: 28)

Im Alltag eine Mischung aus Fahrrad, öffentlicher Verkehr, zu Fuss, also die drei Hauptdinge. Normalerweise Arbeitsweg U-Bahn U3, 3 Stationen oder mit dem Fahrrad, je nach Wetter.
Man, 45, couple with children, Saarlandstraße (SA05: 30)

Ich bin eine Schönwetter-Velofahrerin [lachen]. Wenn es schön ist und nicht allzu kalt fahre ich mit dem Velo an den Ostermundigen-Bahnhof und gehe dort in die S-Bahn nach [place of work] und wieder zurück, vier Mal in der Woche. Wenn es nicht schön ist, nehme ich den Bus. Das hat ja keinen Sinn noch mit Regenhosen, das lohnt sich nicht. In die Stadt gehe ich immer mit dem Bus, da habe ich nicht so Lust mit dem Velo.
Woman, 55, living alone, Oberfeld (O5: 18)

Ich bin körperlich nicht so fit, wie die Nachbarn hier rum. [...] Das heisst wenn ich in die Stadt fahre, das sind dann 25 Minuten mit der Bahn [...] Einkaufen mache ich, wenn ich irgendwo, zwei Stationen dahin, das mache ich mit dem Rad. Oder Freunde besuchen, die nicht weit weg sind, oder ich fahre mit dem Fahrrad zur Bahn, weil ich dann drei Minuten spare.
Woman, 55, couple with children, Klein Borstel (K4: 14)

For other residents, there are differences between summer and winter:

Im Sommer eigentlich immer mit dem Velo, also zum Arbeiten gehen, ich habe auch nicht so weit, vielleicht 20 Minuten hin, zurück etwas mehr weil es bergauf geht. Und für in die Stadt, nach Bern rein, schaue ich auch immer, dass ich das Velo nehme. [...] Im Winter habe ich aber Bedenken wegen dem Umfallen, Dunkelheit, gefroren sein, dann fahre ich nicht gerne Velo. Dann mache ich meinen Arbeitsweg manchmal ganz zu Fuss, manchmal eine Strecke zu Fuss, und oft einfach mit dem Bus.
Woman, 50, living alone, Oberfeld (O6: 30)

The distance also plays a role, if it is too long, public transport is used:

Im Sommer bin ich dann auch mit dem Fahrrad hingefahren, aber das ist mir manchmal zu viel, das sind so 15km eine Strecke, dann fahre ich meistens mit der Bahn.
Woman, 55, couple with children, Klein Borstel (K7: 48)

Distanzen innerhalb 1-2km mache ich meistens zu Fuss, wenn's 3km sind nehme ich das E-Bike, wenn's noch weiter ist halt Bus oder Zug.
Man, 70, childless couple, Oberfeld (O1: 30)

Finally, many residents have intermodal mobility practices, i.e. combining different modes in the same journey, including also bikesharing in Hamburg:

Ich habe so eine Abokarte für den öffentlichen Nahverkehr hier in Hamburg, benutze auch viel das Fahrrad, und viel auch in Kombination. Wir können zum Glück hier bis auf die Sperrzeiten im Berufsverkehr das Fahrrad in der Bahn mitnehmen, in vielen Buslinien auch, das mache ich ganz viel. Ich habe auch Freunde auf dem Lande, da fahre ich dann so weit es geht mit der Bahn und die letzten vier, fünf Kilometer mit dem Fahrrad, das funktioniert wunderbar.
Woman, 65, living alone, Klein Borstel (K2: 34)

Im Alltag, wir fahren beide Bus und Bahn. Ich mache das so, dass ich mit dem Fahrrad immer zur nächsten Bahn, also bis nach Barmbek fahre, das da abstelle und dann habe ich eben eine Monatskarte.
Woman, 50, single-parent family, Saarlandstraße (SA03: 50)

Ein Beispiel, ich bin mit Freunden in der Kneipe verabredet in der Schanze [central district], da fahre ich mit dem StadtRAD hin, weil ich zurück dann doch lieber die U-Bahn nehme.
Woman, 70, living alone, Saarlandstraße (SA12: 139 - 141)

As mentioned above, regarding the reasons for modal choice, for several persons, the weather influences whether they take the bicycle, even if they have a preference to cycle:

Naja, wenn's dann kalt wird oder glitschig oder so, dann fahre ich natürlich nicht. [...] Im Winter kann es sein, dass es dann ein paar Monate lang nicht benutzt wird.
Woman, 75, living alone, Klein Borstel (K8: 20 - 22)

Wenn es einigermassen trocken oder schön ist fahre ich mit dem Velo.
Man, 70, living alone, Oberfeld (O2: 6)

Das ist eigentlich wetterabhängig. Ich fahre schon am liebsten mit dem Fahrrad, weil es einfach Bewegung, frische Luft und so. Wenn's halt regnet, dann fahr ich halt mit der U-Bahn.
Man, 45, couple with children, Saarlandstraße (SA05: 32)

Comfort or even laziness is another important reason for multimodality:

Manche sagen, kannst ja auch mit dem Fahrrad, da bin ich einfach zu faul [lachen] obwohl wir jetzt neuerdings auch Duschen haben, damit wir mit dem Fahrrad können.
Woman, 50, single-parent family, Klein Borstel (K1: 66)

In die Stadt, das hat einfach, da bin ich vielleicht etwas bequem, aber die Strassen entlang mit dem Verkehr, das macht mich einfach nicht an, mit dem Velo zu gehen. Ich habe eine Kollegin in [small town], da gehe ich schon mit dem Velo, da kannst du dem Bach entlang und musst auch nicht auf der Hauptstrasse.
Woman, 55, living alone, Oberfeld (O5: 22)

The flexibility of the bicycle, as well as its velocity—often the bicycle is the fastest option—are important reasons to use a bicycle whenever it is possible also for multimodal users:

Mit dem Velo bist du halt am flexibelsten. […] Wenn du dazwischen noch an eine Sitzung musst, bist du einfach am schnellsten mit dem Velo. Mit dem öV musst du wieder umsteigen, warten.
Man, 40, couple with children, Burgunder (B6: 30 - 30)

Lange habe ich mir gesagt es ist gleich lange, bis ich eine Phase hatte, wo ich viel Velo gefahren bin und gemerkt habe, ich bin schneller mit dem Velo, so 10 Minuten im Durchschnitt.
Man, 50, living alone, Sihlbogen (SI1: 44)

As mentioned above for the cyclists, wearing particular clothes, e.g. when going to the theatre, can also influence modal choice:

Wenn ich zum Beispiel ins Theater gehe, fahre ich nicht mit dem Fahrrad, weil ich da ein bisschen besser angezogen bin. Wenn's in Strömen regnet, ich kann auch bei Regen, aber je nach dem wo ich hinwill und was ich anziehen sollte, ob ich ein bisschen besser angezogen sein soll.
Woman, 75, childless couple, Saarlandstraße (SA09: 76)

Finally, social aspects can also play a role for modal choice, especially public transport, of course:

Ich finde Autofahren auch furchtbar unattraktiv, weil ich nicht in Kontakt mit anderen Menschen kommen kann. Wenn ich mit den öffentlichen Verkehrsmitteln unterwegs bin, kann ich Menschen kennenlernen, manchmal muss ich sie kennenlernen, auch nicht alle Begegnungen sind prickelnd. Insgesamt ist viel mehr Kontakt da und das macht mir viel mehr Spass, ich weiss nicht was für unzählige spannende tolle Begegnungen ich schon auf Zugreisen hatte.
Woman, 40, couple with children, Weißenburg (W7_F: 59)

8.2.2.4. Walking

The often-underestimated mobility mode, walking, was mentioned by several interviewees who also walk longer distances than to the next bus station or supermarket around the corner:

Ich habe nicht mal ein Velo, ich mache alles zu Fuss. Ich habe den Vorteil, ich bin Rentner, von daher kann ich mehr Zeit investieren darein. Ich laufe sehr gerne, manchmal wenn wir weggehen nimmt sie die S-Bahn und ich laufe zum Bahnhof Bern [distance of 4 km].
Man, 70, childless couple, Burgunder (B2_M: 27)

Wir erledigen viel zu Fuss. Wenn die Wahl darauf fallen würde, fahre ich zwei Stationen Bus oder gehe ich zu Fuss, dann würde auf jeden Fall zu Fuss, wo Leute sich wundern, warum nimmst du nicht den Bus? Dann sag ich, da sich hinzustellen, auf den Bus fünf Minuten zu warten oder schon nur zwei Minuten, in der Zeit bin ich ja schon die Hälfte des Wegs gelaufen.
Man, 50, couple with children, Klein Borstel (K6_M: 34)

Ich gehe viel zu Fuss. Das tue ich auch sehr gerne, dass ich mir manchmal sage, ach nee, diese Strecke, das ist jetzt nicht so weit, 3km hin und 3km zurück, dass kann ich gut auch zu Fuss machen.
Woman, 55, couple with children, Klein Borstel (K7: 54)

Different reasons are mentioned, similar to cycling: the physical activity, change one's mind after a day at work, pleasure and also the flexibility to pass everywhere:

Gerade zur Arbeit und von der Arbeit wieder zurück ist es gut, um wirklich abzuschalten, oder die Gedanken zu sortieren. […] Ansonsten gehe ich wahnsinnig gerne zu Fuss, weil ich habe das Gefühl, durch die Bewegung sich einfach der ganze Körper sortiert und ja, es ja letztendlich auch einfach gesund ist, der Gesunderhaltung dient. Und dass sich der Hormonhaushalt dahingehend reguliert, dass das Hungergefühl angemessen ist und so weiter. Für mich ist das eine wichtige Bewegungsform, um mich fit und gesund zu halten.
Woman, 40, couple with children, Weißenburg (W7_F: 79)

Das macht mir auch sehr viel Spass, auch wenn ich hier am Kanal entlang gehe, das finde ich immer eine sehr schöne Erholung einfach. […] Das ist für mich sehr wichtig, die Bewegung, auch die Freiheit, die damit verbunden ist, und gerade wenn man sich zu Fuss bewegt ist man freier,

man ist von niemandem abhängig, in keiner Form. Es ist egal was passiert, dann kann man, egal ob ein Stau ist, ich kann trotzdem weiter, irgendwas gesperrt ist, als Fussgänger habe ich eigentlich die besten Voraussetzungen, um mich fortzubewegen.
Woman, 55, childless couple, Saarlandstraße (SA06: 22 - 24)

8.2.2.5. Car use

As the overview showed, several residents use cars. This section presents, first, their reasons and the frequency of their car use and, then, the different types of car use, including also taxis.

According to the survey, particular shopping (e.g. big or heavy things) is the most common reason to use a car. About 70% of the respondents use a car for this purpose, but only 5% more than once per month (see Figure 40). In contrast, daily shopping is the least important reason, only 12% of the residents use a car for this. Leisure activities and visiting relatives or friends are both reasons to use a car for about half of the households, 10% drive more than once per month for this purpose. Finally, a quarter of the households use a car for professional reasons, with slightly higher shares of frequent uses than for the other motives. These differences show that in everyday life (food shopping or professional reasons), very few residents use a car. Only particular reasons such as transporting large things or visit relatives or friends lead to car use, but less than once per month for most households.
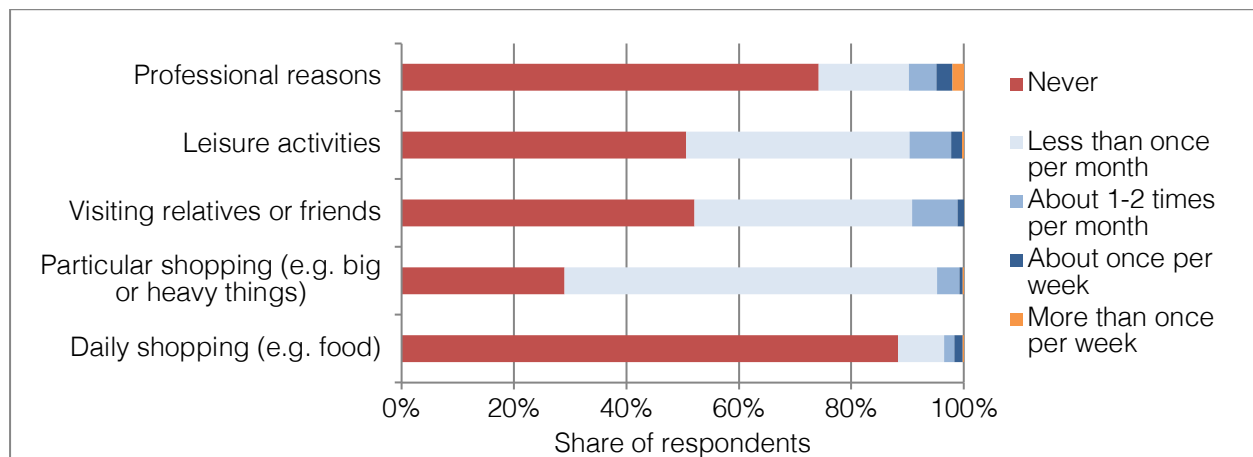
Figure 40: Reasons and frequency of car use (N=469 to 477)

Comparing the shares in the different car-free housing developments, one shows a slightly different pattern (see Table 72 in the Appendix): Stellwerk60, where there are also inhabitants owning a car (even if they are not part of the population considered here). However, the second car-reduced development, Giesserei, does not differ from the others. Weißenburg, instead, has slightly higher shares for car use to visit relatives or friends and leisure activities—this may be due to a more car-dependent spatial context than in the larger German cities and in Switzerland, or due to a population that has not completely chosen to live car-free. Conversely, the residents of Saarlandstraße have the least important car use, no reason reached more than 40%.

The interviews emphasise these results. The respondents' car use is very low. Except one household that uses a car every week, only a handful use it about once per month. The majority uses a car between one and four times per year and some households even less. Moreover, a few respondents declared that they currently never use a car:

Wir nutzen im normalen Alltag eigentlich nie ein Auto. Im Beruf fahre ich mal, aber an der Arbeitsstelle wo ich jetzt bin fahre ich da auch nicht mehr Auto.
Man, 45, couple with children, Saarlandstraße (SA05: 34)

For the others, the reasons for using a car are similar to those in the survey. No one uses it for daily shopping on a regular base. In sum, a car is used for holidays (this aspect will be presented in 8.5.2), leisure and transporting large things:

> *Sachen entsorgen, was Neues kaufen, da braucht man manchmal ein Auto. Aber das ist meistens für grössere Sachen, für den normalen Einkauf brauchen wir nie ein Auto. Ich würde wirklich sagen, Ferien, Skitouren, und grössere Transporte.*
> Woman, 35, couple with children, Burgunder (B5: 8)

The most important reason relates to the option "particular shopping" in the survey: transport big or heavy things that cannot easily or not at all be moved differently than by car. It includes not only shopping but also move house or waste disposal. For several households, this is even the only reason a car is used for:

> *Wirklich einfach wenn man etwas transportieren muss, was man sonst nicht kann.*
> Woman, 35, couple with children, Burgunder (B7: 10)

> *Eigentlich fast nur wenn wir mal etwas Grösseres einkaufen gehen irgendwo, Gartencenter oder so.*
> Man, 45, couple with children, Oberfeld (O7: 12)

For the two other main activities—visiting friends or relatives and leisure—a car is used if alternatives, primarily public transport, are unavailable, timetables unadapted or journey times very different—objectively or subjectively. Visiting friends or relatives living in difficultly accessible places or parties which do not fit to the public transport timetables were mentioned:

> *Wenn wir an einen Anlass gehen, eine Hochzeit oder so, wo wir wissen, wir kommen nicht mehr zurück ohne öV, oder es ist so weit vom Schuss ab, dass man nachher zu früh nach Hause müsste. Solche Situationen, wenn der öV nicht passt, aber das ist recht selten.*
> Man, 45, couple with children, Oberfeld (O7: 12)

> *Manchmal mieten wir uns ein Auto. [...] Wenn wir zum Beispiel zu meinen Eltern fahren, weil das irgendwie mit drei Kindern und der Bahn einfach vollkommen unbequem wäre. [...] Einfach an Orte, die man mit der Bahn oder mit öffentlichen Verkehrsmitteln schlecht oder gar nicht erreichen kann.*
> Woman, 40, couple with children, Weißenburg (W3_F: 32)

> *Wenn wir Freunde, die irgendwo auf dem Dorf leben, besuchen, da fahren wir dann oft mal mit dem Auto, wenn es dann wieder so aufs Dorf hinaus ist. Aber das ist eher ein Mangel an Infrastruktur, der uns dann zum Auto greifen lässt.*
> Woman, 40, couple with children, Weißenburg (W7_F: 48)

A more specific case mentioned by several respondents are elderly parents that become ill or are not mobile anymore:

> *In so Krankheitsfällen, irgendwie unsere Mütter leben halt noch, die sind beide betagt, eine deutlich über 80, die andere wird 80, sind schon so ein paar Beschwerden da. Dann ist das auch nicht ganz so problematisch, meine Mutter hat ja ein Auto [lachen] was ich dann nutzen könnte, wenn sie krank ist, um hin und her zu fahren.*
> Woman, 55, couple with children, Klein Borstel (K7: 76)

Then, various leisure activities are also mentioned. Here, similarly, either destinations are not accessible without a car or it is a matter of higher comfort:

> *Wenn man im Frühling auf eine Skitour will, ist man manchmal auf ein Auto angewiesen.*
> Woman, 35, couple with children, Burgunder (B5: 6)

> *Zum Beispiel gehen wir mit den Kindern in einen Schwimmkurs in [suburban town]. Um dorthin zu gehen, man kann mit Zug und Bus, aber das braucht 30-40 Minuten und mit dem Auto knapp 10 Minuten. Das ist ein Beispiel wo wir ein Auto nehmen, das ist jede Woche.*
> Man, 30, couple with children, Sihlbogen (SI4: 10)

> *Wir nutzen es häufig um in Konzerte zu gehen, oder Ausflüge zu machen, so, wo man halt schnell, also die weiter entfernt sind und wo man einfach ein bisschen flexibel sein muss. [...] Das ist ein*

bisschen Bequemlichkeit, also wir gehen gern zum Beispiel ins Konzert, wir haben ein Abo in Essen, und das könnte man mit dem Zug machen, aber das erfordert, dann passen die Fahrzeiten nicht zu den Konzertzeiten [...] Das machen wir hin und wieder auch einfach so, dass wir sagen wir fahren mit dem Auto, da ist ein Wasserschloss oder da ist eine interessante Siedlung oder eine interessante Stadt. Das kann man halt schlecht dann planen mit Bussen und Bahnen, das ist zu kompliziert und da lohnt dann auch ein Auto. Da packt man Picknick ein und dann macht man das. Was noch lohnt sind eben so Ausflüge, wenn viel Familie dabei ist.
Woman, 65, childless couple, Weißenburg (W2: 32 - 34)

Whereas most residents have—often deliberately chosen—a workplace where they do not need a car, few residents mentioned professional reasons, i.e. car use during work time:

Ab und zu beruflich, wenn ich an Orte muss, wo die Anbindung an den öV nicht gut ist, wenn ich nicht so flexibel bin, einfach vom Job her. Aber da habe ich von der Firma aus ein Auto.
Man, 35, childless couple, Sihlbogen (SI3: 22)

A few other reasons for using a car appeared in the interviews, especially the need to transport or travel with children and the case of disease, e.g. when a household member cannot walk:

Mal zum Therapeuten-Termin, der ein bisschen ausserhalb gelegen ist oder so, wo man dann mit den Kindern nach der Schule hin muss, was mit den Busverbindungen viel zu umständlich und zu lang wäre, dafür leihen wir's dann mal.
Woman, 50, couple with children, Klein Borstel (K5: 20)

Beispielsweise dieses Jahr war meine Frau krank und war nicht mobil, sie musste relativ mühsam an Stöcken gehen, da haben wir relativ häufig das Mobility-Auto gemietet oder dass sie den Rotkreuzfahrdienst beansprucht hat, der sie in die Arztpraxis oder zur Therapie geführt hat. Oder dass wir Ausflüge machen können haben wir jeweils das Mobility-Auto dann benutzt.
Man, 70, childless couple, Oberfeld (O1: 18)

Different residents also reported using a car in combination with public transport. This seems more common in Switzerland than in Germany, probably due to the different carsharing systems (as presented above, in Switzerland, Mobility is available all over the country and particularly at many train stations, thus, facilitating intermodal journeys):

Wenn ich nach [region in Central Switzerland] gehe, die Eltern besuche, die Schwester besuche, die wohnen auch nicht gerade am Bahnhof, dann nimmst du das Mobility ab [train station] und bringst es wieder zurück.
Man, 35, childless couple, Burgunder (B3: 20)

For some households, financial reasons play an important role—if carsharing is cheaper than public transport, they use it:

Wenn wir jetzt mal in die Stadt wollen oder Ausflüge machen, dann kucken wir halt, je nach dem wo wir hinmüssen, häufig ist es tatsächlich mit dem Auto günstiger als mit dem Bus. Wir würden eigentlich lieber mit dem Bus fahren, aber wir nehmen dann den günstigeren Weg.
Woman, 40, couple with children, Weißenburg (W3: 44)

Besides these different motivations for using a car, more generally, car use is an important element to be mobile for most car-free households. All the interviewed residents use cars, at least rarely, in three different ways: either they drive a carsharing, rental or private lent car, or they get a ride from someone, or they use a taxi:

Wir haben da einen Carsharing-Platz und wir haben die Möglichkeiten uns Autos zu leihen von Freunden oder was wir gemacht haben, wenn wir an die Elbe gefahren sind, mit Öffentlichen hin und dann mit einer Taxe zurück, das sind aber 40 Euro.
Woman, 55, couple with children, Klein Borstel (K4: 10)

Carsharing, ab und zu mal einen Leihwagen, bei Krankheiten sind wir auch zum Krankenhaus schon mal mit dem Taxi gefahren.
Woman, 50, couple with children, Klein Borstel (K5: 66)

Using a carsharing car or a rental or private lent car is, as it already appeared before, an important option for most residents with a driving licence, for those who owned a car before as well as for those who never owned a car and only used it when they needed one. The different types of carsharing cars that meet all transport or mobility needs are highlighted as a major advantage compared to car ownership:

> *Was ich den riesigen Vorteil finde, dass du genau das Auto hast, das du brauchst im Moment. Wenn du umziehst oder was transportieren musst, nimmst du einen Minivan oder so, und für nur schnell wohin zu zweit reicht ein Smart völlig. [...] Wenn du ein eigenes Auto hast, hast du ein Modell.*
> Man, 45, couple with children, Oberfeld (O7: 58)

> *Ich habe auch Autos verschiedener Typen, also wenn die ganze Familie da ist, also meine grosse Tochter, meine kleine Tochter jeweils mit Freund oder Mann und Kind, dann kann ich einen Neun-Sitzer leihen [...] Oder wenn ich grosse Sachen transportiere, dann leih ich einen Transporter. Also ich habe nicht ein Auto, ich habe 10 Autos [lachen].*
> Woman, 65, childless couple, Weißenburg (W2: 30)

Another possibility of car use, also for persons without a driving licence, is to get a ride from someone, often a family member or parents of children's friends for their leisure activities:

> *Wenn wir in [big city in Southern Germany] sind bei meinen Eltern fahren wir öfter mal mit, wenn die im Nahbereich irgendwohin fahren. [...] Beruflich ab und zu mit Kollegen.*
> Man, 40, couple with children, Klein Borstel (K9: 48)

> *Sich ab und zu mal abholen zu lassen, wenn es dann angeboten wird, und die Strecke alternativ schwierig ist. Dann will man ja auch die Leute nicht vor den Kopf stossen, „das nehme ich nicht an", das spielt manchmal auch eine Rolle.*
> Man, 55, childless couple, Saarlandstraße (SA02: 54)

> *Wenn man irgendwo gemeinsam mit mehreren Leuten irgendwohin fährt, mit einer Gruppe irgendwo in ein Tagungshaus, oder sonst, zu einer Feier wird man mitgenommen. Aber das ist selten [lachen].*
> Man, 60, living alone, Saarlandstraße (SA10: 20)

Taxis (or in Zurich also Uber) are used by most residents, but often not regularly. They represent mainly an option "*in case of*"—and for real emergency, there is also the ambulance:

> *Wenn ein Notfall wäre kann ich ein Taxi bestellen oder die Ambulanz wenn es wirklich schlimm ist.*
> Woman, 40, couple with children, Burgunder (B4: 46)

> *Taxi fahre ich dann auch manchmal. Wenn ich zu Freunden fahre, fahre ich erst mal hin mit öffentlichen Verkehrsmitteln und zurück kucke ich dann einfach, jetzt gibt es ja auch Apps, wenn die Verbindung schlecht ist, dann nehme ich ein Taxi.*
> Woman, 50, single-parent family, Klein Borstel (K1: 54)

> *Taxi fällt mir bislang immer noch gar nicht ein, das ist gar nicht auf meinem Radar drauf, aber ich denke das wird irgendwann kommen, vielleicht wenn ich nicht mehr so gut zu Fuss bin.*
> Woman, 75, living alone, Klein Borstel (K8: 38)

> *Ich bin noch recht häufiger Taxifahrer [lachen]. Das geht so weit, dass wenn ich abends von irgendwo nach Hause komme, dann stehst du am HB, Nachtbusse gäbe es schon, aber dann musst du zum Central, ein Nachtticket lösen, 40 Minuten warten – komm, Taxi, führ mich nach Hause.*
> Man, 50, living alone, Sihlbogen (SI1: 36)

The costs of a taxi are also mentioned. Compared to the costs of a car, one can use a taxi very often, or also related to the comparatively cheap dwelling in most developments:

> *Wenn's tatsächlich mal irgendwie fürchterlich brennt oder ich ganz eilig irgendwohin muss, dann nehme ich mir auch ein Taxi. Ich sage, das war von Anfang an mein Argument, als ich das Auto abgeschafft habe, dass ich für das Geld, das ein Auto kostet ganz schön viel Taxi fahren kann*

[lachen].
Woman, 65, living alone, Klein Borstel (K2: 66)

Taxi scheu ich mich nicht zu nehmen. Dadurch, dass ich kein eigenes Auto habe spare ich ja auch diese Wahnsinnskosten, die man damit hat, und dann kann man sich auch mal ein Taxi leisten.
Woman, 55, living alone, Saarlandstraße (SA01: 43)

Wenn ich in der Stadt bin, im Ausgang und unbedingt nach Hause will, bestelle ich Uber, das kostet mich 20 Franken. Und ich habe so eine günstige Wohnung, also so günstig auch nicht, aber günstig, wenn ich im Monat 100-200 Franken für Uber ausgebe, dann ist das als würde ich mitten im Zentrum wohnen.
Woman, 30, flat share, Sihlbogen (SI5: 131 - 133)

8.2.3. Mobility biographies

The next sections focus on the evolution of daily mobility. First, (eventual) changes after moving to the car-free housing development are presented. Then, other "key events" and the residents' mobility trajectories are analysed.

8.2.3.1. Changes after moving to the car-free housing

Moving house is a key event which often leads to changes in mobility practices. Due to the new place of residence, daily mobility is eventually reconsidered and adapted. In a car-free housing development where owning one transport mode is not allowed, this may be even more frequent. First the results from the survey questions addressing changes in public transport, bicycle and car use are presented. Then, evidence from the interviews is added.

Public transport is the mode with the smallest changes in use. 65% of all residents use buses and trains similarly often after moving to the car-free housing development, 27% use them more and only 8% less than before (see Figure 41). In four developments, the share of unchanged practices is even higher (FAB-A 81%, Burgunder 80%, Weißenburg 79%, Saarlandstraße 75%). In three others, there is an important increase: in Klein Borstel 45% report a higher use of public transport—probably due to the relatively long distance to the centre of Hamburg—in Sihlbogen 41% do so and in Giesserei 38%. In contrast, Stellwerk60 is the only development with a higher share of decreased public transport use (21%), possibly due to the relatively long distances to the nearest train stations (U-/S-Bahn).
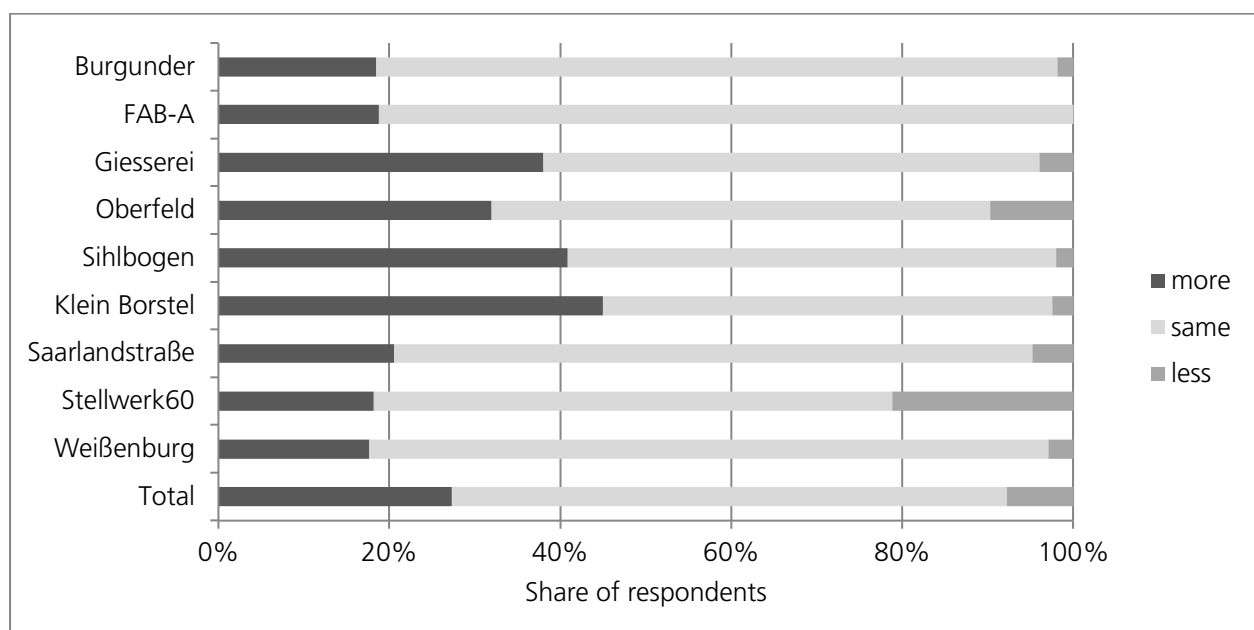
Figure 41: Changes in use of public transport after moving to the car-free development (N=477)

Bicycle use increased more strongly after moving to the car-free development. 38% of the residents cycle more, but, again, the majority (56%) has not changed (see Figure 42). This is especially true for the inhabitants of Burgunder (73%) and FAB-A (69%) as well as Oberfeld, Saarlandstraße and Weißenburg (about 63%). Two developments stand out for more and less: in Stellwerk60, 62% cycle more, in Sihlbogen 20% do less. In addition to (un)attractive public transport services, mentioned above, these results can be explained by a context and distances as well as bicycle paths to the city centre encouraging (or not) cycling—in other words, the city's mobility culture.
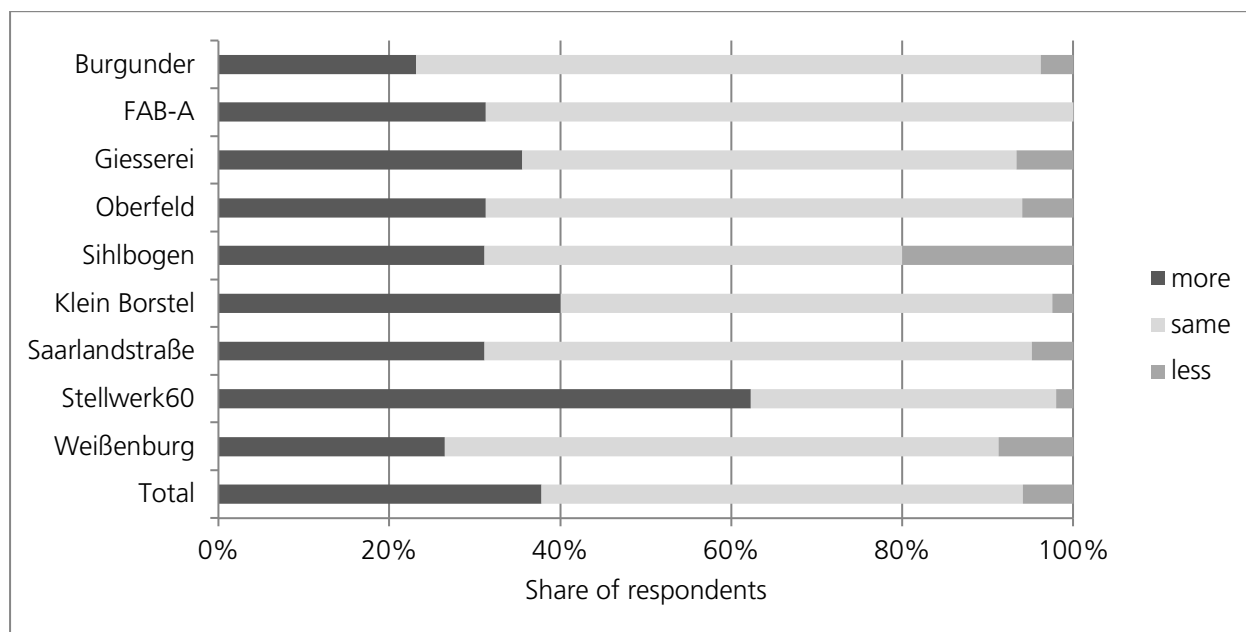
Figure 42: Changes in use of bicycles after moving to the car-free development (N=458)

Unsurprisingly, car use shows an important decrease. About 44% of the residents drive less, but still a majority of 52% have not changed their car use after moving (see Figure 43). The decrease is even higher in some developments: in Klein Borstel about three quarters of the respondents drive less, in Sihlbogen 55% and in Stellwerk60 42%. This decline can partly be explained by households who owned a car before (26%) and also by a spatial context and a mobility offer facilitating a car-free life, for example the possibility to lend a bicycle trailer or a cargo bike in the housing development.

This decline in car use was explained by several respondents during the interviews:

> *Der grosse Unterschied ist das Auto, das ich überhaupt nicht mehr brauche. Vorher habe ich es eigentlich relativ oft gebraucht. Auch wenn ich am Wochenende Ski fahren oder auf eine Bergtour ging, war es halt praktisch.*
> Man, 35, childless couple, Sihlbogen (SI3: 16)

While in Burgunder, FAB-A and Klein Borstel, no respondent uses a car more often, in some of the other developments, residents do so (Oberfeld and Weißenburg: 7%, Stellwerk60: 9%). This may be due to the presence of carsharing on the site, facilitating the access to cars—in the two German developments, a whole range of shared cars are available. However, these changes may also be due to other reasons coinciding with moving to a car-free housing development. An interviewee indicated professional changes or the birth of a child as well as getting a driving licence as reasons he uses more often a car than before. His statement also shows that using a car a few times per year represents an increase for residents who did not drive at all before:

> *Ich fahre viel mehr Auto [lachen]. Aber das ist auch wegen den beruflichen Sachen. Und auch wegen der Familie glaube ich, sonst wäre es auch anders möglich. Aber es sind wenige Tage im Jahr wo ich es brauche, für Freizeit und Arbeit. [...] Die Grundveränderung ist, ich habe den Fahr-*
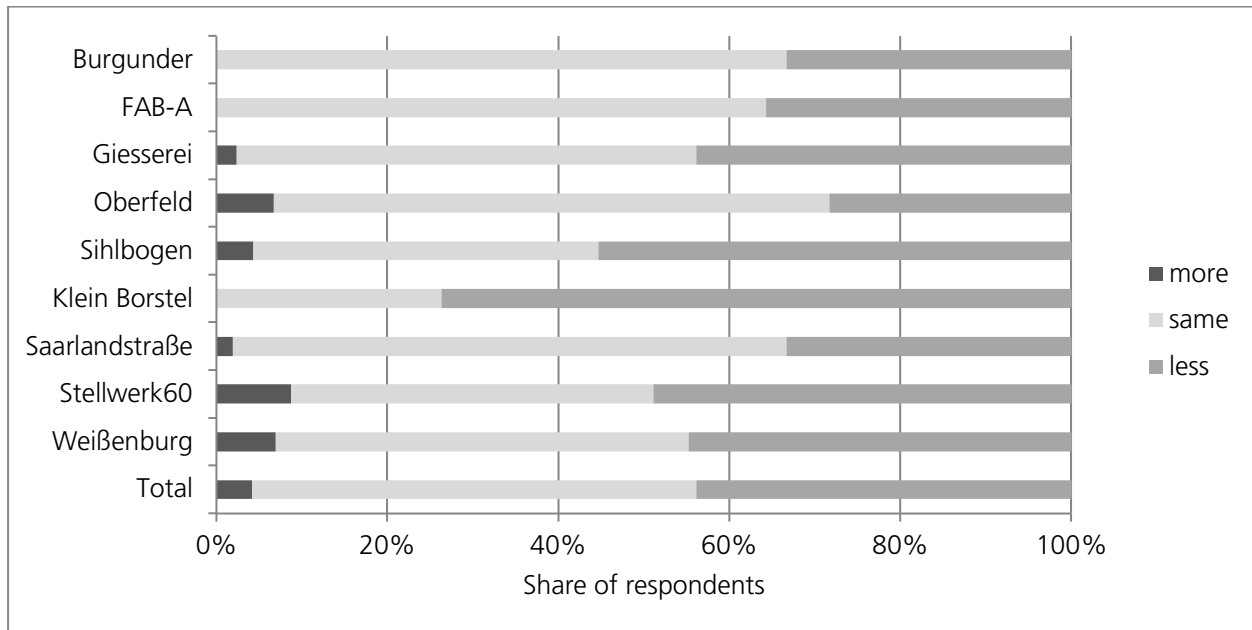
Figure 43: Changes in car use after moving to the car-free development (N=426)

The interviews confirmed that, in general, the mobility practices of many residents have not changed after moving to the car-free housing development or not even in a recent period before:

> *Hier hat sich nicht viel verändert, da waren wir ja schon etwa 16 Jahre autofrei, wir waren daran gewöhnt.*
> Man, 70, childless couple, Burgunder (B2_M: 23)

> *Das war vorher eigentlich auch ziemlich genau so. Es war halt zentraler, das heisst meine Frau ist mit dem Rad zur Arbeit, die 2km die es damals waren. Wir sind mehr zu Fuss einkaufen gegangen [...] weil auch die Spezialgeschäfte in Fussgängerentfernung waren. Es hat sich eigentlich nicht viel geändert.*
> Man, 40, couple with children, Klein Borstel (K9: 92)

Even for some car owners the change was only minor because they already used mostly alternative transport modes to their car before:

> *Wir hatten ein Auto, aber vor allem für die Arbeit meiner Frau, sonst haben wir schon vorher recht versucht uns mit öV oder Velo fortzubewegen. [...] Von daher war es nicht eine Revolution. Das ist wie so vorher schon gewachsen, und jetzt ein Schritt weiter noch gewesen.*
> Man, 40, couple with children, Oberfeld (O4: 6 / 24)

> *Ich hatte früher ein Auto. Ich bin eigentlich ein Samstagsfahrer gewesen, ging ein Mal die Woche einkaufen und sonst sehr beschränkt.*
> Man, 70, living alone, Sihlbogen (SI2: 2)

However, former car owners have generally adapted their mobility practices arriving at the car-free housing development. They use the other transport modes more often, but also organise their daily mobility differently, some even think they move a bit less than before:

> *Man teilt vielleicht den Tag anders ein, weil es einfach nicht möglich ist, an drei Orten noch schnell hopp hopp hin. Oft hat man sich ja auch etwas getäuscht, was dank dem Auto alles rein passt. Manchmal ist dann der Laden doch schon zu, oder man steckt im Stau, man denkt einfach man sei total mobil und total schnell. Und sonst, ich fahre mehr Zug als früher, deutlich, aber auch nicht so viel, dass ich ein GA bräuchte. Ich bin vielleicht auch sesshafter geworden.*
> Woman, 65, single-parent family, Oberfeld (O3: 72)

8.2.3.2. Other key events and mobility trajectories

In the interviews, two additional "key events" to the residential change presented before and two more diffuse processes relating to the residents' mobility trajectories appeared. The first "key event" when mobility practices changed is retirement from work life:

> *Was sich geändert hat ist mehr mit der Pensionierung. Vorher habe ich an einem Ort gearbeitet, wo ich viel reisen musste, auch als wir selbst kein Auto mehr hatten.*
> Man, 70, childless couple, Burgunder (B2_M: 31)

Second, children caused different travel practices. The arrival of the first or a second child or their school enrolment results, for many parents, in less movements:

> *Ich habe fast mehr ein Auto gebraucht vorher, also Mobility mehr gebraucht. Aber es hat glaube ich mehr mit der Familiensituation zu tun, nicht unbedingt wegen hier, weil wir früher einfach mehr mobil waren, die Kinder nicht in der Schule waren. Mit einem Kind waren wir einfach viel mobiler, jetzt sind wir mehr zu Hause, rein wegen der Familienkonstellation.*
> Man, 45, couple with children, Oberfeld (O7: 32)

Then, two broader processes influencing mobility practices appeared. On the one hand, age-related changes, related to different physical abilities, but partly compensated by technological innovations such as e-bikes:

> *Eine Veränderung würde ich eher im Zusammenhang mit dem Älterwerden sehen. Sonst hat sich da nichts geändert. Ich habe bevor ich hier eingezogen bin 14 Jahre schon ohne eigenes Auto gelebt und hier, inzwischen sind's 17. Also die Veränderung ging klar auf den Punkt älter werden. Dazu kommt eben auch, ich glaub das spielt auch eine Rolle, ich habe inzwischen zwei künstliche Hüftgelenke, das wirkt sich auch auf die Mobilität ein bisschen aus.*
> Woman, 70, living alone, Saarlandstraße (SA12: 59 / 65)

> *Aber bin deutlich weniger Velo gefahren als jetzt, aber ich wäre auch jetzt nicht mehr, oder ungern gefahren. Jetzt ist es der Flyer [e-bike], der es möglich macht.*
> Woman, 65, single-parent family, Oberfeld (O3: 50)

The other important process is socialisation, similarly to what was described above for mobility access (see 8.1.1.6). Even if some residents grew up in a car-centred household, many respondents already used different transport modes during childhood and youth and, thus, learned that not only a car enables to be mobile in everyday life:

> *Meine Eltern hatten ein Auto, meine Mutter hat es immer benutzt, für alles, und mein Vater hat es nie benutzt, hat alles mit dem Fahrrad gemacht. Ich würde ja nach wie vor behaupten, wenn man es einmal richtig schön gesehen hat, dass das geht, dass das durchaus auch ein Vorbild war.*
> Woman, 50, single-parent family, Saarlandstraße (SA03: 31)

> *Ich ging schon immer gern, schon als Kind. Ich glaube, das lernt man auch viel von den Eltern, ob die viel gehen.*
> Woman, 55, childless couple, Saarlandstraße (SA06: 46)

> *Ich bin auch so sozialisiert, dass ich von Kindesbeinen an eigentlich das Fahrrad brauchte.*
> Man, 50, couple with children, Weißenburg (W8_M: 60)

This also applies to the residents' children as an interviewee relates:

> *Es macht ja viel aus, wie man als Kind aufwächst, was man so für Ideen mitbekommt, wie man leben kann. Ich meine die Kinder sind es sich auch einfach gewöhnt, die sind auch viel selber schon mit dem öV unterwegs, sind früh selbständig in dem.*
> Man, 40, couple with children, Oberfeld (O4: 8)

Looking more in detail at the different transport modes, several aspects of socialisation to transport modes appear. Most of the handful of respondents who (nearly) never used a car during their whole life course grew up in a car-free household, while some gave up car use only after leaving their parental home. An important reason was that they lived in big cities where cars

were not necessary. On the other hand, there are also few respondents who grew up without a car but used it later during their life. Most of them are elderly residents whose parents did not have a driving licence or a car because it was not common at that time.

However, the majority of residents already used cars before, whether they owned one or never did. Many of them grew up in a rural area where the car was an important part of everyday life and a central transport mode for the family and for themselves as soon as they had reached the age of majority:

> *Ich bin auf dem Land aufgewachsen, dort wäre es, ohne Auto hätte es mich recht angeschissen. Ab 18 bin ich Auto gefahren, habe das Auto der Mutter gebraucht. Aber du musst auch weitere Wege machen, wenn du in den Ausgang willst sind es 10, 15, 20km.*
> Man, 35, childless couple, Burgunder (B3: 12)

> *Ich bin in einer Familie aufgewachsen, die sehr automobil war, so 80er-Jahre, das Auto gehörte einfach zur Familie. Am Wochenende, wenn man nicht wusste was machen, ist man einfach mit dem Auto irgendwohin gefahren, also wirklich einfach ganz stupid.*
> Man, 35, childless couple, Sihlbogen (SI3: 30)

On the other hand, many residents (and also those growing up in a car-centred family) are used to public transport since their childhood:

> *Ich bin schon früh von der Familie weg, weil ich in eine andere Schule bin und bin dann immer mit dem Zug gereist schon relativ früh. Das war vielleicht auch ein Teil davon, dass es normaler wurde und ich mich sehr sicher gefühlt habe, mit öffentlichen Verkehrsmitteln.*
> Man, 40, couple with children, Oberfeld (O4: 28)

> *Als Jugendliche natürlich Bus und Bahn, auch zur Schule. Wie ich aufs Gymnasium kam, gab's ganz günstig eine Gesamtnetzkarte. Da bin ich wirklich zum Vergnügen U-Bahn gefahren, das ganze Netz hoch und runter.*
> Woman, 65, living alone, Saarlandstraße (SA08: 53)

> *Ich bin dann relativ viel mit dem Zug lange unterwegs gewesen. Ich bin im Zug quasi aufgewachsen [lachen]. Von daher hat sich eigentlich auch nie die Frage gestellt, ein Auto zu haben, ich war immer so unterwegs. Auch wenn wir am Wochenende mit Kollegen unterwegs waren, sind wir relativ oft mit dem Zug unterwegs gewesen.*
> Man, 35, childless couple, Sihlbogen (SI3: 38)

Similarly, the majority of the residents also cycled ever since they move on their own and thus got used to this transport mode:

> *Da bin ich schon etwa in der 5. Klasse nach [small town] in die Schule, etwa 4km, mit dem Velo. Das war relativ heavy, aber das hat dazu geführt, dass das Velo irgendwie zu mir gehört hat nach ein paar Jahren.*
> Woman, 35, couple with children, Burgunder (B7: 26)

> *Ich bin früher auch immer mit dem Fahrrad überall hingefahren, als Kind.*
> Woman, 55, living alone, Saarlandstraße (SA11: 82)

> *Fahrradfahren war eigentlich immer. […] Seit wir in Münster wohnen also eigentlich alles immer mit dem Fahrrad.*
> Woman, 60, living alone, Weißenburg (W5: 14)

Similarly, multimodal mobility practices were already usual during childhood or youth. In several families, the car was not used for everything, but e.g. for shopping or holidays, whereas trips to the city centre were made by public transport:

> *Ich bin schon mit dem Zug ins Gymnasium, aber in die Ferien sind wir immer mit dem Auto.*
> Woman, 40, couple with children, Burgunder (B4: 12)

> *Man fährt nicht mit dem Auto in die Stadt, man fährt mit der Bahn, die Freunde besucht man auch mit der Bahn und nicht mit dem Auto oder halt mit dem Fahrrad. Und das Auto haben wir dann um nach Dänemark oder Norwegen zu fahren, dafür haben wir's genutzt. Aber ansonsten,*

Bus und Bahn.
Woman, 50, single-parent family, Klein Borstel (K1: 143)

After leaving the parents' home, different trajectories leading to car-free housing residents were found. For several residents, the car once played an important role in their adult life:

Zwischendurch habe ich auch das Velo genommen für einen kleinen Einkauf. Aber die grossen mit dem Auto oder für Ausflüge, Ski fahren auch. [...] In die Ferien sind wir mit den Kindern mit dem Auto, immer. Die Ausflüge, die Besuche, meine Eltern.
Woman, 70, childless couple, Burgunder (B2_F: 48)

Ich bin auch bis Anfang der 80er viel Auto gefahren, viel unterwegs gewesen.
Woman, 65, living alone, Saarlandstraße (SA08: 15)

Others had a much less important car use, for example only during certain periods of their life when they lived or worked in a place where a car was needed—in many citations nuances regarding car use appear, either today or then:

Wenn ich dann morgens von neun bis abends um zehn gearbeitet habe und dann einmal quer am andern Ende der Stadt, dann habe ich gern schon mal das Auto genommen, weil ich abends gut durchgekommen bin. Aber ja, ich sag mal vielleicht waren damals 30% der Fahrten waren vielleicht mit dem Auto und jetzt sind's 5% oder 2% oder so [lachen]. [...] Natürlich auch mal zum Einkaufen, wenn's vor der Tür steht nutzt man's mehr, das ist einfach so: „Ach ja, zum Sport, ach regnet gerade".
Woman, 50, couple with children, Klein Borstel (K5: 24 - 26)

Ich habe relativ spät gelernt zu fahren, so gewohnt war ich es mir auch nicht, überall hin zu fahren. Mit den vier Kindern sind wir auch in die Ferien, mit der Harfe ins Orchester bringen, vom Brockenhaus etwas holen, das war immer sehr praktisch. Aber ich wäre nicht die, die mit dem Auto zum Coop gefahren wäre, da sehe ich keinen Vorteil drin.
Woman, 65, single-parent family, Oberfeld (O3: 50)

Ich habe eine Zeit lang so gelebt, dass ich wirklich ein Auto gebraucht habe oder es doch wirklich eine Einschränkung bedeutet hätte. Also so wie ich in [big city in North Rhine-Westphalia] gelebt habe, ich wäre abends aus dem Kino gar nicht nach Hause zurück gekommen, da fuhr kein Bus mehr. Da war es einfach nötig.
Woman, 70, living alone, Saarlandstraße (SA12: 123)

For others, the car was (and still is) only an exceptionally used transport mode:

Ich hatte eine Zeit lang in Köln mal ein Auto, das habe ich nur in den Ferien genutzt, in Köln überhaupt nicht [lachen] weil ich war glücklich, wenn ich einen Parkplatz hatte. Dann stand das da, ich habe alles mit Fahrrad und Bahn gemacht.
Woman, 40, couple with children, Weißenburg (W7_F: 3)

Most residents also reported public transport use when they were adults, before moving to the car-free housing development, especially for long distances:

Lange Strecken bin ich eigentlich immer schon mit der Bahn gefahren.
Woman, 65, living alone, Klein Borstel (K2: 18)

Es gab für mich nie die Überlegung, als ich in [town northeast of Hamburg] gewohnt habe, um nach [town southeast of Hamburg] zu fahren, da musste man ja nicht durch die Stadt fahren, aber mit Öffis eben schon durch die Stadt, erst mal zum Hauptbahnhof und dann mit der S-Bahn wieder raus Richtung Bergedorf und dann mit dem Bus, könnte man sich ja sagen, wieso hat sie sich da kein Auto gekauft? Keine Ahnung. Aber es war überhaupt nie eine Überlegung. Das ist irgendwie ganz interessant, wenn ich mir das jetzt so überlege, hätten ja andere Leute ganz häufig gemacht. Arbeitsstelle, Auto kaufen, mit dem Auto zur Arbeit fahren war für mich echt keine Option. [...] Ich fand das blöd, dass die Leute alleine im Auto sitzen. Das hat mich schon immer genervt, weil ich immer Radfahrerin war, eben auch als Jugendliche. Dann habe ich die Leute dann morgens gesehen, wie sie alle alleine im Auto sitzen, dann dachte ich immer, nein, das ist doch total Scheisse, Blechdose.
Woman, 55, living alone, Saarlandstraße (SA11: 14 - 16)

As it appeared in the last citation, many residents cycled before, too, at least since they live in an urban environment, and often also while they owned a car:

> *Auch eigentlich als ich Auto gefahren bin, habe ich immer ein Fahrrad gehabt. So kurze Strecken zum Einkaufen oder so, wenn ich nicht grad sehr viel einzukaufen hatte, dann bin ich immer mit dem Rad gefahren.*
> Woman, 65, living alone, Klein Borstel (K2: 106)

> *Wir haben immer in grossen Städten gewohnt und sind beide immer Fahrrad gefahren.*
> Woman, 65, childless couple, Weißenburg (W2: 18)

> *Wir haben vorher noch ein bisschen weiter draussen gelebt […] 5-6km im Süden. Auch als ich da gelebt habe und noch studiert habe bin ich auch zur Uni eigentlich fast immer mit dem Fahrrad.*
> Woman, 40, couple with children, Weißenburg (W3_F: 50)

Finally, a few residents had a motorbike earlier. But they all stopped driving it years ago, for example when they had children, as the husband of this respondent:

> *Er war früher auch Motorradfahrer und hat dann aber, als unser erstes Kind, das sein lassen und ja, irgendwie, jetzt ist er Radfahrer und liebt sein Fahrrad.*
> Woman, 40, couple with children, Weißenburg (W3_F: 18)

8.2.4. Comparison and discussion of daily mobility

Even if it is difficult to compare the car-free housing residents' daily mobility practices to the overall population due to different types of data available, some major differences appear. They refer to the importance of cars and motorised two-wheelers, representing the main transport mode for 46% of the commuters in urban areas in Switzerland and for 50% in German core cities (see Table 54). In contrast, the share of public transport is only about half of the one in car-free housing developments. Furthermore, the (e-)bicycle also plays a more important role for car-free residents, overall only 8% in Switzerland and 9% in Germany use it primarily, compared to 25% in the car-free developments. My results are, instead, in line with former surveys on car-free housing residents (Ernst, 2008; P. Moser & Stocker, 2008; Scheurer, 2001b). Even in Amsterdam, the share of car-free GWL-terrein residents cycling to work is twice the city's average, although on much higher levels than in Germany or Switzerland (Foletta & Henderson, 2016, pp. 20–21).

Main transport mode used	Car-free housing developments (all residents, trips to place of work or education)	Population in Swiss urban municipalities (aged 15+ and working outside their dwelling)[66]	German core cities in agglomerations[67] (working population)
Walking	11%	9%	8%
(E-)Bicycle	25%	8%	9%
Public transport	59%[68]	38%	31%
Car and motorised two-wheelers	0%	46%	50%

Table 54: Comparison of mobility modes used to reach place of work or education

More generally, in car-free housing developments, three types of daily mobility practices exist: public transport-oriented residents, bicycle-oriented residents and, the main group, multimodal residents. The importance of each type also reflects the mobility culture of the respective city. In Münster, for example, bicycle-oriented residents are predominant whereas in Zurich, there are

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[66] Source: BFS (2018)

[67] Source: Destatis & WZB (2016)

[68] For comparison, combinations of public transport and cycling / walking are attributed to public transport, as this part ot the journey is generally the most important.

mainly public transport-oriented inhabitants. The influence of a city's major mobility mode on car-free households is supported by the study on car-free households in Lyon using mainly public transport and cycling only if they already did before (Deleuil et al., 2017).

The motivations for modal choice reflect general findings. For cycling to work or school, they are similar to those found in a large study on cycling in Switzerland and refer to well-being (both physical and mental), independence and civic engagement (Rérat, 2019).

Even if the residents do not own cars, they are not absent from their mobility practices. They use different forms of automobile mobility, mainly carsharing cars or cars borrowed from friends or relatives, but also taxis represent an important alternative for most residents—although mainly not regularly, but *"in case of"*. This has also been found by other studies on car-free urban households (Deleuil et al., 2017) as well as on residents of new-build urban areas where, despite car ownership, car use is relatively small (Jarass & Heinrichs, 2014). The "cargo use" of a car for shopping big and heavy things or for waste disposal echoes the findings of Mattioli et al.'s study on "car dependent practices" (Mattioli, Anable, & Vrotsou, 2016).

Both the survey and the interviews showed that, overall, there is a relatively important reduction in car use and an increase in cycling and public transport use—even if the majority of the respondents have not changed their mobility practices after moving to the car-free housing development. Nonetheless, two "key events" which lead to adapting mobility practices were mentioned: retirement and the birth of a child—in line with general findings of mobility biographies research (Müggenburg et al., 2015). Similarly, two more diffuse processes were observed: old age leading to adapt mobility practices and socialisation, mainly during childhood and youth. While only 17% of the residents grew up in a car-free household, most were socialised with cycling and public transport. Thus, the mobility biography seems to play an important role, alternative mobility modes were already used and experienced before, making the step to living without a private car much easier for most residents.

8.3. Shopping practices

Shopping is an example of a typical activity of everyday life that concerns all households (at least for groceries) and implies spatial mobility, at least transport of goods. In this chapter, the different places where the car-free housing residents buy their daily goods are presented and the mobility modes they use for shopping. Finally, the different strategies to shop without owning a private car are addressed, including online shopping and delivery services. All these findings are based on the interviews.

8.3.1. Shopping destinations

Almost all residents choose proximity and fulfil their daily needs in the neighbourhood. Often, the supermarkets and grocery shops in the surroundings are the main shopping destination for food:

> *Einkaufen? In Bümpliz [district where the development is located] im Normalfall. Es gibt ja im Zentrum von Bümpliz einen grossen Coop, Migros, es gibt auch einen Bäcker, für den täglichen Gebrauch vor allem dort.*
> Man, 40, couple with children, Burgunder (B6: 55)

> *Das tägliche kaufe ich hier im Ort [Klein Borstel] ein, weil ich mir sage, wenn wir wollen, dass es hier noch einen Kaufmann gibt, dann müssen wir hier auch kaufen, auch wenns vielleicht ein bisschen teurer ist als beim Aldi.*
> Woman, 65, living alone, Klein Borstel (K2: 60)

Das meiste hier schon im Umfeld, es gibt hier wirklich sehr viel: Discounter, den Edeka da direkt vor der Tür.
Woman, 70, living alone, Saarlandstraße (SA12: 61)

Another important place to buy food are markets, in the district or the city centre:

Ich gehe ein Mal die Woche auf den Markt, damit ich diese Plastikfolien da nicht mehr um das ganze Gemüse rum habe. Auch das ist von hier 10 Minuten mit dem Fahrrad. Auch wirklich ein Markt, der alle Produkte aus dem Umland auffährt.
Woman, 50, single-parent family, Saarlandstraße (SA03: 62)

As the last citation shows, many residents claim to be conscious consumers and want to buy ethical and sustainable goods. In three developments, this concern led to specific offers (see chapter 5). In Burgunder and Oberfeld, on one evening per week, an organic farmer holds a market stand in the development. It is used and appreciated by many residents:

Wir haben, super, ein Mal pro Woche Zauggs Biohof. Bei dem kaufe ich alles was Gemüse ist, eigentlich unser ganzes Gemüse, Mehl, Milchprodukte. Fleisch essen wir fast nie oder wenn, dann so ein Suppenhuhn oder Fisch vom Markt kaufe ich noch. Bei Zaugg findet man fast alles, Polenta, einheimische Früchte.
Woman, 40, couple with children, Burgunder (B4: 40)

Da in der Siedlung kommt jeden Freitag ein Bauer, der da einen Marktstand aufstellt für zwei Stunden. Da gehen wir auch viele Lebensmittel kaufen.
Man, 70, childless couple, Oberfeld (O1: 32)

In Oberfeld, there is also a small organic shop for long-lasting food that residents run and in Klein Borstel, the residents founded a food cooperative to buy organic food together, they get dried goods and also vegetables and apples from a regional organic farm:

Wir haben einen Laden für trockene Sachen. Ich habe glutenfreie Enkel, da finde ich viele Sachen für sie, weil es so besondere Sachen im Angebot hat. Und Fairtrade und biologisch natürlich, das sind alles Sachen, die ich unterstütze.
Woman, 65, single-parent family, Oberfeld (O3: 42)

Dass wir zum Beispiel einkaufen, haben Sie vielleicht schon von Nachbarn gehört, dass wir viel gemeinsam einkaufen und schicken lassen, unsere Food Coop haben und einmal im Monat wird der Bioladen-Kram gebracht. Das hat auch ganz schnell funktioniert. Der Apfel-Lkw kommt einmal im Monat und bringt uns Äpfel und Apfelsaft vom Demeterhof. Das hatten wir innerhalb von wenigen Monaten hatten wir das hier organisiert, dass die Grundsachen einfach hier sind. Da müssen zwar andere fahren, aber wenn ein Lkw dann für 30 Haushalte oder so was bringt, ist es besser als wenn 30 Pkws fahren [lachen].
Woman, 50, couple with children, Klein Borstel (K5: 22)

For more specific goods, in the bigger cities where such an offer exists, a few residents mentioned shopping centres in the district:

Ansonsten kaufe ich auch immer noch viel in [neighbourhood east of Klein Borstel]. Da gibt's ein grosses Einkaufszentrum, da bin ich auch immer noch vertraut.
Woman, 65, living alone, Klein Borstel (K2: 60)

Other residents mentioned they dislike shopping centres and prefer the city centre, which is, in fact, an important shopping destination for all car-free households:

Im [shopping centre in the district] sind wir also nie, so von wegen Einkaufen. Das ist mir auch unsympathisch, so riesige Warenhäuser, wenn man eh nie geht ist man sowieso überfordert, weiss nicht wohin man muss. In der Stadt muss man ja auch, aber dann ist es eines, das finde ich weniger unsympathisch.
Woman, 40, couple with children, Burgunder (B4: 62)

Ich würde auch nicht auf die Idee kommen ins [shopping centre in the district] zu gehen. Also ich komme eher auf die Idee nach [central neighbourhood] zu fahren, weil da mein Herz hängt und ich

mich da aufhalten möchte.
Woman, 45, couple with children, Klein Borstel (K3: 45)

8.3.2. Mobility modes used for shopping

As presented in the chapter about car use, only few households go shopping daily goods by car. They use it every now and then for bulk shopping, or when they use a car anyway, they also buy heavy things:

Ganz selten machen wir Wochenendeinkäufe. Wenn wir mal in die Ikea gehen und dafür ein Auto nehmen, dann nutzen wir grad die Gelegenheit und kaufen 1'000 Liter Mineralwasser ein.
Man, 45, couple with children, Oberfeld (O7: 64)

In general, a car is only exceptionally used for shopping:

Innerhalb der Stadt käme es überhaupt nicht in Frage. Das letzte Mal als ich mir ein Auto geliehen habe für einen Einkauf war glaube ich für den Fernseher, wie lange ist das her, 10 Jahre? Aufwändig, dann fährt man in eine Tiefgarage, und dann irgendwie muss man, damit man dieses Paket mitkriegt, ich glaube ich hatte mich schon fast danach geärgert, es war ein bisschen grösser als unser Fahrradanhänger, es passte nicht gut, und so Vibrationen. Aber schön war das nicht.
Man, 50, couple with children, Weißenburg (W8_M: 18)

When the distance is short enough, most residents walk or cycle to the shops:

Ansonsten gibt's hier Läden in der Nähe. Also ich esse schon viel Biokost, aber das ist auch beim Edeka gibt's das und bei Budnikowsky, die haben die Alnatura-Sachen. Das ist gut zu Fuss zu erreichen oder mit dem Fahrrad auch.
Man, 60, living alone, Saarlandstraße (SA10: 43)

Hier haben wir einen Rewe vor der Tür. Da kann man also wirklich den Einkauf in Rucksack und Taschen verstauen und sonst haben wir immer einen Fahrradanhänger, der dann auch als Lastenanhänger gilt.
Woman, 50, couple with children, Weißenburg (W8_F: 19)

The bicycle with its accessories is particularly relevant for shopping. An important number of residents use primarily the bicycle for shopping, often with a trailer or the cargo bike:

Meistens mit dem Velo, wir haben Rucksack und Taschen.
Man, 35, childless couple, Burgunder (B3: 28)

Wenn ich viel einkaufe, dann fahre ich mit dem Fahrrad, je nach dem wo ich einkaufe, weil ich grosse Gepäcktaschen habe oder weil wir einen Fahrradanhänger haben.
Woman, 75, childless couple, Saarlandstraße (SA09: 68)

Einkäufe mache ich auch mit dem Fahrrad. Ich habe zum einen einen normalen Einkaufswagen, den ich hinters Fahrrad hängen kann, wenn ich Lebensmittel einkaufe. Am Wochenende macht man meist den Grosseinkauf, dann habe ich eine Sackkarre noch, die man hinters Fahrrad hängen kann.
Man, 65, childless couple, Weißenburg (W9: 9)

8.3.3. Car-free shopping strategies

Shopping, especially when bigger quantities are needed, e.g. for a family, is an often-cited argument to own a car. As we already saw above, there are many alternatives such as carsharing that make it easily possible to shop by car without owning one. However, in the interviews, the respondents mentioned different other strategies for "real" car-free shopping—i.e. without driving a car. They are often combined. An important strategy is shopping less and more often, in order to be able to transport the goods on foot or bicycle or with other accessories:

Was wir nicht machen ist wöchentlicher Einkauf. Es kommt mal vor, dass es einen grösseren gibt. Aber wir gehen alle zwei, drei Tage Kleineres, was wir grad brauchen, nicht dass wir eine Riesenmenge einkaufen für eine Woche. Das ist dann schwieriger, der Rucksack hat eine gewisse Füll-

menge und mit vier Taschen auf dem Velo ist es auch mühsam.
Man, 35, childless couple, Burgunder (B3: 28)

Man muss sich schon ein bisschen anders organisieren, wenn man kein Auto mehr hat, grad was das Einkaufen auch zum Beispiel angeht. Da mach ich nicht mehr so Grosseinkäufe wie früher, sondern kaufe eben grad häufiger und ein bisschen weniger ein, damit ich nicht so schwer schleppen muss.
Woman, 65, living alone, Klein Borstel (K2: 62)

Wir gehen auf jeden Fall öfter einkaufen. Manche Familien machen ja den Samstagseinkauf riesig gross für die ganze Woche. Das machen wir nicht. Wir gehen schon eher so zwei-drei Mal die Woche einkaufen für die nächsten zwei-drei Tage.
Man, 45, couple with children, Saarlandstraße (SA05: 62)

Shopping is often integrated into other everyday trips or activities, the way back home from work or during children's (e.g. sports) activities:

Dadurch dass wir auf so vielen Wegen immer unterwegs sind, das hat sich im Laufe der Jahre immer verändert, wo wir einkaufen. Je nach dem wo wir die Kinder hinbringen, kaufen wir ein, wenn die Tochter beim Ballet ist zum Beispiel.
Woman, 50, couple with children, Klein Borstel (K5: 62)

Meistens gerade auf dem Arbeitsweg auch Hause, im Coop da vorne oder unten Migros [supermarkets]. Das ist beides praktisch, dass wir immer so einkaufen.
Man, 45, couple with children, Oberfeld (O7: 64)

As mentioned before, different accessories to the bicycle are used to transport shopping, not only trailers, but also simpler things such as a basket:

Ich habe einen Korb hinten auf dem Velo wie da früher die Hausfrauen [lachen]. Das ist immer noch das praktischste, dann kann ich die Tasche da reinwerfen, muss nicht mal was anbinden.
Man, 70, living alone, Oberfeld (O2: 20)

Similarly, there is also a tool for transporting more goods on foot: the shopping trolley:

Das war das erste, ich habe mir einen Einkaufswagen zugelegt [lachen], dass ich mit dem Einkaufen gehen kann.
Woman, 55, living alone, Oberfeld (O5: 54)

Mein Oma-Shopper, um auf den Markt zu gehen, entweder mach ich das mit dem Lastenrad oder damit. Kleine Hilfsmittel.
Woman, 40, couple with children, Weißenburg (W7_F: 115)

Another heavy good that can be a challenge are mineral water bottles. Besides tools to transport them, or delivery services (see below), there is another solution: drink tap water. And for those who prefer sparkling water, a water carbonator is an option:

Das war eine der ersten Anschaffungen, der Wassersprudler.
Woman, 50, couple with children, Klein Borstel (K5: 64)

Also ich bin auf jeden Fall inzwischen auf Leitungswasser umgestiegen [lachen], damit entfällt schon mal das lästige Wasser anschaffen.
Woman, 55, living alone, Saarlandstraße (SA01: 49)

Finally, other important shopping modes for car-free households are online shopping or delivery services. Food is normally not regularly ordered online, it was mentioned only for bigger quantities and only by residents in Switzerland, where the two big supermarket chains' online shops ("Coop@home" and "LeShop") are more and more known:

Online bestellen ist für mich wirklich noch etwas, wo ich finde, das ist noch praktisch. Das mache ich vielleicht im Monat ein Mal für einen grossen Einkauf.
Woman, 50, living alone, Oberfeld (O6: 24)

So alle 3 Monate, machen wir eine LeShop-Bestellung, wenn wir das Gefühl haben, wir müssten mal wieder Fruchtsäfte haben für im Keller. Dann sammeln wir das, dass wir über 200 Franken kommen, dann sind die Versandkosten gratis. [...] Und wir bestellen viel online, zum Beispiel Kaffee, Wein. Dann kommen wir gar nie in eine Situation, wo wir viel schleppen müssen.
Man, 45, couple with children, Oberfeld (O7: 64)

Wenn ich etwas Grösseres brauche, ich mache vielleicht zwei Mal im Jahr einen Grosseinkauf, so mit Vorräten, Getränken, so die grossen Sachen, dann bestelle ich bei Coop@home. Dann fülle ich die Bestellung am PC aus und lasse es liefern und die bringen es nach Hause.
Man, 35, childless couple, Sihlbogen (SI3: 52)

As mentioned by one resident, specific goods such as coffee or beverages are more often ordered online. This is also the case in Germany and for residents not shopping online otherwise. It is also organised together with neighbours to reduce delivery trips:

Es gibt natürlich Sachen, die wir uns liefern lassen, Wein zum Beispiel von Delinat, die haben einen Versand, oder Tee lasse ich mir auch zuschicken. Aber so 95% der Lebensmittel kaufen wir im Laden oder am Marktstand.
Man, 70, childless couple, Oberfeld (O1: 34)

Grössere Geschichten wie Getränkekisten lassen wir uns liefern. Einmal im Monat kommt da eine Lieferung von jemandem, der dann noch mehrere Haushalte hier beliefert.
Man, 55, childless couple, Saarlandstraße (SA02: 44)

Furthermore, several residents have a vegetable- or fruit-basket subscription for getting fresh goods from a regional (organic) farm every week. However, this is often not only motivated by logistic reasons related to home delivery, but also by ethical motivations, i.e. supporting contract farming:

Ich habe die grüne Kiste im Moment noch. Aber die habe ich auch eigentlich nicht, weil ich denke, die sollen mir das mal nach Hause liefern, weil ich das nicht anders hinkriege. Sondern das ist eher so, dass ich denke, ich finde das super, die sollen irgendwie auch einen kalkulierbaren Kundenstamm haben.
Woman, 55, living alone, Saarlandstraße (SA11: 58)

In beruflich sehr angespannten Zeiten wo wir wenig Zeit haben, lassen wir uns Biogemüse nach Hause liefern. Die beliefern eh schon etliche hier im Umkreis, so dass nicht grössere oder weitere Touren entstehen.
Woman, 40, couple with children, Weißenburg (W7_F: 117)

Delivery services are also used for all types of non-food, especially for heavy or large things such as furniture or household appliances. Nonetheless, many residents are aware that delivery is not only positive for commerce, society and the environment and try to use it consciously:

Ab und zu fährt für uns ein Auto, weil's etwas anliefert. Da sind wir relativ normal drauf, dass wir uns gerne mal irgendwelche Sachen bestellen, meine Frau eher Klamotten, ich eher was bei Amazon, Bücher oder Techniksachen. Da fährt das Auto für uns dann natürlich, nur die paar Hundert Meter die es extra für uns als Umweg fährt.
Man, 40, couple with children, Klein Borstel (K9: 50)

Jetzt habe ich kürzlich etwas Grösseres gekauft, eine CD-Anlage musste ich eine neue haben. Migros Electronics, die liefern es für 5 Franken nach Hause, weil mir das zu gross und zu schwer und mit dem Bus schon etwas mühsam war. Also es gibt einfach solche Möglichkeiten, die ich auch nicht wusste. Und das ist noch irgendwie die Band-Genossenschaft, die das liefern, das ist drei Mal gut.
Woman, 55, living alone, Oberfeld (O5: 14)

Der Klassiker ist Lieferdienste. Als ich hier reinkam, ich meine die Möbel sind zum Teil gross, schwer. Dann gehe ich einkaufen, schaue mir die Sachen an im Laden, dann Liefertermin, ihr bringt das her, stellt es grad noch auf, ich habe nichts zu tun damit und am Schluss ist es fertig.
Man, 50, living alone, Sihlbogen (SI1: 38)

Another possibility to transport large and heavy things are cargo taxis, but they seem to exist only in Hamburg:

> *Vor Kurzem hat mein Mann ein Möbelstück abgeholt und das wurde mit einem Lasttaxi gemacht, also das geht auch.*
> Woman, 55, childless couple, Saarlandstraß (SA06: 32)

Finally, simply walking and carrying goods, often also in combination with public transport, is another very basic mode frequently mentioned for shopping without a car:

> *Wir haben sogar ein Ferienhaus, eine Alphütte, mit Kollegen gemietet, die ist etwas abgelegen, 20 Minuten vom Dorf entfernt wo es einen Laden gibt. Wir haben schon oft gedacht, man müsste mal mit einem Mobility gehen […] Aber schlussendlich machen wir es nie, es wäre viel mehr Aufwand, mühsam. Also wir schleppen einfach alles Essen nach hinten.*
> Woman, 40, couple with children, Burgunder (B4: 18)

> *Das hätte ich früher nie gemacht, mit so einem Möbel da nach Niederwangen, zum Bauhaus hoch, dann nachher mit der S-Bahn und dann damit zum 10er-Bus und nach Hause gefahren. Ich schaue das dann ein Stück weit als Herausforderung an. Es ist dann nicht das bequemste, es juckt mich dann, das so zu probieren anstatt ein Auto zu mieten, mit Mobility zu gehen, wenn es nicht grad ein Möbel ist, dass man zu zweit tragen müsste.*
> Man, 70, living alone, Oberfeld (O2: 18)

8.3.4. Comparison and discussion of shopping practices

Proximity is the key for car-free residents to satisfy their daily needs. Shopping is generally integrated into everyday mobility practices, most residents shop in the surrounding neighbourhood, for example on the way back home from work. They mainly walk for shopping or often use a bicycle, with accessories, to facilitate transporting bigger quantities. Former surveys of car-free housing residents found similar mobility practices: a large majority of shopping trips are made by non-motorised means (Ernst, 2008; Mantau, 2010; Scheurer, 2001b). This is also confirmed by general studies on residents of central urban areas, e.g. in Berlin it was found that groceries are mainly bought by foot or bicycle at shops near the place of residence (Gebhardt et al., 2005, p. 280).

Car-free housing residents only exceptionally use cars (see also 8.2.2.5), unlike the overall population: in Switzerland 40% of shopping trips are made by car (OFS / ARE, 2017, p. 45) and in Germany even 53% (MiT 2017, 2018). Although in urban areas these rates are smaller: in German metropolises, the modal share of the car for shopping trips is 36%, whereas walking reaches 39% and the bicycle 14% (MiT 2017, 2018). More detailed statistics for Hamburg, including multiple answers on which mobility modes are used for daily needs' shopping, show that in the whole population, 79% walk, 35% cycle, 40% use a car and 22% use public transport, compared to 93% walking, 36% cycling, 9% using a (carsharing) car and 32% travelling by bus and train for car-free inhabitants of Hamburg. 11% of them do online shopping for daily needs, compared to 8% overall. For other types of online shopping, these shares are similar and reach about one third (MiT 2017, 2018). Online shopping is similarly important for car-free housing residents: it is only rarely used for groceries, but more often for other goods—emphasising the importance of digitalisation to facilitate car-free living.

Besides the logic of proximity, use of carsharing and home delivery services based on ICT, other strategies are applied to facilitate shopping without owning (or even using) a car. My findings are similar to those of the Finnish study on households giving up a car which almost all restructured their shopping practices, from frequency of shopping to purchase new means such as pannier bags and shopping trolleys or borrowing a car for bigger purchases. Some also reduced "recreational shopping" to avoid taking the bus to the city centre just for this purpose (Laakso, 2017, p. 139).

Finally, the importance of ecological and social values also appears in most residents' shopping practices: in nearly all collaborative housing projects, this even led to specific offers such as (organic) market stands, grocery shops or food cooperatives.

8.4. Leisure activities

The residents' leisure activities are central in studying mobility practices because leisure represents, by far, the most important mobility purpose in both Switzerland and Germany (Follmer, 2018; OFS / ARE, 2017). This chapter presents, first, the types of leisure activities and, second, the mobility modes the residents use for this purpose.

8.4.1. Types of leisure activities

To get an overview, the survey asked for the frequency of a set of leisure activities: typical activities performed at home such as watching TV or spending time in the internet, outdoor activities and sports, social activities including meeting friends or relatives, and cultural activities such as going to the cinema (see Figure 44). The most frequent leisure activity is spending time in the internet and at the PC, 79% do so "(almost) every day" and only 2.5% answered "never". There are several common activities that about half of the residents do at least once a week: sports (70%), watching TV (68%), meeting friends or relatives (55%), and going for a walk, hike or bicycle tour (46%). On the other hand, the highest shares of not realised activities are actively co-operating in an association (42%), going to the theatre or the opera (34%), doing handicrafts or gardening (23%), and participating in community activities in the development (20%).
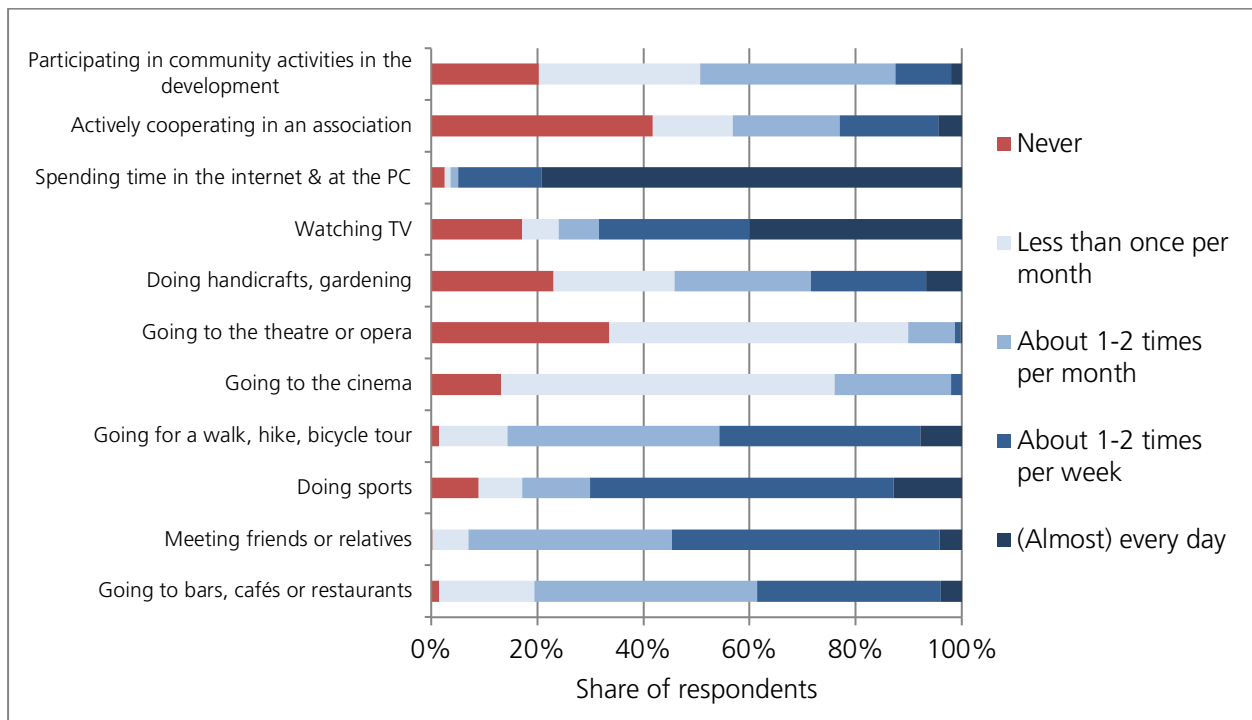
Figure 44: Leisure activities (N=465 to 477)

Some leisure activities are less frequent in several car-free developments (see Table 73 in the Appendix). Sihlbogen especially stands out with four activities reaching very high shares of "never" answers: participating in community activities in the development (81%—which is also due to the fact that only few and informally organised such activities take place there), co-operating in an association (77%), going to the theatre or the opera (56%) and doing handicrafts or gardening (46%). In Stellwerk60, there are also many respondents never participating in commu-

nity activities (41%) and not co-operating in an association (53%). In Weißenburg, the share of residents who never go to the theatre or the opera is higher (42%), maybe due to the presence of many households with limited financial resources. On the other end of the scale, in Burgunder, Klein Borstel and Weißenburg only about a quarter of the respondents are not doing volunteer work in an association. These differences reflect the developments' characteristics, smaller collaborative housing based on ecological and social values attract residents that are also, in general, more engaged.

In the interviews, similar leisure activities were reported. Four types appear very common: cultural activities, meeting friends or relatives, sports, and outdoor activities. Cultural activities—going to the cinema, the theatre, concerts or exhibitions—were mentioned by many residents. Several interviewees also mentioned the active form: singing in a choir, playing an instrument, playing in a theatre group or painting—activities not included in the questionnaire. In the cooperatives or housing projects (Klein Borstel, Oberfeld and Saarlandstraße), cultural activities seem to be much more common than elsewhere. There, nearly all residents mentioned this type of leisure. Meeting friends, instead, is a frequent activity for most residents, for relatives it depends on where they live. Several elderly persons also reported babysitting their grandchildren. Sports and outdoor activities—including going for a walk, hike or bicycle tour, but also day trips, for example by boat or mountain rides, or going to a lake for swimming in summer—are common leisure activities everywhere, too:

> *Am liebsten gehe ich eigentlich wandern oder Schneeschuhlaufen, so. Und was mache ich noch, etwa eine Velotour, auch von da aus.*
> Woman, 50, living alone, Oberfeld (O6: 38)

> *Wir machen dann halt Fahrradausflüge oder fahren mit dem Fahrrad irgendwo in den Wald oder fahren an den See oder in die nähere Umgebung, an den Kanal. Also dass man einfach sich die erreichbaren Ziele sucht. Und das ist ja in Münster alles recht schön.*
> Woman, 50, couple with children, Weißenburg (W8_F: 79)

The last citation shows a general feature: outdoor activities often start at home and take place in the—more or less distant—surroundings, even if there are also longer trips to places further away. A handful of residents has an allotment garden where they pass an important part of their leisure time. In general, nature plays an important role for most residents' leisure activities, which is not surprising for persons emphasising the importance of environmental values. The most popular types of sports activities confirm this, many residents go running, do watersports or race cycling. Otherwise, training at the gym or doing yoga are also very popular and finally, some residents mentioned different ball games. Children's sports activities were mentioned, too.

Many interviewees actively co-operate in an association, where they exist for example in the residents' association in the development or in the self-administration of the housing cooperative. Others co-operate in political parties, trade unions, environmental or social organisations or the parents' council of their children's school. This volunteer engagement is consistent with the importance of altruistic values reported above. Residents do not only care for their personal wellbeing, they also spend time for the community, be it in the housing development or on a more general societal level.

Furthermore, several other leisure activities were mentioned, including going to church, but also activities taking place at home, such as reading or spending time in the internet. Many residents—especially persons working— actually said that they like to spend time at home. Even more residents reported spending an important amount of time in the development, outside their dwelling—except in Sihlbogen where this is only rarely the case—either outdoors or in community activities indoors, more or less spontaneously organised:

Wir haben ein sehr gutes Verhältnis mit den Nachbarn obenan, Sommerabende mit ihnen ge-
niessen, jassen oder einfach zusammen grillieren. Was weniger vorkommt ist mit den Kindern
spielen gehen. Oder Pingpong spielen, das etwa noch. Boule auf dem Kiesplatz unten, aber mehr so
einzelne Abende, das ergibt sich dann gerade. Fussball schauen ab und zu.
Man, 35, childless couple, Burgunder (B3: 46)

Ich singe zum Beispiel in einem kleinen Chor mit, zu dem mich eine Nachbarin gefragt hat. Dann
gehe ich mit anderen Nachbarinnen immer tanzen und heute Morgen war ich hier bei dem benach-
barten Wohnprojekt, da gehe ich regelmässig zu einer Qi Gong-Gruppe. Also es finden sich
schneller Leute, mit denen man auch mal was macht. Oder mal spontan eine Radtour zu machen,
das kann man hier schneller und einfacher auch mit Nachbarn mal machen.
Woman, 65, living alone, Klein Borstel (K2: 62)

In der Kompostgruppe helfe ich ab und zu schaufeln. Oder das Donnerstagsznacht gibt es, eine lose
Gruppe, wo man sich eintragen kann in einem Doodle-Kalender, wenn man kochen will oder bei
jemandem essen gehen. Das sind dann immer 4-6 Leute, die sich bei jemandem zusammenfinden.
Woman, 50, living alone, Oberfeld (O6: 70)

Soziales Leben findet viel statt hier, es gibt viele Gruppen. Heute Abend gibt es eine Lesegruppe
Philosophie. Wir haben hier ein relativ reges soziales Leben mit den Nachbarn.
Woman, 75, childless couple, Saarlandstraße (SA09: 96)

8.4.2. Mobility modes used for leisure activities

As reported above, many activities do not need any mobility, either because moving is the activity and, thus, starts and ends at the place of residence: running, walking, cycling—or even swimming and paddling in Saarlandstraße—either because the activities take place at home or in the housing development. This is often highlighted, not as the main argument, but as a practical side effect of such activities:

Ansonsten freuen wir uns natürlich immer über alles, was auch im Wohnprojekt stattfindet. Früher
als sie kleiner waren fand hier noch mehr statt. […] Für mich könnte hier noch viel mehr stattfin-
den, weil man dann gar keine Wege hat und das nette Leute sind.
Woman, 50, couple with children, Klein Borstel (K5: 58)

An important characteristic of leisure activities is that, generally, they can be chosen without constraints that apply e.g. for work. Thus, the choice of the location or its accessibility is an important strategy for most residents to cope with the absence of a car that is needed for many locations, as often enough alternatives exist or the near surroundings provide many opportunities for leisure activities:

Am Wochenende sind wir relativ viel draussen unterwegs, entweder in der unmittelbaren Umge-
bung oder mit dem öV irgendwohin.
Woman, 35, couple with children, Burgunder (B5: 56)

Wenn's innerhalb von Hamburg ist überlege ich mir S-Bahn oder Rad. Wenn's ausserhalb ist, dann
meist mit der Bahn eigentlich. Weil es eigentlich selbstverständlich ist, kommen dann auch nur
Ziele in Frage, die mit der Bahn zu erreichen sind und die werden dann mit der Bahn erreicht.
Man, 40, couple with children, Klein Borstel (K9: 64)

Ich glaube, das ergibt sich automatisch wirklich, weil man eben nicht so schnell weiter weg kommt,
sucht man sich sicherlich eher im näheren Umfeld seine Freizeitgestaltung.
Woman, 55, living alone, Saarlandstraße (SA01: 61)

Heute, wenn ich unterwegs bin, das Erste was ich mache, wenn ich etwas plane, eine Tour oder so,
schaue ich wie ist die Zugänglichkeit mit dem öV.
Man, 35, childless couple, Sihlbogen (SI3: 16)

This also applies to children's activities, they need to be accessible without the parents playing taxi drivers:

Ich habe immer gesagt, wir sind beide berufstätig, ich kann nicht auch noch Taxifahrer spielen, ich kann nicht zum Tennis, zum Reiten, zum Golf spielen, zum was nicht alles Kinder heutzutage machen. Ihr könnt euch aussuchen, was in eurem Radius möglich ist, ihr könnt da mit dem Fahrrad hinfahren und mehr geht nicht, so. Der Radius wurde immer grösser und daher haben sie sich auch immer mehr ausgesucht und können sich auch frei bewegen.
Woman, 50, couple with children, Weißenburg (W8_F: 77)

Generally, for more distant leisure activities, the bicycle and public transport are the most used transport modes—similar to the use described above for everyday activities. Compared to the car, public transport has specific advantages for leisure activities such as hiking, one does not need to return to the car:

Das Schöne ist halt mit dem GA, das ist überhaupt kein Problem, wenn es mir hier nicht passt, dann muss ich nicht zurück zum Auto, dann gehe ich noch ein Stück weiter und auf die andere Seite nach Hause anstatt zum Auto zurück. Klar, die Skis musst du zurücktragen, aber die Langlaufskis sind so leicht, das ist kein Problem. Oder Schneeschuhe ist auch kein Problem. Oder wandern, das ist auch kein Problem, da braucht es gar nichts ausser einem kleinen Rucksack [lachen].
Man, 70, living alone, Oberfeld (O2: 28)

However, sometimes, a car is used, but for nearly all interviewed residents, this is exceptional rather than regular. For most of them, the car is not the preferred mode, but mainly used when there is no alternative, i.e. for distances too long for cycling (particularly for children) and/or if there is no public transport (or it is perceived to be insufficient):

Wandern, im Gurnigel und so, für dort haben wir ab und zu ein Mobility genommen. Das ist so ein typischer Wochenendausflug, so drei Mal im Jahr, da kommst du mit öV wirklich fast nicht hin.
Man, 45, couple with children, Oberfeld (O7: 34)

Ich bin auch schon mal mit dem Stadtteilauto gefahren, ist aber wie gesagt, innerhalb, zwei, drei Mal im Jahr. Also meistens fahren wir mit dem Zug.
Man, 60, childless couple, Weißenburg (W1: 110)

Das ist zum Beispiel ärgerlich, dass das Hiltruper Freibad mit öffentlichen Verkehrsmitteln sehr schlecht angebunden ist. Wir würden da gerne mit dem Bus bis vor die Tür fahren und mit dem Bus zurück, das wäre total praktisch. Geht nicht, man muss entweder das letzte Stück laufen und schon dahin muss man schon komisch irgendwie umsteigen, was ich für die Entfernung, die es ist, die 5km, eine Zumutung finde für den öffentlichen Nahverkehr. Ja, und wir beide würden dann mit dem Fahrrad hinfahren, aber die Tochter ist natürlich mit ihren 8 Jahren nach dem Schwimmbad total k.o. da ist das eine Zumutung. Da mieten wir ganz oft ein Auto, aber das wäre eigentlich auch gar nicht nötig, wenn man da eine vernünftige Verkehrsanbindung planen würde.
Man, 40, couple with children, Weißenburg (W7_M: 138)

8.4.3. Comparison and discussion of leisure activities

Comparing the leisure activities of the car-free housing residents to national data from Switzerland (for Germany, recent data was found only for two types), some differences appear (see Table 55). Car-free residents are more likely to go to the cinema (only 13% never do, compared to 33% in Swiss cities) and the theatre or opera (34%/52%), but more of them never watch TV (17%/9% in all Switzerland). Furthermore, residents of car-free housing more often co-operate in an association in Germany, whereas in Switzerland their share corresponds to the urban average.

The higher interest for cultural activities goes together with the higher education level and the values important to car-free housing residents. Similarly, their high cultural capital also explains the activities revealed in the interviews such as playing music instruments or singing in a choir. Furthermore, their interest in physical activities can be linked to the preference of cycling in everyday life or to be outdoors, in line with the importance attributed to environment. Finally, community activities appeared as an important residential motivation and are, therefore, also reflected in the leisure activities. As mentioned, differences appear between the developments.

Residents in cooperative housing differ from the others, they are more numerous to spending time on cultural and social activities and to participating in volunteer work in associations, too.

	Total car-free housing	Switzerland (cities)[69]	Germany
Going to bars, cafés or restaurants	2%		
Meeting friends or relatives	0%	3.2%	
Doing sports	9%	10.8%	
Going for a walk, hike, bicycle tour	2%	4.1% (walk/hike)	
Going to the cinema	13%	32.5%	
Going to the theatre or opera	33%	52.2%	
Doing handicrafts, gardening	23%	27.1% (handicrafts)	
Watching TV	17%	9.2% (whole country)	5.8% (whole country)[70]
Spending time in the internet and at the PC	3%		
Actively co-operating in an association	42%	41.1%	60%[71]

Table 55: Comparison of leisure activities, share of the population "never" doing an activity

Often, no transport is needed for leisure activities because they take place at home, in the development or start and end there (e.g. running, bicycle tours). This allows to reduce transport activities to a minimum, but also needs proximity to attractive recreation areas and a particular environment suitable for community activities (including common rooms but also shared outdoor spaces). As for other activities, cars are is limited, while it represents the dominant transport mode for leisure, overall, in Switzerland and Germany, and leisure represents, moreover, the most important travel purpose (Follmer, 2018; OFS / ARE, 2017).

8.5. Holiday travels

The last example of practices are holiday travels—defined as trips with overnight stays. They represent a different type of mobility as they take place beyond the residents' usual activity space. Therefore, it may not be possible to use habitual transport modes. Furthermore, distances travelled are longer and, thus, the effects on the environment more important than those of daily mobility. First, the frequencies and types of holiday travels are presented, and, second, the mobility modes used for travelling.

8.5.1. Frequencies and types of holiday travels

Nearly all respondents travelled in the year before the survey (see Figure 45). Half of the respondents did five trips or more with an overnight stay. Only 4% have not travelled at all. The share of households with any holiday trip during the last 12 months is significantly higher in Weißenburg

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[69] Source: BFS (2016a)

[70] Source: BFS (2017a)

[71] Source: Destatis & WZB (2016)

(12%), probably due to the financial situation of its residents. In FAB-A and Klein Borstel, instead, all residents travelled at least once.
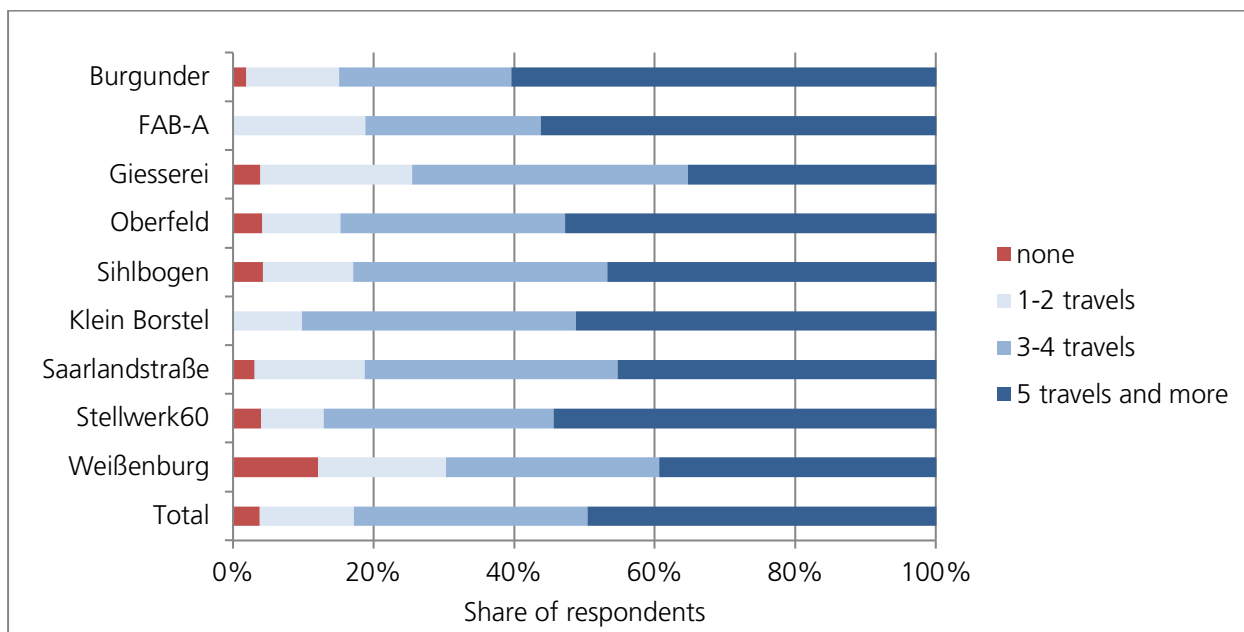
Figure 45: Holiday travels with at least one overnight stay during the last 12 months (N=478)

The interviews shed some light on these trips. While two respondents in Weißenburg did not go on holiday for financial reasons, the other interviewees all travelled. The destinations are very diverse, but a trend towards proximity appears: about half of the households reported holidays in their country in which they live and the same number visited other Western European, mostly neighbouring, countries. Only few respondents travelled further and a handful did bicycle holidays.

The reasons behind these choices are different but, as we will see below, mobility plays an important role. Other reasons for staying near for holidays are young children or the wish to do activities that can be done in the country:

> *Es ist nicht unbedingt, dass wir uns bewusst einschränken, um kein Auto mieten zu müssen, aber die Schweiz bietet so viel, und die Kinder sind in einem Alter, dass man ihnen nicht den Grand Canyon zeigen muss. Das sagt ihnen noch nichts.*
> Man, 45, couple with children, Oberfeld (O7: 36)

> *Wir haben Freude an den Bergen und wir gehen auch immer wieder an verschiedene Orte, im Winter Langlauf-Ferien sind wir machen, mal im Goms, mal im Münstertal. Es ist dann gar keine Notwendigkeit, in ein anderes Land zu gehen. [...] Es hat mit der Erreichbarkeit zu tun und weil wir uns wohlfühlen da.*
> Man, 70, childless couple, Oberfeld (O1: 52/54)

However, holidays in Switzerland, Germany or other European countries are of various types. As the last citation shows, many residents like sports and outdoor activities and not just relaxing:

> *Jetzt waren wir an der Nordsee gerade, auch mit fünf Mal Umsteigen und tralala. Da haben wir auch schon am Anfang mal Hotelurlaub gemacht, aber nur als sie ganz klein waren, weil wir dachten, es würde vielleicht mal entspannt sein, ist es aber nicht. Jetzt sind sie alt genug, nächstes Jahr wollen wir mit Rad oder Boot oder irgendwie sowas Touren machen. [...] Norddeutschland reicht uns da ja, nach Mecklenburg, in den Harz, wenn wir Berge wollen, reicht uns der Harz.*
> Woman, 50, couple with children, Klein Borstel (K5: 46 / 48)

> *Wir haben letztes Jahr zum Beispiel eine Bergtour gemacht, Schweizerreise. Dieses Jahr waren wir mit dem Velo in Polen, Tschechien unterwegs. Oder in Schottland 2013 auch mit dem Velo.*
> Man, 50, living alone, Sihlbogen (SI1: 54)

The reasons to go on bicycle holidays are similar to those for cycling in everyday life:

> *Urlaub mit dem Fahrrad, das ist toll, diese Entschleunigung, das geht sehr schnell. Diese Weit-*
> *sicht, das ist toll, macht Spass, nicht im Sinn von Aufregung, sondern ganzheitlich, Zufriedenheit.*
> Man, 55, couple with children, Saarlandstraße (SA07: 40)

The few people travelling throughout the world are either younger or elderly residents. While for some this represents an exceptional trip, others regularly travel to faraway countries:

> *Übersee habe ich schon lange lange nicht mehr gemacht, weiter. Doch, in Marokko war ich mal vor*
> *sechs, sieben Jahren.*
> Woman, 55, living alone, Oberfeld (O5: 36)

> *Im Januar war ich in Indien, im Sommer in Portugal, jetzt [November] in Vietnam und Ende Ja-*
> *nuar gehe ich nach Laos. Das brauche ich irgendwie und kann dann lange zehren davon.*
> Man, 70, living alone, Sihlbogen (SI2: 22)

Many respondents reported that they did different holidays before. Some have enough travelled at earlier stages of their life and prefer to stay nearer now, also for age reasons:

> *Das ist nicht der Einfluss des Autos, sondern dass ich nicht mehr reisen muss. Wir sind früher so*
> *viel gereist, wir brauchen das gar nicht mehr. Also in der ganzen Welt.*
> Man, 70, childless couple, Burgunder (B2_M: 33)

> *Ich war als Junge an vielen Orten und muss auch nicht mehr unbedingt nach Australien. Es gibt*
> *genug Sachen in Europa oder der Schweiz, die man schliesslich auch nicht kennt.*
> Woman, 65, single-parent family, Oberfeld (O3: 44)

As it already appeared before, for young parents, the children have changed their holiday travel practices:

> *Im Reiseverhalten gibt es markante Unterschiede zwischen früher und jetzt. Früher war es so Iran,*
> *Usbekistan oder möglichst weit weg und so. Auch viel mit dem Zug, nicht immer. Jetzt gehen wir*
> *ins Reka-Dorf [holiday villages focused on families], systematisch ins Reka-Dorf. Jetzt haben wir*
> *uns entschieden, 2018 zum ersten Mal ans Meer zu gehen, dann gehen wir mit dem Zug nach Ligu-*
> *rien. Da haben wir einfach geschaut, wo kann man hinfahren mit dem Zug.*
> Woman, 35, couple with children, Burgunder (B7: 40)

8.5.2. Mobility modes used for holiday travels

As the questionnaire results show, public transport (i.e. trains, buses etc.) is by far the most frequently used mode to reach holiday destinations (see Figure 46). Only very few households never went on holiday by bus or train. In contrast, coaches are an uncommon transport mode, but half of the households travelled by car or by aeroplane within Europe. Only about a quarter travelled to destinations outside Europe by air and one-third did cycling holidays.
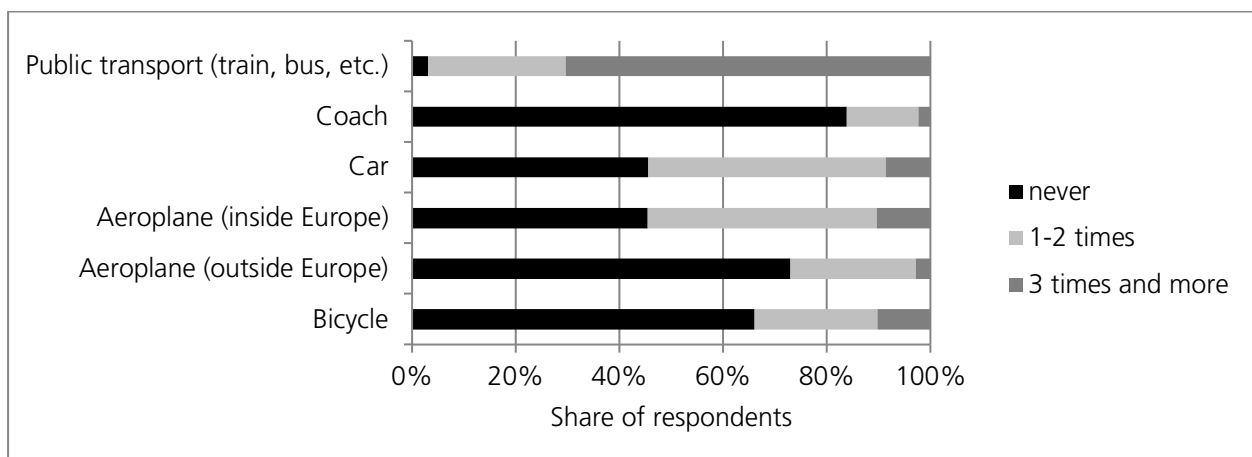
Figure 46: Mobility modes used for holiday travels during the last 12 months (N=370 to 457)

Comparing the different housing developments reveals some differences (see Table 74 in the Appendix). For instance, only about 40% in Burgunder and Giesserei travelled at least once by car in the year before the survey, but 71% in Stellwerk60 and 64% in Weißenburg did so. Whereas in Weißenburg and FAB-A only about one-third travelled by aeroplane within Europe, 82% in Sihlbogen did so and still 62% in Saarlandstraße and Stellwerk60. This may be due to the proximity of an important airport in Zurich, Hamburg and Cologne, but the developments of Klein Borstel, located near Hamburg airport, and Giesserei, not far from Zurich airport, have smaller shares of only about 45%. Flying to a destination outside Europe is also very different, only 11% in Klein Borstel did so, compared to 44% in Sihlbogen. This may also be due to the higher presence of foreign citizens in Sihlbogen, visiting their families. Finally, cycling holidays are very popular in Hamburg (Klein Borstel and Saarlandstraße), FAB-A and Oberfeld with all about half of households travelling at least once by bicycle. In contrast, in the frequent-flyer-development of Sihlbogen, only 12% cycled. However, it is not certain if the respondents all understood this question well and indicated cycling trips with at least one overnight stay or if they just used a bicycle to move at their holiday destination (or to reach a train station in the city in which they live).

The interviews also addressed the transport modes used for holiday travels. As in the survey, public transport is the most used mode:

> *In die Ferien gehen wir immer mit dem Zug oder Postauto.*
> Woman, 40, couple with children, Burgunder (B4: 20)

> *Im europäischen Nahbereich bin ich dann mit der Bahn unterwegs, Italien oder Frankreich oder so. Das finde ich ist ja unproblematisch, das geht ja gut.*
> Woman, 55, living alone, Saarlandstraße (SA11: 50)

> *Egal wo wir hinfahren, ob wir nach Wangerooge in den Urlaub fahren oder nach Südtirol wie zuletzt, da sind wir nach Düsseldorf gefahren, abends in den Nachtzug eingestiegen und am nächsten Morgen in Innsbruck ausgestiegen. Das ist ein super angenehmes Reisen.*
> Man, 40, couple with children, Weißenburg (W7_M: 47)

While some households only use public transport for holidays when it seems more comfortable or faster, others do it out of personal (environmental) convictions (and even combine trains and bicycles when a destination cannot be reached by public transport) or simply because it is a habit and they never went on holiday by car:

> *Dann ging es hier los, die ersten Sommerferien, alle haben sich ein Auto gemietet. Und ich so: „Hä?" Dann wurden wir gefragt: „Ja wie macht man denn mit Familie ohne Auto Urlaub? Das geht doch gar nicht!" Und ich so: „Ich habe nie mit Auto Urlaub gemacht, weil wir hatten keins."*
> Woman, 55, couple with children, Klein Borstel (K4: 4)

> *Wir gehen wirklich mit dem Zug. Wir sind zum Beispiel früher auch nach Italien, da gab es auch noch einen Nachtzug. Aber das ist für uns sowieso immer, wir sind beide nicht so autoaffin gewesen, dass wir so gerne Auto gefahren wären. Wir sind vielleicht ganz früher auch mal ein ungerades Mal nach Italien mit dem Auto, aber haben dann gemerkt, mit den Kindern ist das überhaupt nicht cool, haben dann lange den Nachtzug genommen, den gibt's jetzt nicht mehr. Letztes Mal sind wir einfach tagsüber gefahren, die sind jetzt auch etwas schneller teilweise.*
> Man, 40, couple with children, Oberfeld (O4: 20)

> *Ich war jetzt eine Woche weg, bin gestern zurückgekommen, am Jadebusen. Da hab ich's halt so gemacht, dass ich mein Fahrrad mitgenommen habe, Nahverkehrszüge genutzt habe und die letzten 10, 12km, weil das ist so ein Ort, wo kein Bus hinfährt, bin ich halt geradelt. Ende September fahren wir noch mal eine Woche nach Langeoog, auch da ist die Verbindung nicht so perfekt, fahren wir halt mit Zug und Fernbus und Fähre da, dauert halt länger.*
> Man, 55, childless couple, Saarlandstraße (SA02: 71)

> *Möglichst ist das schon so unser Anspruch, dass wir möglichst umweltverträglich fahren, es sei denn wir fahren mit dem Auto und das Auto ist voll, das finden wir auch OK.*
> Woman, 55, couple with children, Klein Borstel (K7: 114)

To reach the main train station (or their final destination after a journey by train), several residents do not hesitate to use a taxi:

> *Wenn wir Fernreisen machen, fahren wir gerne auch mit dem Taxi zum Bahnhof.*
> Man, 40, couple with children, Weißenburg (W7_M: 118)

An important part of the residents try to avoid or not depend on cars on holiday. They choose holiday destinations for which they neither need a car to reach them, neither to be mobile on site:

> *Meistens machen wir wirklich Ferien plus minus in der Umgebung, in der Schweiz, wo du halt auch in den Ferien nicht aufs Auto angewiesen bist.*
> Man, 40, couple with children, Burgunder (B6: 75)

> *Ich habe vielleicht, dazu muss ich sagen, viel Urlaub gemacht, wo ich auch kein Auto brauchte, wo ich wandern war, mein Mann auch. Also in der Freizeit spiegelt sich das so ein bisschen wider, und wir viel Fahrrad gefahren sind und auch unsere Urlaubsreisen halt eben entsprechend gemacht haben. Also wir haben jetzt keine Urlaubsreise favorisiert, wo wir mit dem Auto von Ort zu Ort fahren.*
> Woman, 55, couple with children, Klein Borstel (K7: 36)

> *Im Herbst fahren wir öfter auch eine Woche weg irgendwie und dann kucken wir schon, dass man das ohne Auto hinkriegt, also dass man irgendwie eine Wohnung hat, die halt zentral liegt irgendwie.*
> Man, 45, couple with children, Saarlandstraße (SA05: 68)

The reasons to use a car are similar to the general reasons presented above: transport luggage, reach destinations where there is no (comfortable) alternative or, for some, also only a significantly shorter travel time:

> *Ich war jetzt die letzten zwei Wochenenden in Österreich, Freundinnen besuchen, dann musste ich das Auto meiner Mutter nehmen [lachen]. [...] Weil sonst wäre es ewig gegangen, bis ich in Österreich gewesen wäre. Ich konnte statt zwei Stunden öV fahren eine Stunde durchfahren bis nach Österreich.*
> Woman, 30, flat share, Sihlbogen (SI5: 32/34)

Another type of car use that some residents mentioned is to rent a car on site and travel there by public transport (or aeroplane):

> *Im Herbst waren wir in Korsika, da haben wir auch eine Woche ein Auto gemietet. Wir sind mit dem öV runter, aber eine Woche haben wir eins gemietet, um etwas rumzukommen.*
> Woman, 35, couple with children, Burgunder (B5: 6)

> *Letztes Jahr zum Beispiel waren wir in Finnland, dann haben wir da für eine Woche ein Auto gemietet, sonst kommt man in Finnland nirgendwo rum.*
> Man, 45, couple with children, Saarlandstraße (SA05: 30)

Several residents mentioned alternative strategies to resolve the luggage issue when going on holiday: adapt luggage—e.g. use light luggage, trolleys, backpacks—or limit luggage to the really necessary:

> *Ich habe inzwischen gelernt, mit kleinem Gepäck zu reisen. Alle fragen immer: „Wie, hast du nur so einen kleinen Koffer?" „Reicht!" Auch das gehört eigentlich mit zu dem Thema, dass man sich entsprechend organisieren kann. [...] Gerade wenn ich verreise finde ich es immer wichtig, dass ich nur so viel Gepäck habe, wie ich auch alleine tragen kann.*
> Woman, 65, living alone, Klein Borstel (K2: 68 / 70)

> *Mit Gepäck finde ich das total unproblematisch. Bei uns gilt schon lange, jeder muss sein Gepäck selber tragen, seit sie das können. Ein Rucksack und ein kleines Ziehköfferchen und mehr gibt's nicht.*
> Woman, 50, couple with children, Klein Borstel (K5: 44)

Wenn ich zur Familie gehe, ich habe so einen Trolley, eine Tasche zum Ziehen, wo ich die Skier reintun kann, die Stöcke. Da hat alles Platz, etwas sperrig, aber praktisch zum Mitnehmen.
Man, 35, childless couple, Sihlbogen (SI3: 4)

Another possibility, for those who do not want to restrict themselves, is to send luggage to the holiday destination before, by mail or by the train company:

Wenn wir stationär bleiben in den Ferien, dann schicke ich vorgängig das ganze Material in zwei Dispoboxen per Post. Das ist ja auch, also man sucht so etwas andere Lösungen.
Man, 40, couple with children, Burgunder (B1: 24)

Was wir noch brauchen, das ist natürlich super, für Winterferien, da schicken wir das Gepäck. [...] Da müssen wir einfach zum Bahnhof Bümpliz Nord, mit dem Anhänger das Gepäck bringen, zwei-drei Tage vorher. Man muss sich einfach organisieren, dafür braucht es auch kein Auto [lachen].
Woman, 40, couple with children, Burgunder (B4: 50)

Wenn wir uns einen Luxus leisten wollen und luxuriös verreisen wollen, also wenn wir mit der Bahn fahren, dann schicken wir das Gepäck per Post vor und packen zwei grosse Reisetaschen und schicken die vor und reisen mit einem Handgepäck wo das nötigste, falls das Gepäck mal einen Tag später ankommt, drin ist. Und dann fahren wir mit leichtem Gepäck mit der Bahn und alles ist gut. [...] Ein Koffer darf bis 31.8 kg wiegen, das ist eine ganze Menge Zeugs [lachen].
Man, 40, couple with children, Weißenburg (W7_M: 56 - 58)

For aeroplanes, the results differ from the survey. About the same number of respondents uses aeroplanes as those who try to avoid this transport mode. Among the air passengers, some fly regularly, between once and several times a year. However, the majority of the interviewed residents only fly exceptionally to go on holiday, to reach faraway destinations for example, but try to avoid it normally—primarily, but not only, for environmental reasons. The citations show that it is not only an easy decision for some residents because they would like to travel further:

Für längere Distanzen auch mal das Flugzeug. Aber ich versuche, wenn es irgendwie geht, zu vermeiden [...] weil ich finde, ich kann auch im Umkreis wo ich mit dem Zug fahren kann schöne Orte finden, um Ferien zu machen. Also da finde ich ist es dann wirklich eine ökologische Frage.
Man, 40, couple with children, Burgunder (B6: 75 - 77)

Ferien ist schon so, dass ich schaue, dass ich es eigentlich immer mit dem Zug machen kann, nicht den Flieger nehmen muss dafür. Aber ich habe auch schon weite Flugreisen gemacht, aber es ist schon etwas, was ich eigentlich wirklich vermeiden möchte, was mich aber manchmal schon ziemlich hart ankommt. Manchmal denke ich wenn es CO_2-freie, wenn es eine Technologie gäbe, wo man völlig umweltneutral fliegen könnte, mal im Herbst eine Woche nach Sardinien oder irgendwie so. Ich habe das Gefühl, das fehlt mir mehr, als ein Auto brauchen zu können.
Woman, 50, living alone, Oberfeld (O6: 44)

Kuba ist jetzt tatsächlich eine Ausnahme. Ach, ich bin gerne in Griechenland. Also ich finde es ist schon einfach problematisch, ich gönne mir relativ selten Flugreisen, weil es einfach, also dafür kann man ja locker ein Jahr lang mit dem Auto irgendwohin düsen. Das finde ich schade, dass das so ist. Ich merke das beeinträchtigt mich eben auch, ich möchte da schon bewusst mit umgehen, von daher reise ich selten mit dem Flugzeug, aber also ich war schon ein paar Mal in Griechenland oder auf den Kanaren.
Woman, 55, living alone, Saarlandstraße (SA11: 50)

A handful of residents considers using aeroplanes only for very particular reasons such as visiting relatives that live far away:

Bei den ganzen Ferien, ich fliege wirklich so wenig wie nötig. Letztes Jahr hat mein Bruder in [Canada] geheiratet, dann war es logisch, dass wir rübergehen. Aber in Europa ist für mich fliegen mittlerweile ein No-Go, dann mache ich etwas nicht, statt irgendwohin fliegen.
Woman, 35, couple with children, Burgunder (B5: 52)

Zu fliegen versuche ich auch zu vermeiden. Mein Sohn war mal fünf Jahre in Japan beruflich bedingt, da habe ich ihn dann einmal besucht, weil er mir dann auch das Ticket spendiert hat. Aber so Urlaub würde ich niemals mit dem Flugzeug machen. Ich habe keine Flugangst, aber ich fliege

nicht gerne, so eingequetscht zu sitzen. Ich sag mal ich kann hier in Nordeuropa so viel schönen
Urlaub machen, da muss ich nicht um die halbe Welt fliegen.
Woman, 65, living alone, Klein Borstel (K2: 40)

Finally, some residents are relatively strict non-flyers, for ecological reasons, but also because they like to travel by train and do not feel any need, particularly with children:

Skandinavien würde mich auch mal reizen. Aber da müsste man etwas länger Zeit haben, finde
ich, dass es sich lohnt, so weit zu fahren, mit dem Zug natürlich, wir fliegen ja nicht. Aber ich fühle
mich auch nicht eingeschränkt, weil ich finde es völlig sinnlos mit dem Flugzeug irgendwohin flie-
gen, um eine Woche zu baden, wenn man es in Ligurien oder an der Adriaküste ebenso gut kann.
Für die Kinder braucht es Wasser und Sand, dann muss ich dafür nicht ganz weit weg gehen.
Woman, 40, couple with children, Burgunder (B4: 22)

Innerhalb von Europa gibt es jetzt für mich keinen Grund zu fliegen. Also es bedeutet zum Beispiel
beim letzten Urlaub waren wir vier Wochen unterwegs und davon haben wir eine Woche in Zügen
gesessen, weil wir von Hamburg über Süddeutschland, über Ljubljana nach Kroatien und dann
über Triest und Zürich wieder nach Hamburg gefahren sind. Aber das finde ich auch angemessen,
ich mag gerne so reisen. Ich finde es auch toll für die Kinder, weil die ein Gefühl dafür kriegen, wie
sich Landschaft verändert, auf dem Hinweg über Österreich, Rückweg über die Schweiz, dass eben
diese Alpen dazwischen sind, dass es dauert und dauert und dauert [lachen].
Woman, 45, couple with children, Klein Borstel (K3: 26)

Flugreisen, habe ich mir vor Jahren vorgenommen, auch aus Umweltgründen, wenn es geht lass
ich es sein und zu Urlaubszwecken erst recht nicht.
Man, 60, childless couple, Weißenburg (W1: 46)

These citations show that many residents are aware of the negative consequences of air traffic and try to avoid flying for holiday travels, more or less strictly. Herespecific mobility skills can be helpful, too, for example regarding financial aspects. Flight tickets, especially from low-cost companies, are often very cheap compared to train tickets. With some knowledge of the complex train fare systems, cheap train tickets can also be purchased in advance for holiday travels:

Die Preise sind zum Teil auch ein bisschen horrende, aber ich buche das immer sehr frühzeitig. Ich
habe eine BahnCard und buche dann frühzeitig online die Sparpreise, da kommt man auch ganz
günstig hin und weg.
Woman, 65, living alone, Klein Borstel (K2: 52)

8.5.3. Comparison and discussion of holiday travels

Residents of car-free housing developments are frequent holiday travellers. More than half of them did five or more trips with an overnight stay, compared to a mean of 3.0 for the Swiss population in 2016 (BFS, 2017b). This higher share is also explained by the lower age of car-free housing residents. For Germany, data on the last three months before the MiD survey show an average of 1.4 overall, but 2.0 in Hamburg (MiT 2017, 2018). This leads to an important difference compared to Switzerland, probably due to different survey methodologies and questions.

The interviews showed that most car-free residents travel within their country or to a neighbouring one. Even if it is difficult to compare qualitative data to quantitative, German statistics report, similarly, that 73% (68% in Hamburg) of the holiday trips with overnight stay led to a destination in the country and 22% to other European countries (MiT 2017, 2018). In Switzerland, the shares are lower: only 33% of holiday trips take place within the country, 38% in neighbouring countries and 21% in other European countries (BFS, 2017b).

Looking at the modal split for holidays, public transport (train, bus, etc.) is the most frequently used mode of car-free housing residents, but over half of them also use cars or aeroplanes to reach their holiday destinations within Europe. Few persons travelled by coach, bicycle or outside Europe by plane. It is difficult to compare these shares to overall data, but the residents seem to fly

more than the average population. In Switzerland, the main transport mode for trips within the country is the car (65%), followed by public transport (31%), whereas outside Switzerland it is the aeroplane (45%), the car (42%) and public transport reaches only 10% (BFS, 2017b). In Hamburg e.g., for 28% of the travellers (32% in car-free households), an aeroplane was the main transport mode, 38% (18%) chose the car and 28% (43%) the train (MiT 2017, 2018). Similarly, the evaluation of car-free housing projects in Munich showed that in 2006, 34% of the residents travelled by aeroplane, 21% used a car and 41% public transport (Ernst, 2008). The importance of air transport was also reported by the study of the car-free housing development of Floridsdorf in Vienna which highlighted that this represents the most important environmental impact of the residents, even if nearly half of the households never took an aeroplane in the survey period (Ornetzeder et al., 2008).

The interviews showed that many residents are aware of the negative effects of travelling and try to travel in a more sustainable way. They move primarily by public transport, only exceptionally use cars and mainly stay in their own or surrounding countries. Even if some use aeroplanes, most residents try to avoid flying as much as possible because of the environmental consequences. Therefore, even if the car-free households analysed seem to have an important holiday mobility, most of them differ from the overall population and do not travel by low-cost carriers but by (night) train to spend a weekend or holidays in another European city or country. Many residents also prefer destinations that are not car-centred, or even car-free such as some East Frisian Islands, for example.

For one group of the residents, the habit of living car-free does not change when it comes to holiday travels and is, as for everyday mobility, not seen as a limitation or sacrifice:

> *Das kann natürlich sein, weil die Autofreiheit so selbstverständlich ist, kann es natürlich sein, dass man sagen würde, wir würden andern Urlaub machen, wenn wir mit dem Auto unterwegs wären. Aber eigentlich, als Einschränkung denke ich auf keinen Fall. Das ist kein zähneknirschender Verzicht.*
> Man, 40, couple with children, Klein Borstel (K9: 60)

These results are interesting compared to previous studies showing that often, population groups characterised by sustainable mobility practices in their everyday life have carbon-intensive patterns of holiday travel, notably because they regularly fly (Barr, Shaw, Coles, & Prillwitz, 2010; Czepkiewicz, Heinonen, & Ottelin, 2018).

Moreover, different strategies, mainly related to luggage issues, were reported and, as for daily mobility, car- and aeroplane-free travel needs more knowledge: in many cases, it is much easier (and often cheaper, too) to book a flight than an international train ticket, especially when it is not a direct journey or concerning more than two countries.

In contrast, for the other group of residents, holidays are particular and different from everyday mobility, meaning that they do not hesitate to rent or borrow a car for this purpose and for the advantages mentioned before. They consider that with children and to reach certain places, a car is needed and, thus, they do not want to limit or adapt their holidays to what is possible without a car.

9. Car-free lifestyles

This part presents the results of the fourth research question, the lifestyles of car-free housing residents. The aim of this typology is to condense the different residents interviewed in a few types of lifestyles, based on their mobility practices and values. As presented in chapter 3.2, these two elements constitute lifestyles in the definition adopted in this thesis. As values and practices are very broad and not mentioned in detail in all interviews, due to the focus on mobility, the typology is based not only on general values but particularly on motivations to live car-free.

The importance of ecological values allowed to differentiate three types: those for whom living ecologically is a guiding principle, those for whom ecological values play a role but are rather secondary compared to practical motivations, and those who have not mentioned ecological values or for whom they have a very small influence on their mobility practices. For practices, I focused on everyday mobility. Here, it appeared that the importance of cycling varied most between the different residents and, thus, was used to differentiate two general types of mobility practices: those who primarily cycle (except for long distances or particular events) and those who have multimodal mobility practices, often including the bicycle, but using public transport at least as frequently, too. Car use is another significant difference, but it mainly corresponds to the importance of ecological values and is therefore reflected by this differentiation.

Carrying out the analysis method described in chapter 4.2.3, six types of lifestyles are found among the interviewed individuals (see Figure 47). There are rather small differences in the number of individuals belonging to each group, ranging from seven to eleven per type. About half are cyclists and half multimodals, whereas regarding ecological values, for 17 they are very important, for 21 secondary and for 16 of little if any importance.
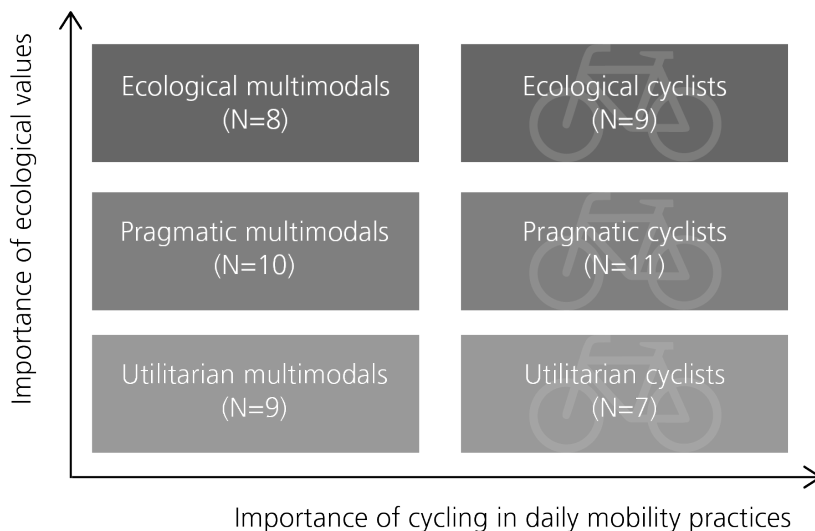
Figure 47: Overview of types of lifestyles

Even if, as mentioned in chapter 3.1, the household level is important to understand an individual's mobility practices, lifestyles are here related to individuals, mainly because values are a personal characteristic and because it appeared that different lifestyles can co-exist in a household—especially when mobility practices are the same and only the underlying motivations different.

The six lifestyles found among the car-free housing residents are presented in the following chapters. For each type, first, the values and mobility practices differentiating them are described. Then, the mobility capital, other practices (including leisure and holidays) and socio-demographic characteristics are compared to see if they are different or not. Finally, they are discussed and compared.

9.1. Ecological cyclists

"Ecological cyclists" have strong environmental convictions that guide their practices:

> *Ich habe dann aber bewusst gesagt, ich versuche ohne Auto zu leben und das geht auch hier in Münster. Und weil ich, aus Umweltgründen habe ich das gemacht, weil ich das schon bisschen als problematisch ansehe.*
> Man, 60, childless couple, Weißenburg (W1: 4)

Living in a car-free housing development and moving without motorised vehicles are important aspects for leading a sustainable life, and social values are central, too:

> *Das Argument ist ja immer, es [the car] ist praktisch. Ich fand dann es ist ja noch viel praktisch, aber es geht ja nicht nur um einen selbst sondern darum, ob wir auch Sorge tragen wollen zu unserer Umwelt und nicht nur uns als Individuum sehen, sondern als etwas Ganzes, wo nicht nur das individuelle Bedürfnis im Vordergrund steht, sondern andere Sachen.*
> Man, 40, couple with children, Oberfeld (O4: 28)

Thus, it is "normal" for them to live car-free, they do not feel restricted and do not report any difficulty. Instead, they emphasise the advantages of doing so, their quality of life. They prefer to live in the city anyway, in an environment adapted to car-free living, and also highlight that they want to be a good example and show that it is possible to live without a private car. They are all rather negative towards cars, especially as cyclists in the city:

> *Den Lärm, die Umweltverschmutzung, die Klimaschädlichkeit, die Ressourcenverschwendung, die Einschränkung des Lebensraums, des Verkehrsraums, also so das, was auch die Autofahrer wenn sie aufs Rad steigen nicht mögen am Auto. Die Unfallgefahren des Autos, die Gefahren die ein Autofahrer anderen Leuten aufbürdet, die Ressourcenverschwendung der Herstellung der Autos.*
> Man, 40, couple with children, Klein Borstel (K9: 16)

The bicycle represents the main transport mode they use in everyday life, all year, in all weather conditions and for most trips and purposes, in the city or at least within an important range. They cycle because they like to be outdoors, independent and move themselves, but personal convictions and preferences are also mentioned explaining their modal choice:

> *Am liebsten gehe ich mit dem Velo arbeiten, wenn es irgendwie geht, und sonst mit dem Zug. Aber ich bin sogar nach [former place of work located at 18 km from home] mit dem Velo.*
> Woman, 40, couple with children, Burgunder (B4: 10)

Cargo bikes or bicycle trailers are used by some "ecological cyclists" to transport children e.g. For longer distances or particular trips, they rely on public transport. Instead, cars are used only exceptionally, a few times per year, when no alternative is available. The same applies to taxis or getting a lift from someone. Most of the "ecological cyclists" have a driving licence and a carsharing subscription, but never owned a private car (with three exceptions, including a resident who gave it up over 30 years ago).

The "ecological cyclists" have other practices in common, too. Their leisure activities take place to an important extent in the housing development they live in. They all have a fulfilled social life and often meet and visit friends. Nearly all do volunteer work in associations or less formal contexts. Sports, outdoor and cultural activities are all regular leisure activities, too. For holiday travels, their ecological convictions result in avoiding cars and especially aeroplanes and, thus, spend holidays in Europe and often in their home country, travelling by train or sometimes even by bicycle:

> *Für Freizeitreisen kommt für uns das Flugzeug nicht in Frage, ausser wenn es eine Hochzeit ist, ja. Aber wenn man auch woanders hingehen kann, wenn niemand auf einen wartet, kommt es absolut nicht in Frage, mit dem Flugzeug zu gehen.*
> Woman, 35, couple with children, Burgunder (B7: 76)

The "ecological cyclists" live in couples (except one person living alone), four with two children and four without any. The majority are tenants, but there are also owners and cooperative members. They are all active, aged between 40 and 60. Men and women are equally present in this group. Nine out of 54 interviewees are "ecological cyclists", they are found in all developments except Sihlbogen. Three live in Weißenburg, two in Burgunder and Klein Borstel each and one in Oberfeld and Saarlandstraße. It is consistent that ecological cyclists are overrepresented in the "cycling city" of Münster and in collaborative housing where ecological and social aspects are highlighted.

9.2. Ecological multimodals

The second type of residents has very similar values as the former: "ecological multimodals" also have strong environmental convictions that guide their practices:

> *Für mich ist die Ökologie schon etwas sehr Wichtiges. Ich finde schon wir müssen unbedingt mehr Sorge tragen zu unseren natürlichen Ressourcen. Das heisst auch für meinen Lebensstil etwas, das finde ich etwas Wichtiges. Und ja, ich lebe schon seit ich zu Hause ausgezogen bin immer in relativ grossen Städten und hatte eigentlich selber nie ein Auto.*
> Woman, 50, living alone, Oberfeld (O6: 6)

Most of them highlight their will to live without a private car, again also to demonstrate that it is possible to do so. Cars have a very negative meaning for these residents, and they express no need for them. As the former type, they see no problems or difficulties in car-free living. They also mention other "alternative" values guiding them, such as a social community:

> *Was mich in meinem Leben sehr geprägt hat, da war dieses Autothema nur eins, 70er-Jahre, Umweltbewegung, Eine-Welt-Initiativen. […] Da war so ein Stichwort „neuer Lebensstil", heute würde man sagen nachhaltiger Lebensstil, da war Mobilität auch ein Thema. […] Ich möchte mein Leben alternativ gestalten, in vielen Bereichen: menschlicher, sozialer, umweltbewusster, gerechter mit der dritten Welt.*
> Man, 60, living alone, Saarlandstraße (SA10: 23)

Their mobility practices, instead, differentiate from the "ecological cyclists". They all cycle in everyday life, but also use regularly public transport. Either they cycle more in summer and use buses and trains in winter, or they use the bicycle for short distances (e.g. in the neighbourhood) and public transport to travel further. The second important difference is that they even never drive cars, whereas taxis and getting a lift from someone are alternatives they use, too. This is explained for some residents by the absence of a driving licence, the others do not drive anymore and most never owned a car in their life. However, they all have diverse mobility skills to use the different alternatives to car driving, including delivery services which are mentioned by nearly all "ecological multimodals".

Their leisure practices are also similar to the other "ecological" lifestyle: a diversity of activities is reported, outdoor activities as well as different cultural activities and sports. Voluntary work is frequent, too, and in the housing cooperatives, many activities happen in the development. For holidays, they also avoid flying and, therefore, travel mainly in Western Europe:

> *Ich fliege sehr gerne, aber das erlaube ich mir eigentlich nicht, vor allem aus ökologischen Gründen. Ich mache was ich kann mit dem Zug, ich wandere viel. Ich bin viel in der Schweiz und Europa.*
> Woman, 55, living alone, Oberfeld (O5: 36)

Five of these "ecological multimodals" are persons living alone, but there are also three living in families, including one single parent. Except one renter, all are owners or cooperative members, aged between 45 and 75 years. There are only two men but six women. Eight of the interviewees are part of this type, three of them live in Klein Borstel, two each in Oberfeld and Saarlandstraße

and one in Sihlbogen. Except this last person, it is consistent that these persons are found in co-housing projects where ecological and social values are put forward.

9.3. Pragmatic cyclists

For "pragmatic cyclists", ecological values as well as social values such as living in a community are important. However, they are not as central as for the two former types, practical motivations have a similar importance to explain their practices. They have no need for a car in everyday life, especially in a city adapted to car-free living:

> *Der Mix der Kombination ökologisches Bewusstsein, den Fahrausweis nicht machen, merken, man kann ganz anders funktionieren im Alltag, das ist eigentlich möglich, was man will, ohne Auto, hat dazu geführt, dass wir kein Auto haben.*
> Man, 40, couple with children, Burgunder (B1: 8)

As the more ecological types, they do not report major difficulties and are habituated to live car-free. But they are less negative towards cars, they find them useful in certain situations. They highlight the importance of the bicycle for them, the independence it allows, the physical movement, being outdoors:

> *Für mich persönlich ist es glaube ich überwiegend eine grosse Selbstverständlichkeit. Ich habe das immer so gemacht. Mir würde es auch richtig fehlen, wenn ich's nicht könnte, weil ich einfach Bewegung brauche, und ich habe keine Lust, abends mich dann ins Sportstudio zu begeben und da auf so einem Fitnessfahrrad zu fahren, das finde ich einfach völlig überflüssig. Dieses ganze Ausdauertraining, das habe ich einfach im Alltag dadurch, dass ich Fahrrad fahre. Das finde ich ist irgendwie toll, und das tut mir gut, und da habe ich auch eine Menge Stressabfuhr im Alltag, das ist irgendwie sehr super. Und dann spielt für mich natürlich auch eine Rolle, mich einfach umweltbewusst und ressourcenorientiert zu verhalten.*
> Woman, 55, living alone, Saarlandstraße (SA11: 80)

The bicycle is their first choice for daily mobility. They also use bicycle trailers, cargo bikes or folding bikes and e-bikes more than the other types of residents:

> *In einer Stadt ohne Auto zu leben ist überhaupt kein Problem. Also wir fahren sowieso nur Fahrrad in der Stadt. Wir hatten immer einen Kinderanhänger, die Kinder sind so früh sie konnten auch selber Fahrrad gefahren.*
> Woman, 50, couple with children, Weißenburg (W8_F: 13)

For longer distances or in particular situations (e.g. accompanying little children), they use public transport, but prefer cycling whenever it is possible. Their car use is restricted to extraordinary reasons, they drive at most a few times per year. As the different bicycle types already showed, these cyclists' mobility capital is particularly developed in this domain, but also for car use. Except one person, they all have a driving licence and most have a carsharing subscription or can use a car from friends or relatives. The majority never owned a car or only during a very short period in their life, when it was necessary for professional reasons e.g.

According to the importance of social values, they spend an important part of their leisure time in the housing development and also meeting friends and relatives elsewhere. Outdoor activities, sports or gardening as well as cultural activities are frequent, too. For holidays, the practices vary: cars and aeroplanes are used by some, even if many try to avoid flying:

> *Auch mit dem Fliegen, eigentlich will ich das gar nicht mehr. Ich bin gerne im Süden, war auf Malta und Zypern als das 100 Euro kostete hin und zurück. Aber letztlich ist mir alles zu, ich fange an, anders zu handeln, zu denken.*
> Man, 55, couple with children, Saarlandstraße (SA07: 26)

Most of the eleven "pragmatic cyclists" live in families, but there are also three persons living alone. Owners, tenants and cooperative members are all present. They are aged between 35 and

60, except one retired person aged 71. Women are about twice as frequent as men. This group is the largest with eleven persons. Three persons live in Weißenburg and two each in all other developments except Sihlbogen. This can be explained by its characteristics of rather average rented dwellings not attracting particularly ecological residents and by the fact that Zurich is probably the least cycling city of all.

9.4.   Pragmatic multimodals

The second type of "pragmatic" residents have similar values as the first: social and community values are highlighted and ecological values exist, too, but are not central to explain everyday mobility practices:

> *Auf der anderen Seite, klar, ist es natürlich auch so eine Gewissenssache, man weiss, man ist auf der richtigen Seite, die ökologischere, die vernünftigere, die bessere Variante. Wobei das jetzt, weiss ich nicht, bei uns steht glaub ich immer noch das rationale im Vordergrund. Das ist einfach, warum soll ich mir diese Stressfaktoren machen, was weiss ich, nach [central district] zur Arbeit zu fahren mit dem Auto, da spricht überhaupt nichts dafür.*
> Man, 45, couple with children, Saarlandstraße (SA05: 90)

As the citation shows, they mainly report practical and financial reasons to explain why they live without a private car: they have no need in the city and can also make considerable savings without owning a car. For most it is also a habit to live without a car:

> *Diesem Wahn, sich für so eine mobile Blechkiste geldmässig krumm zu legen, dem entsage ich einfach. Und in kompletter Konsequenz. Für bestimmte Dinge, die für Autobesitzer selbstverständlich sind, mal eben schnell spontan die Freunde da und da zu besuchen, da und da hinzufahren um dieses und jenes einzukaufen oder spontan in den Freizeitpark oder an die Ostsee zu fahren, also ich komme auf den Gedanken nicht. Ich komme gar nicht drauf, weil sozusagen die Abwesenheit eines Autos für mich derart selbstverständlich und normal ist, dass ich die möglichen Vorteile gar nicht in Betracht ziehe. Es ist jahrzehntelange Gewöhnung, und ich finde es gut und richtig, mich daran gewöhnt zu haben. Und keine Last zu haben, ich habe wahrscheinlich unter dem Strich sind meine Einkünfte 500 Euro höher, weil ich kein Auto habe.*
> Man, 60, living alone, Saarlandstraße (SA04: 98)

As the former types, they do not consider it problematic to live without a private car and attribute a rather negative image to cars, even if they also highlight their usefulness in certain situations:

> *Ich erlebe Autos häufig auch etwas als, wie soll ich sagen, Plage oder Seuche. Wenn ich zum Beispiel sehe wie viele Leute da mit dem Auto kurze Wege machen und dann nur eine Person drin sitzt und dann bleibt der Bus stecken in den Autokolonnen drin, dann finde ich irgendwie ist das ja auch etwas unklug um es jetzt milde auszudrücken, ein Auto zu brauchen, wenn es so viele gute andere Möglichkeiten gibt, sich fortzubewegen Es gibt ganz wenige Situationen, wo ich dann denke, da wäre es jetzt noch praktisch, ein Auto. Wenn ich irgendwo hin will wo kein öV hinfährt oder nur drei Mal am Tag, aber das ist eigentlich eher selten.*
> Man, 70, childless couple, Oberfeld (O1: 16)

They have multimodal mobility practices: they use bicycles and public transport and frequently walk more than just to the next station. Distances and weather conditions mainly explain which is used, some individuals regularly cycle while others rarely do (two persons even never). They all use taxis, whereas some do not use cars anymore, but most drive occasionally, to transport big things e.g. Their relation to the car is pragmatic:

> *Autofrei bedeutet eigentlich autoarm und kein eigenes Auto zu besitzen. Das sehen manche Nachbarn ganz anders, es gibt ein paar die sind ganz streng auch mit sich, die möchten gar nicht mit dem Auto, auch nicht mal mieten, aber die meisten sind da entspannter. Auf jeden Fall möchte ich kein eigenes Auto haben in Hamburg, ich hänge nicht am Auto […] Wenn ich eins brauche, kann ich mir eins leihen.*
> Woman, 55, couple with children, Klein Borstel (K7: 104)

Even if all "pragmatic multimodals" have a driving licence, they do not all have a carsharing subscription or access to a privately shared car. But they nearly all owned a car before, a few just before they moved to the car-free housing development and most already a long time ago. Instead, they own different types of bicycles and often public transport passes. They have also developed various mobility skills, which reflect their use of different transport modes, and other strategies such as using delivery services. Unlike "utilitarian multimodals", this group adapts activities to what is accessible without a car and does not choose activities and then use a car when public transport or cycling are no alternatives:

> *Es ist auch einfach vom Gedanken her total raus, es wird so gekuckt wie kommen wir da hin,*
> *Bahn, Bus, Fahrrad, zu Fuss. Und das Auto ist gar nicht so auf dem Schirm.*
> Man, 45, couple with children, Saarlandstraße (SA05: 48)

Similarly to the other types, leisure time is often spent in the housing development. Social, cultural and sports activities are all important for residents of this type whereas volunteer work is less present. For holidays, practices are diverse—reflecting the different ways of living pragmatically with an ecological attitude. Even if "pragmatic multimodals" try not to depend on cars for holidays, they represent the main reason for car use for many:

> *In den Ferien ist es wirklich so das Freiheitsgefühl, dass es [the car] einem gibt, das kenne ich*
> *schon auch, aber nur in den Ferien. Wenn wir auf einem Zeltplatz sind und du kannst jederzeit*
> *schnell einkaufen oder irgendwo auf einen Berg hoch in ein schönes Restaurant. Dort finde ich*
> *wirklich es gibt einem ein Freiheitsgefühl und Flexibilität, das schätze ich schon in den Ferien.*
> Man, 45, couple with children, Oberfeld (O7: 60)

While some try to avoid flying, the majority does not:

> *Ich fliege allerdings noch mit einer Freundin nach Zypern, sehr ungern. Fliegen gehört nicht ganz*
> *zu dem was wir oft machen. […] Eigentlich wegen der Ökobilanz, also wegen der Ökobilanz, finden*
> *wir sehr schlecht.*
> Woman, 55, couple with children, Klein Borstel (K7: 110 - 112)

The ten persons characterised by this type of lifestyle mainly live in couples with or without children, but there is also one living alone and another in a single-parent family. Half are cooperative members, three tenants and two owners. Men and women are equally present. The age ranges from about 35 to 75 years but about half are 70 and older. It represents the second-largest group with ten persons, living in all developments except Weißenburg: three in Oberfeld and Saarlandstraße, two in Burgunder and one in both Sihlbogen and Klein Borstel.

9.5. Utilitarian cyclists

The last two lifestyles differ from the former in the sense that ecological values do not play an important role and that cars are regularly used. "Utilitarian cyclists" highlight practical motivations to live without a private car, especially no need to move in the city they live in and negative aspects of owning a car. However, financial reasons also play a role. For most households of this type, a car would represent a considerable expense and, therefore, they prefer to save this money for other things. Moreover, the negative effects of driving cars in cities are emphasised by many "utilitarian cyclists":

> *Ich bin früher auch überzeugter Autofahrer gewesen. Es ist nicht so, dass ich gesagt habe, ich bin*
> *jetzt der Öko […] gar nicht. Ich war der total konservative, der sein Auto hatte und auch sein Auto*
> *gerne genutzt hat. Nur irgendwann bin ich dann angefangen zur Arbeit immer mit dem Fahrrad*
> *zu fahren, weil es einfach irgendwann nervig war mit dem Auto, weil ich schlecht durchgekommen*
> *bin.*
> Man, 40, couple with children, Weißenburg (W3_M: 186 - 188)

Living car-free is, thus, a mainly utilitarian decision where ecology plays only a minor role, if any, and using rather than owning a car is emphasised:

> *Das hat natürlich auch diese ganze Seite von Umweltschutz und beziehungsweise einfach Rohstoff besser auszunutzen und so weiter. Die hat es, nur, ganz ehrlich, ich kann mir das gar nicht auf die Fahnen schreiben, dass ich deshalb, oder nur deshalb, das ist ein toller Effekt, den ich damit automatisch mache. Aber ich verzichte nicht auf ein Auto, ich brauche keins! Und wenn ich eins brauche, dann habe ich eins, es gehört mir halt nur nicht.*
> Man, 40, couple with children, Weißenburg (W7_M: 34)

Daily mobility needs are mainly satisfied by bicycle. E-bikes and especially cargo bikes and bicycle trailers are relevant for these residents. There are personal preferences explaining this modal choice, but also more utilitarian ones such as velocity, flexibility and affordability. Public transport is used only for longer distances and only rarely in the city. Instead, and this is the main difference compared to "pragmatic cyclists", carsharing cars are regularly rented when alternatives are not available or also when a car is simply cheaper than public transport, for leisure activities or special shopping e.g. Thus, all "utilitarian cyclists" have a driving licence and a carsharing subscription. They all owned a car once in their life, mostly only for a short period and it was given up for financial reasons or when it broke down and city life allowed to live car-free. Their mobility capital is developed mainly around the bicycle and the (shared) car and a bit less related to public transport:

> *Ein Lastenrad und Carsharing brauche ich. Ich habe mehrere Fahrräder, ein normales Zweirad, wenn ich alleine schnell irgendwohin möchte, ich habe mein Lastenrad, ich habe sogar noch ein Rennrad zum reinen Sportfahren und ja, Carsharing. Damit bin ich dicke ausgestattet, luxuriös ausgestattet.*
> Man, 40, couple with children, Weißenburg (W7_M: 113)

The comparison of their leisure activities shows the importance of outdoor activities, including sports and gardening, whereas cultural activities are less present, probably also for financial reasons. Many residents of this type also do volunteer work, and all spend some of their leisure time in common activities in the development. For the majority, holidays are limited by their financial situation, they often stay at home or visit relatives. Therefore, public transport but also cars are the main transport modes used, only one person flies regularly.

Persons living alone, childless couples and families are all about equally present in this lifestyle type. Except one cooperative member, they are all renters and aged between 35 and 65 years. Men and women are equally present. It is not surprising that, except one in Saarlandstraße, the other six rational cyclists all live in Weißenburg. Münster is a cycling city, with a size and a public transport network making the bicycle the most useful transport mode in a utilitarian perspective. On the other hand, Weißenburg is completely subsidised housing, therefore financial reasons also play a more important role than in the other developments.

9.6. Utilitarian multimodals

As for the former type, ecological values are not particularly important for "utilitarian multimodals" or were not even mentioned during the interviews:

> *Ich bin kein dogmatischer Autoablehner, also die gibt's hier auch. Ich habe überhaupt keinen Grund, mich aufs hohe Ross zu setzen, ich fliege jedes Jahr mindestens zwei Mal. Da ist mein ökologischer Fussabdruck. […] Ich glaube das autofrei ist für mich kein Wert in sich, sondern ein Baustein in einem Konzept „Gutes Leben" und da gibt's einfach für unterschiedliche Leute unterschiedliche Rangreihen.*
> Woman, 70, living alone, Saarlandstraße (SA12: 43)

They live car-free for practical and financial reasons, even if the affordability of a car is not the point for most, they rather prefer spending money for something else. Many mentioned that a car represents not a status symbol for them but a useful tool in some situations. At the same time, negative aspects of owning a car, but also of cars in urban areas were often emphasised. "Utilitarian multimodals" mainly highlight that they feel no need for a car in the city:

> *Grundsätzlich in der Stadt, weil wir in der Stadt leben, haben wir das Gefühl, es ist nicht nötig, dann kann es auch autofrei sein. […] Ich finde es auch nicht primär eine ideologische Frage, sondern eine praktische und ökonomische.*
> Man, 40, couple with children, Burgunder (B6: 6)

Their daily mobility practices consist primarily of public transport use and secondarily of cycling, depending on weather, distance and trip purpose. For some, cycling is only a leisure activity. While four persons gave up driving, mainly due to age reasons, the others regularly use cars when there is a need such as transporting something, or when alternatives are unavailable, for some "utilitarian multimodals" also when they are unattractive compared to public transport: Thus, they all have (or had for the persons not driving anymore) a driving licence and many are carsharing members. They have a diversified mobility capital including access and skills related to all types of transport modes, ranging from public transport passes and bikesharing subscriptions to competences related to the use of the internet.

The whole range of leisure activities is present, but they do mainly not happen in the development and only one person is engaged in volunteer work. Meeting friends and relatives, sports and outdoor activities are, instead, very popular. "Utilitarian multimodals" travel throughout the whole world and, therefore, also by aeroplane. Cars are frequently used for holidays, too. Here it appears clearly that ecological values have no influence on mobility practices.

All types of households are present, three out of nine are persons living alone. Most persons of this type are renters, there are only two cooperative members and one owner. Three persons are over 65 years old and three between 25 and 35. They live in Sihlbogen and Saarlandstraße (three each), Burgunder (two) and Klein Borstel (one). It is, again, consistent that persons for whom ecological and social values are less important are found mainly in developments with rented dwellings and not in the co-housing projects.

9.7. Comparison and discussion of car-free lifestyles

This chapter presented a typology of six lifestyles of car-free housing residents, based on values or motivations to live car-free and daily mobility practices. The different characteristics of the lifestyles are summed up in Table 56.

It is difficult to compare these lifestyles to the existing literature, as they are based on qualitative data and on a very particular population of car-free households. However, they show that within this apparently homogeneous population, important differences exist. The six car-free lifestyles differentiate mainly in terms of values and reasons important to them and daily mobility practices, the two dimensions on which the typology was based. The analysis of the six types showed that socio-demographic aspects seem not determinant, household types and ages as well as men and women are not particularly overrepresented in any of them, while leisure activities and holiday travels also show differences. In particular, the different attitudes on flying for holidays are remarkable. While previous research has shown that the value-action gap is often wide for air travel (Barr et al., 2010; Czepkiewicz et al., 2018), the ecolocial and pragmatic types of car-free housing residents avoid flying or only rarely do so.

	Ecological cyclists	Ecological multimodals	Pragmatic cyclists	Pragmatic multimodals	Utilitarian cyclists	Utilitarian multimodals
N	9	8	11	10	7	9
Important values/ reasons	Ecological and social values mainly, practical reasons, too	Ecological and social values mainly, practical reasons, too	Practical reasons and social values predominant, ecological values, too	Practical reasons and social values predominant, ecological values, too	Mainly practical & financial reasons, no/weak ecological values	Mainly practical reasons but also financial, no/weak ecological values
Modal choice	Mainly cycling, car use as little as possible	Cycling or public transport, no car use (as a driver)	Mainly cycling, very limited car use	Cycling or public transport, selective car use	Mainly cycling, regular car use	Mainly public transport, regular car use
Driving licence	Most	Nobody	Nearly all	All	All	All (some do not drive anymore)
Flying for holidays	Avoided	Avoided	Rarely	Rarely	Uncommon	Regularly
Leisure activities	All types, volunteer work important	All types, volunteer work important	All types, volunteer work less	All types, volunteer work less present	Outdoor and sports mainly, volunteer work also	Few in the housing development and few volunteer work
Household types	Couples with two children or without any, one person living alone	5 persons living alone, 3 families (including one single parent)	Families, 3 persons living alone	Couples with or without children, one single-parent family and one person living alone	Couples with or without children and persons living alone	All types
Types of residents	Majority of renters	All types	All types	5 cooperative members, 3 tenants and 2 owners	Renters, except one cooperative member	All types, mainly renters
Age	40 to 60	45 to 75	35 to 60	35 to 75 (half >70)	35 to 65	25 to 35 and 65 to 70 (3 each)
Men and women	equal	mainly women	more women	equal	equal	equal

Table 56: Overview of characteristics of the different car-free lifestyles

It appears that the different lifestyles are not equally distributed in all developments (see Table 57). Only in Saarlandstraße, all six types are present—this may, at least partly, be due to the comparatively high number of interviews (12) I conducted in this development. Moreover, it includes three different parts and all types of occupancy statuses. Instead, in Sihlbogen only the three multimodal types and in Weißenburg only the three cyclist types are found. This can be explained by the cycling culture present in Münster and its absence in Zurich. In Oberfeld as well as (with one exception) in Klein Borstel, only the four more ecological types are present, which is consistent with their characteristics of sustainable housing cooperatives or projects that attract particular types of residents. Finally, the results also show that strong ecological values can lead

to strong cycling practices (nearly) everywhere, even if an existing cycling culture seems to favour it.

	Burgunder	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Weißenburg	Total
Ecological cyclists	2	1		2	1	3	9
Ecological multimodals		2	1	3	2		8
Pragmatic cyclists	2	2		2	2	3	11
Pragmatic multimodals	2	3	1	1	3		10
Utilitarian cyclists					1	6	7
Utilitarian multimodals	2		3	1	3		9

Table 57: Presence of the different lifestyles in the housing developments

10. A territory's hosting potential for car-free living

The last empirical part of this thesis answers the fifth research question on a territory's hosting potential for car-free living. The aim of this chapter is to go beyond my personal analysis of the housing developments and their characteristics, presented in chapter 5, and to consider the residents' view of the hospitality potential for car-free living of the places they live in, as well as the context necessary for car-free living more generally. Survey and interview results are mixed in this chapter, too. To begin with, the perceived suitability of the car-free housing developments indicates how the residents evaluate their residential context to live without a private car. As reported below, there is a very high suitability as well as an important satisfaction. We can, thus, assume that the examined developments offer a hosting potential enabling car-free living. Consequently, their characteristics can be considered as examples of a territory's hosting potential for car-free living. Thus, the importance the residents attribute to the different characteristics of their living environment are analysed to bring to light what are the essential "material artefacts" of a territory necessary for "successfully" living car-free. Finally, as presented in chapter 3.3, a territory's hosting potential includes not only material, but also immaterial aspects. These are addressed in the last chapter.

Chapter	Dimension	Sub-dimension
10.1	**Evaluation of the car-free housing development**	Suitability Satisfaction
10.2	**Material artefacts for car-free living**	Mobility Mobility infrastructure in the development Location and access of the development Infrastructure in the surroundings Characteristics of the development
10.3	**Immaterial aspects for car-free living**	Social context in the development Broader social and cultural context

Table 58: Overview of the hosting potential dimensions

10.1. Evaluation of the car-free housing development

A large majority of the respondents evaluated the housing development they live in as "very suitable" to live car-free (65% overall) or at least "suitable" (29%, see Figure 48). In Stellwerk60, only 52% answered "very suitable", whereas in FAB-A all households did so. There is only one household answering "not at all suitable" (in Burgunder—unfortunately, the household did not comment this evaluation so we do not know what the reasons are) and two households "rather not suitable" (one in Burgunder, mentioning the unsuitable and insufficient bicycle parking facilities, and one in Stellwerk60, adding a comment on disturbances due to people partying outdoors on the green area in the development in summer). All the other residents answered at least "rather suitable".
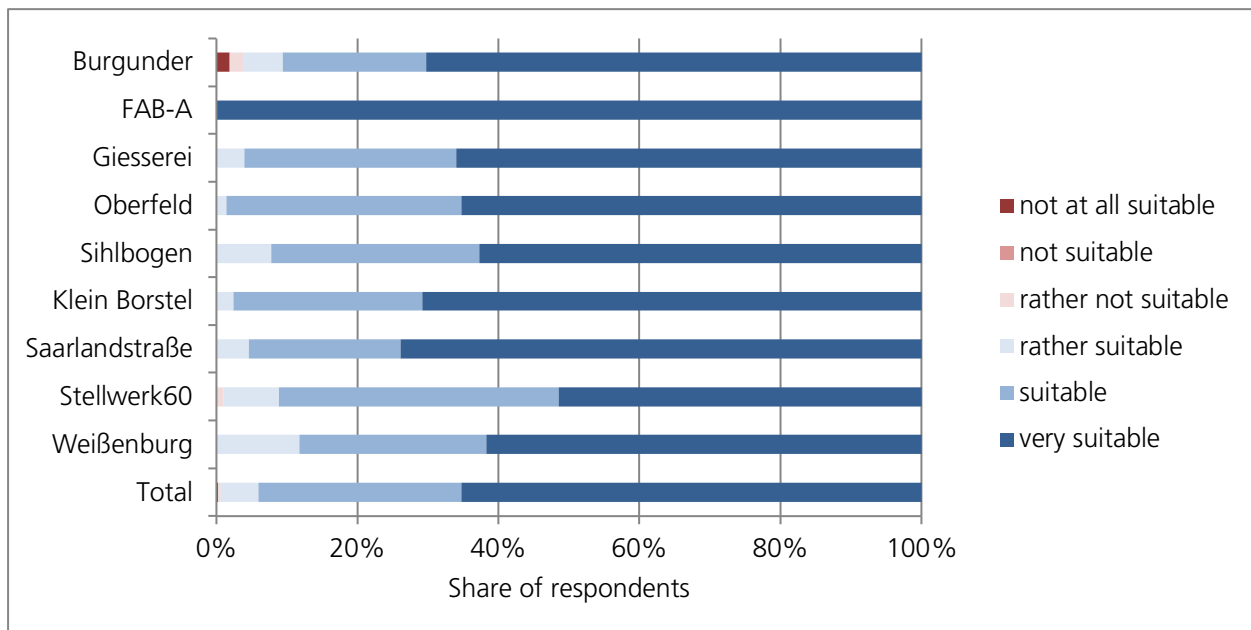
Figure 48: Perceived suitability of the car-free housing development (N=484)

31% (N=152) of the households answering this question added a comment, mentioning 205 elements related to the suitability of their car-free housing development (see Table 59). More than half of these mentions are related to mobility issues, showing its importance, but this may also be influenced by the context of the survey, focusing on mobility. Then, 10–20 mentions each concern characteristics of the development, its surroundings, its location, its residents and local supply. The comments point out deficiencies, but sometimes also positive aspects to undermine the high suitability of the car-free housing developments (these will be treated in detail below). By far the most often mentioned aspect are unsuitable or insufficient bicycle parking facilities (28 mentions), second is the presence of carsharing in the development (13), followed by proximity to public transport and the necessity of a larger car-free or car-reduced environment (12 each).

Mobility	**103**
Unsuitable or insufficient bicycle parking	28
Presence of carsharing in the development	13
Proximity to public transport	12
Too long distance to public transport	9
Residents	**19**
Surroundings	**16**
Larger car-free or car-reduced environment	12
Local supply	**15**
Too long distance to shops and supermarkets	8
Location	**14**
Development characteristics	**11**
Various	**10**

Table 59: Comments on the suitability of the car-free housing development (N=205)

The deficiencies will be discussed in the following part, they mostly reveal important aspects of the hosting potential that should be improved. There are important differences between the housing developments, due to their specific characteristics and locations for example, the comments are detailed for each one in Table 75 in the Appendix.

In the interviews, the residents were asked if they are satisfied with the car-free housing development. Nearly all of them reported very high levels of satisfaction. Even if all of them mentioned aspects that could be improved (see below), only a handful of persons are clearly unsatisfied in general. They all mention social reasons, two residents of the most recent housing project in Saarlandstraße regret that the intended community living does not really work in their part of the housing development and a resident of Sihlbogen complains about the ignorant neighbours that do not care about anything.

An important aspect for the high satisfaction are children. Many parents related their own satisfaction to live in the car-free housing development to their children's. They estimate that it is a perfect environment for them to grow up, even if sometimes for them, personally, everything is not at its best:

> *Bezogen auf die Tatsache, dass ich Kinder habe bin ich sehr zufrieden, weil meine Kinder hier ein ganz tolles Wohnumfeld haben. Im Grossen und Ganzen sind die Leute grossartig, alle sind eben einander sehr zugewandt. [...] Die Kinder haben Kontakt zu ganz vielen anderen Kindern, andern Erwachsenen, das finde ich ganz ideal für Kinder. [lachen] Und ich komme hier oft an meine Grenzen, weil die Wohnung so klein ist und ganz viele von meinen Vorlieben nicht erfüllt werden.*
> Woman, 45, couple with children, Klein Borstel (K3: 43)

> *Die Siedlung kann auch meiner Tochter viel bieten. [...] Wir sind extrem wohl, wirklich. Ich sage immer, wenn ich keine Kinder hätte, würde ich wohl nicht hier wohnen, wahrscheinlich nicht. Aber mit Kindern finde ich es extrem cool.*
> Woman, 35, single-parent family, Oberfeld (O8: 38)

10.2. Material artefacts for car-free living

This chapter addresses the material artefacts important for car-free living, i.e. the important characteristics of the spatial context. Before focusing on three different types more in detail, I start with an overview.

10.2.1. Overview of material artefacts for car-free living

This overview is based on a survey question asking generally for the importance of characteristics of a housing development to live without a private car. Overall, three classes appear (see Figure 49). First, a group of five fundamental characteristics reaching over 60% of "(very) important" answers and nearly any of less than "rather important":

– A bus or tram stop within a maximum 5 minutes' walk
– Proximity to a local train (U-/S-Bahn) station
– Safe and easily accessible bicycle parking
– Safe and direct foot and bicycle paths in the surroundings
– Shops for daily needs at maximum 5 minutes on foot
– Proximity to a local recreation area, e.g. park or wood

These aspects highlight, on the one hand, the importance of access to urban public transport and high-quality infrastructure for walking and cycling (including parking). On the other hand, the only really essential characteristic of the surroundings is the presence of a shop for daily needs around the corner. However, proximity to a local recreation area is also very important. Here, an important difference between the two countries appears: in the Swiss developments, about 75% (66% in Burgunder) evaluate this aspect "(very) important", while they are only about 50% in the German developments (see Table 76 in the Appendix).

Then, there is a group of five factors with about 40% of "(very) important" answers:

– A carsharing site in the development

- Proximity to a long-distance train station
- Proximity to the city centre
- Maximum 5 minutes' walk to nurseries and schools
- Maximum 5 minutes' walk to services

Proximity to the city centre and to a long-distance train station both appear less important, what is crucial is their accessibility. Carsharing in the development is also less central for many residents, nearly 40% evaluate it unimportant. As presented above, most use it only rarely, so it is not a problem if they need to move a bit further to get a car. Similarly, most services are often not used regularly enough to need them at less than five minutes walking distance. The comparatively little importance of nurseries and schools is related to the fact that they do not concern everyone. Nearly half of the answers are "rather" or "not (at all) important", even if for families they are often essential, as the presence of nurseries in several housing developments proves.

Finally, two aspects only get 20% of "(very) important" answers and over half of the respondents evaluated them "(rather) / not (at all) important":

- mobility services in the car-free development, e.g. bicycle trailer rental
- restaurants, cafés and bars within 5 minutes walking distance

Whereas the little importance of gastronomic facilities in the immediate neighbourhood seems comprehensible, mobility services are often believed to highly facilitate the residents' mobility practices. Maybe this aspect was not understood well (due to limited space in the questionnaire, only the example of a bicycle trailer rental was given). But probably, residents do not feel the need for formal services in the development. As presented above and detailed in the following sections of this chapter, many informal sharing practices exist and aspects such as bicycle repair workshops are mentioned, which represent another example of such mobility services.
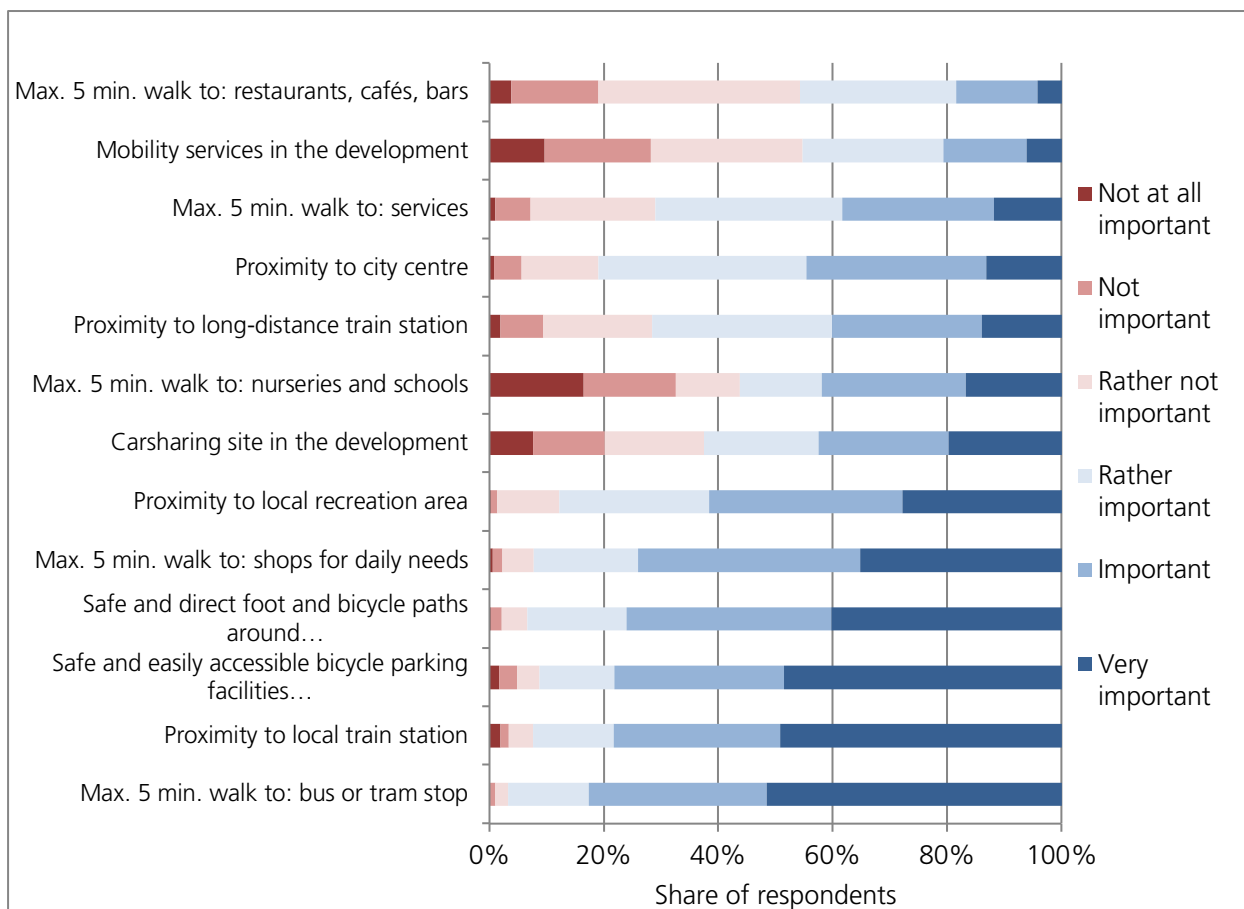
Figure 49: Importance of a housing development's characteristics to live car-free (N=475 to 484)

For several characteristics, it appears that the households related to their own situation or at least the setting of the development they live in seems to influence their answers, whereas the question was to answer *generally* what characteristics of a housing development are important to live without a car. Different examples emphasise this: in Münster, where no U- or S-Bahn train system exists, this element was rated much less important than in developments where a station of such a local train system is nearby. Or the people living in Klein Borstel, where only few restaurants or cafés are close, rate this point much less important than respondents of more centrally located developments or those where such amenities exist in the surrounding neighbourhood.

145 households wrote comments on the importance of the characteristics of car-free developments, mentioning 164 characteristics. Four elements that were not in the questionnaire appeared frequently: big and shared green/open spaces (16 mentions), like-minded people (14), neighbourhood help (10) and less noise/emissions (12). The details are reported below in the sections on the different types of artefacts and also in the next chapter on immaterial aspects. The following sections focus on the three different types of material artefacts, based both on quantitative and qualitative results.

10.2.2. Mobility characteristics

In this first section, mobility is addressed, the infrastructure in the development as well as its location and access. The following citation shows the importance of careful planning and design of a car-free housing development for particular needs of households moving differently than by car which were (also in other developments) not enough considered and led to different problems:

> *Es ist eine autofreie Siedlung, es ist ein Mobilitätsplaner drüber, der davon Ahnung hat. Wer welche Detailentscheidung getroffen hat, ist dann eine andere Frage, man hat gravierende Fehler begangen. Man hat dem Architekten viel zu hohen Stellenwert eingeräumt, schon nur da mit dem karierten Belag, wenn du da jeden Morgen mit dem Velo drüberholperst findest du das nicht so lustig. Es sind Details, aber einfach jemand, der sonst im Auto sitzt, der die Siedlung gemacht hat. Es sind viele Details wo man echt staunt, was das für Leute sind, die das verbockt haben. Services sind OK, mit Mobility und Elektroauto und jetzt das E-Bike, das sie anbieten, das Mieterticket ist auch nice to have natürlich, das ist klar. Von daher, der Wille war schon da, aber die Umsetzung hätte ich als Manager deutlich besser gemacht, das muss man in dieser Deutlichkeit sagen und ich bin nicht der einzige der flucht. Am Anfang haben wir uns da in corpore an den Kopf gegriffen.*
> Man, 50, living alone, Sihlbogen (SI1: 60)

10.2.2.1. Mobility infrastructure in the development

As seen above, the survey showed that within the development, there is one important mobility facility: safe and easily accessible bicycle parking (see Table 60). About 80% of all residents rate it "(very) important" and there were also several comments on its quality and quantity. Instead, a carsharing site in the development is evaluated clearly less important and mobility services (for example bicycle trailer rental) even less.

	Very important	Important	Rather important	Rather not important	Not important	Not at all important	Total
Safe and easily accessible bicycle parking facilities in the development	49%	30%	13%	4%	3%	2%	100%
Carsharing site in the development	20%	23%	20%	17%	13%	8%	100%
Mobility services in the development	6%	15%	25%	27%	19%	10%	100%

Table 60: Importance of mobility characteristics in the development

Several other mobility-related elements appeared in the comments in the questionnaire: the access for cars, either the possibility (if needed for move-in e.g.) or clear regulations who can have access and when, as well as the organisation of visitors parking. To emphasise the importance of cycling, bike workshops to repair by oneself (or by a helping neighbour) were mentioned or bicycle trailer rental (even if that already appeared in the questionnaire).

The interviews endorse these results. Bicycle parking was mentioned by most residents, either positively when they live in a housing development where it is good, or negatively when it is deficient. As mentioned above, this is the most frequently mentioned negative aspect in the survey comments. The interviews also proved that it is crucial to have easily accessible and safe parking facilities, for example ramps to access underground parking:

> *Gute Fahrrad-Unterstellmöglichkeiten sind natürlich auch wichtig, haben wir hier auch geplant, dass jeder auch einen gut zugänglichen Platz hat.*
> Woman, 50, couple with children, Klein Borstel (K5: 118)

> *Die Fahrradrampe ist eins der tollsten Sachen, die wir hier haben, dass man in den Keller sogar fahren kann, nicht nur schieben, im Vergleich zu meiner alten Wohnung. Dieser Komfort rauf und runter zu fahren mit dem Rad, das ist ein Genuss.*
> Man, 60, living alone, Saarlandstraße (SA10: 16)

Unfortunately, in many developments, the situation is insufficient (not enough, uncovered or unsafe parking spaces) or even clearly deficient:

> *Etwas was auch noch wichtig ist, was hier für eine autofreie Siedlung eine völlige Fehlkonstruktion ist, dass es viel zu wenig Veloparkplätze hat. Ich denke das ist etwas, was man für den Bau von weiteren autofreien Siedlungen unbedingt beachten muss. Ich meine wir als Familie, wir haben drei normale Velos, das Cargovelo und noch einen Veloanhänger. Berechnet ist nach der VSS-Norm ein Velo pro Zimmer. Und wenn er [son] Velo fahren kann, wird er auch noch eins haben. Eine vierköpfige Familie hat schnell mal acht Velos.*
> Woman, 35, couple with children, Burgunder (B5: 66)

> *Die Fahrradabstellmöglichkeiten könnten noch besser sein. Wir haben zwar einige Fahrradhäuschen hier, aber die sind viel zu eng und haben keine Möglichkeit, die Fahrräder sicher abzustellen. Also es kann schon mal passieren, dass man aus Versehen anstösst und Domino spielt. [lachen] Also die sind etwas insuffizient und auch zu knapp, da jetzt auch die Kinder langsam grösser werden.*
> Woman, 65, living alone, Klein Borstel (K2: 80)

> *Velo, Katastrophe finde ich, wirklich schlecht, zu wenig Platz fürs Velo, unpraktisch, also schwere Türen zum Öffnen. Es ist immerhin ebenerdig, in Wohnungsnähe, ja, also mittel zufrieden, du wirst irgendwo ein Kreuz machen, natürlich.*
> Man, 50, living alone, Sihlbogen (SI1: 60)

> *Was verbessert werden müsste wären Unterstellmöglichkeiten für die Fahrräder. Das ist ein Witz hier in der Siedlung. Also es gibt zwar ein paar Fahrradständer, aber die Stellplätze in den Kellern sind sehr schlecht zu erreichen.*
> Woman, 65, childless couple, Weißenburg (W2: 98)

Another aspect regarding bicycles is a bicycle workshop, present in some developments and desired in others:

> *Positiv finde ich die Fahrradwerkstatt. Wenn man so viele Fahrräder hat, muss man eine Fahrradwerkstatt haben.*
> Woman, 50, single-parent family, Klein Borstel (K1: 52)

> *Wenn die Phantasie schon da ist, wäre natürlich toll, wir hätten eine Fahrradwerkstatt. Und ob wir da nun jemanden anstellen oder ob jemand sagt, samstags mach ich zwei Stunden und wer's nicht reparieren kann macht vielleicht Putzdienst zwei Stunden.*
> Woman, 50, single-parent family, Saarlandstraße (SA03: 72)

Even if little importance was given to mobility services in the survey, several respondents mentioned in the interviews that cargo bike or bicycle trailer sharing is important, whether formal, organised by the housing cooperative or association, or informal between neighbours:

> *Was natürlich cool ist sind Infrastruktursachen wie ein gemeinsames Lastenrad oder Rikscha.*
> Man, 40, couple with children, Klein Borstel (K9: 94)

> *Es gibt die Möglichkeit, Anhänger auszuleihen oder Lastenvelos. Da gäbe es noch mehr, was ich*
> *gar nicht brauche. Aber das gibt auch ein gutes Gefühl, das Potential zu merken.*
> Woman, 55, living alone, Oberfeld (O5: 60)

Carsharing was also mentioned by several residents, the importance to have it available in the development or at a short distance, but more "in case" than for regular use for most of them. In some developments, the offer should be extended—more or different (e.g. bigger) cars—while in others it seems sufficient, also in combination with other carsharing sites in the neighbourhood:

> *Was ich auch super finde, die Nähe zu Mobility.*
> Man, 35, childless couple, Burgunder (B3: 60)

> *Dass wir das Carsharing-Auto vor der Tür haben, das ist gut. Da wäre es ganz gut, wenn man ein*
> *zweites hätte, so ein Kombi.*
> Woman, 50, single-parent family, Klein Borstel (K1: 52)

> *Die grosse Carsharing-Station, die ist natürlich, 10 Autos ist schon viel, das hat man ja absichtlich*
> *hier auch grosszügig angelegt. […] Wir haben das [Carsharing-]Auto schneller als ein Taxi. Das ist*
> *natürlich auch etwas, was wir natürlich dann auch für erforderlich halten, um dieses Konzept und*
> *diese Attraktivität zu halten.*
> Man, 50, couple with children, Weißenburg (W8_M: 30/71–72)

Some respondents also mentioned the availability of visitor car parking, which is not sufficient everywhere, or different other mobility services such as a parcel counter where delivery services can deposit parcels for the residents.

10.2.2.2. Location and access of the development

Several mobility-related aspects outside the development are also crucial. As the survey results show, especially access to a bus or tram stop within a 5 minutes' walk, a local train station in proximity as well as safe and direct foot and bicycle paths around the development (see Table 61). The access to a long-distance train station as well as to the city centre is much less essential, overall.

	Very important	Important	Rather important	Rather not important	Not important	Not at all important	Total
Max. 5 min. walk to: bus or tram stop	52%	31%	14%	2%	1%	0%	100%
Proximity to local train station	49%	29%	14%	4%	2%	2%	100%
Safe and direct foot and bicycle paths around the development	40%	36%	17%	5%	2%	0%	100%
Proximity to long-distance train station	14%	26%	32%	19%	8%	2%	100%
Proximity to city centre	13%	31%	36%	13%	5%	1%	100%

Table 61: Importance of mobility characteristics outside the development

Thus, the location of the housing development in itself (such as the distance to the city centre) is not that significant. Instead, access matters, this means not only proximity to a public transport station or an attractive bicycle path, but also the quality of the bus or tram service (or the bicycle

infrastructure), as several respondents mentioned in the questionnaire. The interviews emphasise the importance of the location, in several cases it represents a compromise between the too high prices of a really central location and too long a distance to the centre:

> *Es passt gerade, der Standort ist nahe an der Grenze von zu weit aussen. Ich finde, autofrei, wenn man es optimal umsetzt, müsste man näher am Zentrum sein, aber dann hättest du wieder alle Nachteile von hohen Bodenpreisen und weiss ich was. Entweder näher am Zentrum oder dann müsstest du einen besseren öV haben.*
> Man, 45, couple with children, Oberfeld (O7: 78)

> *Ins Kino oder irgendwie in die [central neighbourhood] bummeln, was essen, trinken gehen, das macht man ja nicht so oft, das ist ein bisschen weiter weg. Sagen wir mal, wenn man mal zu einem Konzert fährt nach [central district], ist man auch in einer guten halben Stunde wieder zu Hause. Es ist schon mitten in der Stadt und nicht irgendwo [neighbourhood at the outskirts] oder noch weiter raus. Ich denke, das ist schon ein Punkt, der es einem leichter macht ohne Auto.*
> Man, 45, couple with children, Saarlandstraße (SA05: 74)

As most residents are multimodal, access by and to different transport modes is mentioned and generally, residents are satisfied with the possibilities available:

> *Hier bin ich mobil, habe ich mehrere Möglichkeiten, kann für Grosseinkäufe das Auto nehmen oder wenn ich krank bin, mit dem Fahrrad fahren oder mit der Bahn fahren oder ich kann zu Fuss gehen.*
> Woman, 50, single-parent family, Klein Borstel (K1: 116)

Public transport access is crucial, a high-quality service is an important basic condition for car-free living:

> *Ich find's einfach ideal, ich gehe fünf Minuten zur S-Bahn und bin dann in 20 Minuten in der Innenstadt, das ist doch prima. [lachen] [...] Die S-Bahn fährt alle 10 Minuten, da kucke ich niemals auf die Uhr, wenn ich losgehe, schlimmstenfalls warte ich neun Minuten, das ist auch nicht schlimm. Das fand ich wichtig, dass man einen guten Anschluss an den öffentlichen Nahverkehr hat.*
> Woman, 65, living alone, Klein Borstel (K2: 82 / 84)

> *Was halt schon essentiell ist, ist diese gute Anbindung an öffentlichen Verkehr, ohne den geht's nicht.*
> Man, 45, couple with children, Saarlandstraße (SA05: 72)

Of course, this depends on how much residents rely on it—for many residents, public transport does not need to be perfect because they normally cycle:

> *Bushaltestelle gibt es hier vorne. [...] Für mich nicht so ganz relevant, weil ich eben Fahrrad fahre.*
> Man, 60, childless couple, Weißenburg (W1: 152)

But in most developments, access by public transport is good enough, even if it could be better: either the buses are crowded, the train frequencies too low or imply long waiting times when changing to long-distance trains at the main station (e.g.in Switzerland where many residents commute) or the development depends on only one public transport line, which can be difficult when there is a problem with it:

> *Man hat auch sehr gute öV-Anschlüsse, nicht schön auf die Stunde verteilt, aber vier Mal pro Stunde eine S-Bahn zum Bahnhof. Was ich hier finde sind die Anschlüsse, man wartet meistens eine Viertelstunde, wenn man auf den Fernverkehr umsteigen will, das ist nicht so optimal, aber ja.*
> Woman, 35, couple with children, Burgunder (B5: 40)

Besides the mentioned critical points of public transport, another important aspect was mentioned by a handful of residents in the developments in Hamburg: elevators (or ramps) at train stations, to enable elderly people, families with buggies and cyclists who cannot carry their bike to access to the trains:

*Wir kriegen jetzt hier einen Fahrstuhl. Das war sehr beschwerlich die Zeit als die Kinder klein
waren oder auch manchmal komme ich dann abends, wenn ich unterrichte, spät mit der S-Bahn
zurück und dann muss man das Rad da runter schleppen oder eine Station weiterfahren und zu-
rückfahren. [...] Deswegen finde ich das schon recht elementar, dass wir jetzt diesen Fahrstuhl an
die Bahn kriegen. Die Kleinkind-Zeit haben wir jetzt hinter uns aber das Alter kommt.*
Woman, 50, couple with children, Klein Borstel (K5: 42)

*Ich finde es total schlecht, dass an der U-Bahn Saarlandstrasse kein Aufzug ist, das ist eine Kata-
strophe. Das hat ja auch damit zu tun, dass ich da jetzt im Wohnprojekt wohne, weil ich möchte
mit Leuten zusammen älter werden.*
Woman, 55, living alone, Saarlandstraße (SA11: 68)

For the important group of residents who primarily cycle, access by bicycle is an essential aspect:

*Hier ist wenig Autoverkehr, find ich auch gut. Hier kann ich auch mit dem Fahrrad gut fahren, die
sind gut ausgebaut die Strecken jetzt.*
Woman, 50, single-parent family, Klein Borstel (K1: 114)

*Generell auch in Münster in der Richtung, dass du zu Fuss, mit dem Rad dich sehr gut bewegen
kannst. Das ist eigentlich ich denke mal das ganz grosse Plus in Münster, auch mit der Promenade
[pedestrian/bicycle ring path around the city centre]. Aber es geht nicht nur um die Promenade,
sondern Grünzüge, Strassen, Radwege, vernünftige Bürgersteige, das kannst du hier echt machen.
Deswegen finde ich Münster auch total klasse.*
Man, 55, living alone, Weißenburg (W4: 48)

As the last citation shows, the "bikeability" of the entire city was mentioned by several residents
in the interviews: safe bike paths or parking facilities must exist everywhere. Even if the
residents recognise that most cities develop their bicycle infrastructure, at present, many defi-
ciencies are reported—even in the cycling city of Münster:

*Also Bern ist noch keine Velostadt, das ist mal das erste. Aber es hat sich einiges getan und ist sich
viel am Tun, das sind alles positive Entwicklungen.*
Man, 35, childless couple, Burgunder (B3: 62)

*Es hat sich ja sehr verändert in den letzen Jahren, Hamburg wirbt ja auch mit dem Etikett Fahr-
radstadt. Es sind in vielen Strassen Radstreifen angelegt, da hat sich einiges getan. Es fehlt aber
auch noch viel, viele Radwege in marodem Zustand.*
Woman, 70, living alone, Saarlandstraße (SA12: 135)

*Münster muss was tun. Münster kann sich nicht auf der Verkehrspolitik von vor 20 Jahren ausru-
hen, sondern die müssen was tun. Und das ist halt eine CDU-regierte Stadt, die haben das nicht im
Blickpunkt, die wollen lieber mit 50 oder möglichst mit 70 direkt ins Parkhaus in die Innenstadt
fahren, damit ganz viel Kaufkraft aus dem Umland nach Münster kommt und investiert halt nicht
in Fahrradwege, in grosse Fahrradwege.*
Woman, 50, couple with children, Weißenburg (W8_W: 52)

Furthermore, the importance of particular cycling infrastructures is mentioned, a sufficient
bicycle station (secured parking) at the main train station, for example:

*Es gibt ein Fahrradparkhaus am Bahnhof und wenn ich also über Nacht wegbleibe stelle ich das
da in das Parkhaus und das kostet 70 Cent am Tag.*
Woman, 65, childless couple, Weißenburg (W2: 40)

Finally, the traffic situation around the development was addressed, some households wish a
bigger car-free or at least car-reduced area in the surroundings. The presence of parked cars
around the development is another point raised. This shows that not only practical but also
broader issues play a role for an important number of residents, they would also like to have some
direct benefits in car-free housing developments:

*Was mir etwas Bauchweh bereitet, was rundherum passiert, die Siedlung wird eingekesselt, durch
die Rendite-Siedlung, ich nenne das mal so. Da merkst du, da prallen zwei Weltbilder aufeinander
[...] Das macht mir manchmal schon etwas Sorgen, was nützt es dann, wenn wir hier den Kindern*

Raum geben, möglichst wenig Verkehr wollen, wenn überall von aussen dann Leute mit Auto hin-
ziehen und doch Verkehr machen. Dann wird das Konzept etwas in Frage gestellt und verwässert.
Das finde ich recht schade.
Man, 45, couple with children, Oberfeld (O7: 76)

Fanden Sie nicht auch, dass extrem viele Autos in unserem Umfeld hier fahren und dass diese
Strasse, die Saarlandstrasse, so befahren ist wie keine andere Strasse in Hamburg? Und das zum
Beispiel hier bei dieser Stichstrasse die zum autofreien Wohnen führt, das ist ein Wendeplatz, ein
Platz für Parkplatzsuchende. Ich denke mal da, für mein Gefühl autofrei zu wohnen habe ich eher
das Gefühl ich wohne autofrei weil das das Konzept ist, aber ich wohne nicht wirklich autofrei,
sonst würde sich das hier auch so ein bisschen, es würde vielleicht auch ein bisschen sichtbarer
werden, auch für das Umfeld, da ist eine autofreie Siedlung.
Woman, 50, single-parent family, Saarlandstraße (SA03: 15)

Du kannst ja da draussen schon, was da verkehrsmässig abgeht. Das ist eben der Effekt, die Sied-
lung ist zu klein, dass du das, was du selber einsparst, davon profitieren kannst. Das war klar,
dass dieser Effekt zu klein ist.
Man, 50, living alone, Sihlbogen (SI1: 8)

10.2.3. Infrastructure in the surroundings

The proximity of different infrastructures or facilities in the surroundings of the car-free housing development shows clearly differentiated priorities in the survey responses (see Table 62). Whereas shops for daily needs at maximum five minutes on foot are evaluated one of the most important characteristics, the others are clearly less important, either because not every respondent is concerned with, or because they are not that important in everyday life.

	Very important	Important	Rather important	Rather not important	Not important	Not at all important	Total
Max. 5 min. walk to: shops for daily needs	35%	39%	18%	5%	2%	1%	100%
Proximity to local recreation area	28%	34%	26%	11%	1%	0%	100%
Max. 5 min. walk to: nurseries and schools	17%	25%	14%	11%	16%	16%	100%
Max. 5 min. walk to: services	12%	27%	33%	22%	6%	1%	100%
Max. 5 min. walk to: restaurants, cafés, bars	4%	14%	27%	35%	15%	4%	100%

Table 62: Importance of the development surroundings' characteristics

Here, too, the interviews confirmed the results of the survey. Local supply—shops for daily needs, but also some basic services—was mentioned by most residents as a basic condition for car-free living:

Die Infrastruktur muss stimmen, dass man nicht immer Fahrrad fahren muss lange Strecken, son-
dern dass man auch was zu Fuss machen kann, Arzt, Lebensmittel.
Woman, 50, single-parent family, Klein Borstel (K1: 114)

Toll ist natürlich diese ganze Infrastruktur auch mit den Geschäften, die wir haben. Weil als wir
hierhergezogen sind, war das erste, was passierte, ist dass der Lebensmittelladen dichtmachte, das
war natürlich ein Fiasko. Ziemlich bald, ein halbes Jahr später, kriegten wir einen viel besseren,
weil man natürlich manchmal noch etwas braucht kurzfristig. Wir haben ja alles, von der Post,
Bücherladen.
Woman, 50, couple with children, Klein Borstel (K5: 97)

Eine gute Nahversorgung ist eigentlich auch sehr wichtig.
Man, 45, couple with children, Saarlandstraße (SA05: 72)

Das ist ein wichtiges Kriterium, dass die Einkaufsmöglichkeiten in der Nähe sind. Hammer Strasse ist sogar fussläufig, wenn man mag, oder dann halt mit dem Rad, wo es eigentlich die meisten nötigen Sachen gibt, auch Schreibwaren, Drogerien, Klamotten könnte man da auch noch kaufen, Spielzeugladen, das ist alles irgendwo in der Nähe stattfindet, das ist schon extrem günstig. Ich sag mal zumindestens, dass Lebensmittel in der Nähe, fussläufig eingekauft werden können ist das absolute Kriterium für dieses autofreie Leben.
Woman, 40, couple with children, Weißenburg (W7_F: 82)

Other important characteristics of the neighbourhood were mentioned only by few residents. The most frequent aspect, as in the survey, is recreation areas nearby:

Ganz wichtig ist, dass hier eben auch schöne Natur ist, wo ich spazieren gehen kann.
Woman, 65, living alone, Klein Borstel (K2: 88)

Furthermore, nurseries and schools were mentioned by some families. Cultural activities or restaurants, bars and cafés at short distances were mentioned mainly in Hamburg—probably because in the other, smaller, cities, they are never far from the housing development, even if they are in the city centre, and do less exist in residential areas:

Hier im Umkreis, wir haben Kampnagel, tolles Kino, die Zinnschmelze, das Kulturzentrum, das Museum der Arbeit, Restaurants. Also was hier im Umkreis von einem Kilometer ist, ist so viel, das finde ich für mich auch wichtig.
Woman, 70, living alone, Saarlandstraße (SA12: 51)

10.2.4. Characteristics of the development

A last very important type of characteristics, not mentioned in the survey questionnaire, appeared in the comments and the interviews: features of the housing development, including facilities, outdoor spaces and shared amenities. Some of these material artefacts are closely related and lead over to the immaterial aspects addressed in the next chapter.

To start, on a general level, the fact that car-free housing developments should benefit from a location with little (traffic) noise and emissions in order to directly experience one of the benefits of car-free living was highlighted. Then, some specific facilities of the development were reported in both the survey comments and the interviews. Following the importance of local supply, market stands, grocery shops or food cooperatives in the development are also helpful for a car-free life. They are also linked to particular values, as they all provide fair trade and organic food:

Dass wir Markt und Laden selber haben, das finde ich sehr wichtig, beides.
Woman, 35, single-parent family, Oberfeld (O8: 46)

Delivery services were also mentioned, demonstrating once more the importance of shopping issues, often seen as an obstacle for a car-free life. At the other end of the consumption process, the importance of nearby recycling stations was stressed, too. Their absence or too long distances can also cause important transport problems. For families, the presence of a nursery within the development can play a central role:

Auch ein Grund, der sehr praktisch ist mit Kindern, dass man die Kita in der Siedlung hat. [...] Also das ist etwas, was wirklich wichtig ist, wo man auch merkt, dass es im Alltag eine extreme Entlastung ist. Wenn man noch jeden Tag in ein anderes Quartier in die Kita fahren müsste, verliert man schnell viel Zeit.
Woman, 35, couple with children, Burgunder (B5: 78/80)

The outdoor spaces are the most frequent comment in the questionnaire, indicating the importance of the housing development design. The respondents mentioned large, high-quality and shared green or other open spaces as well as playgrounds. The design of the outdoor spaces should, on the one hand, visualise the advantage of a car-free development, having more space for anything else but car parking:

Was ich den Vorteil finde da, die Siedlung selber ist sicher nicht durch Autos dominiert, die rum-
stehen würden. Es gibt einen Aussenraum der mir ausgesprochen gefällt, so möchte ich wohnen.
Das Wilde, das Grüne, man kann sich das auch aneignen, Bänke werden hingestellt, ein Aussen-
raum der mir gefällt und wo nicht der Parkplatz im Vordergrund steht.
Woman, 50, living alone, Oberfeld (O6: 58)

On the other hand, if outdoor spaces invite to stay and allow different activities, residents can and will appropriate them and pass more of their leisure time there and, thus, do not need to travel anywhere to satisfy their leisure needs:

Diesen Freiraum, das finde ich total super Qualität, dass da, da haben die Kinder von, man kann
hier lang laufen, super feiern, den Garten nutzen, oder sich hier setzen in die Sonne, wenn die denn
mal scheint [lachen] dann scheint die hier im Hochsommer kontinuierlich bis sechs Uhr. Wir ma-
chen oft hier im Garten was. Das sind schon Sachen, die hat man im normalen Block nicht. Das ist
schon eine Qualität eines Wohnprojekts, dass man sich diesen Aussenraum angeeignet hat. [...] Die
tägliche Naherholung kann man, man muss jetzt nicht irgendwo rausfahren, für einen normalen
Tag kann man sich hier erholen.
Man, 45, couple with children, Saarlandstraße (SA05: 80 / 84)

Der Freizeitwert ist ja auch für uns gegeben, einfach mal hinters Haus gehen zu können selber,
draussen zu trainieren, oder eine Runde Boule spielen oder Wikingerschach, mit der Tochter raus,
Volleyball spielen.
Woman, 40, couple with children, Weißenburg (W7_F: 16)

This applies mainly to collaborative housing developments, but all have diverse outdoor spaces with at least a playground serving as a meeting place for residents with children. Similarly, shared amenities in the form of common spaces or rooms (from (party) halls to guest rooms) were also mentioned as important for car-free housing developments. They are absent only in Sihlbogen where this was seen as a negative point—proving the importance of built environment characteristics for community living:

Die Gemeinschaftsgeschichte, das hat es hier zu wenig, das ist nicht adäquat.
Man, 50, living alone, Sihlbogen (SI1: 85)

In the other developments, as the outdoor, these shared spaces allow common leisure activities:

Was natürlich toll ist, ist unser Gemeinschaftsraum, dass da viele Aktivitäten möglich sind. Wenn
man denkt, ich hätte mal Lust, Doppelkopf mit Leuten zu spielen, setzt man das in den Blog und
sucht einen Termin. [...] Oder Openair-Kino machen wir hier im Sommer, wenn das Wetter schön
ist.
Woman, 50, couple with children, Klein Borstel (K5: 85)

Ich glaube, dass es bei einem solchen Projekt wie wir's haben eine grössere Wahrscheinlichkeit gibt,
dass so was entsteht, weil wir auch logische Begegnungsstätten haben, wie den Gemeinschaftsraum,
wie den Boulevard ohne Autos, wo man dann einfach gerne mal kurz vor die Tür geht, wie die
Dachterrasse. Man kommt einfach ins Gespräch, man tauscht sich aus, und ich glaube, dass das
die Wahrscheinlichkeiten steigert, dass man auch gemeinsame Hobbies in solchen Gruppen mani-
festiert.
Man, 55, childless couple, Saarlandstraße (SA02: 61)

Aktivitäten können angeboten werden, es gibt eine Gemeinschaftswohnung, das Geistreich. Es gibt
eine Fahrradwerkstatt, es gab einen Gemeinschaftsgarten, der kommt dann wieder, wenn die Bau-
stelle fertig ist. Es gibt Aktivitäten wie Babytreff, Yoga am Sonntag, Angebote die für alle da sind.
Klar, das Geistreich kann auch gemietet werden. Jeden Sonntag ist ein Nachbarschaftskaffee da,
dass Bewohner und Aktive Kuchen backen und Kaffee kochen und den da verkaufen, jeder kann
kommen und sich dann unterhalten und treffen.
Woman, 50, couple with children, Weißenburg (W8_F: 21)

These leisure activities would, otherwise, imply to move somewhere—even if this may not be the only reason for many residents to participate:

Es macht auch mehr Spass, hier zu Hause zu sein als in der Stadt in einem Mehrfamilienhaus, wo du viel anonymer bist, macht es mehr Spass, das Wochenende hier in der Siedlung zu verbringen. Wir haben so engen Austausch, vor allem die Kinder, die gehen dauernd zueinander essen und übernachten und so. Dadurch ist man automatisch mehr zu Hause.
Man, 45, couple with children, Oberfeld (O7: 32)

Wie weit der Weg eine Rolle spielt, das ist natürlich total praktisch, wenn ich nur ein Stockwerk nach oben gehen muss und nicht durch halb Hamburg fahre, aber würde ich jetzt nicht sagen, dass das der treibende Punkt ist.
Man, 55, childless couple, Saarlandstraße (SA02: 61)

Different citations emphasised that material and immaterial aspects (detailed in the next chapter) are closely interwoven. As different residents point out, the design of most car-free housing developments facilitates community which in turn is perceived to be important, as seen above, for car-free living:

Selbst wenn hier Leute wohnen würden, die sich nicht kennen, allein das Wohnumfeld begünstigt schon massgeblich oder bietet ein Vielfaches mehr an Gelegenheiten, sich kennen zu lernen, nachbarschaftliche Beziehungen aufzubauen als wie im übrigen Teil der Welt sag ich mal [lachen].
Man, 55, childless couple, Weißenburg (W6_M: 176)

Man trifft sich auf dem Spielplatz auch mit anderen Eltern, erst mal ist ein schöner Austausch da, und dann geht das auch ganz schnell, könnt ihr mal kurz nach [daugther] kucken, ich geh mal einkaufen. Das ist wirklich so dieses soziale Leben, das findet viel stärker statt, durch mehr Begegnung entsteht es zwangsläufig, es lässt sich gar nicht verhindern. Es gibt zwar auch diesen Nachbarschaftsverein, der viel organisiert, aber auch ohne den, allein dadurch, dass man sich viel begegnet, kommt man zwangsläufig in Kontakt.
Man, 40, couple with children, Weißenburg (W7_M: 17)

Moreover, social aspects can even outweigh problematic material artefacts, as a resident of a development where the bicycle infrastructure is not particularly adapted to car-free households says:

Autofrei ist das eine, aber die Frage ist genau die: was kommt dann? Was brauchen die Leute an Facilities, damit sie das auch umsetzen. Ich habe überhaupt nicht das Gefühl, in einem fahrradfreundlichen Projekt zu wohnen. Dank dieser Situation, dass ich viel Kontakt mit den Nachbarn habe, dass wir viel gemeinschaftlich regeln, kann ich das hinkriegen. Aber die bauliche Massnahme ist erst mal eine Standardmassnahme.
Woman, 45, couple with children, Klein Borstel (K3: 33)

10.3. Immaterial aspects for car-free living

As mentioned at the end of the last chapter, immaterial aspects also have an influence on mobility and are often closely connected to material artefacts. This chapter addresses first aspects related to the development and its residents and, second, the broader social and cultural context necessary for car-free living.

10.3.1. The social context in the housing development

The other residents were one of the major characteristics important for car-free living mentioned both in the survey comments and in the interviews. For many interviewees, car-free living seems not possible without a community of like-minded residents, where neighbourly help or common activities play an important role. In collaborative housing, there is a general will to live in a certain community where one knows the neighbours:

Der Ausgangspunkt ist so ein bisschen der Spirit, also wir sind ja alle gleichzeitig eingezogen, dass man schon mit einem Impuls hier einzieht, ich will meine Nachbarn kennen lernen.
Woman, 45, couple with children, Klein Borstel (K3: 41)

As detailed at the end of the last chapter, the importance of the neighbours can be linked to different aspects related to car-free living such as being more centred on the place of residence. Moreover, it may also be due to the fact that the residents have something in common, living car-free, that differentiates them from the rest of the society:

> *Das Autofreie macht es aus, dass hier Menschen bewusst hinziehen, und das hier bewusst suchen, nicht nur dass man hier ohne Auto lebt, sondern dass man hier eine Gemeinschaft hat: «Ach, hier wohnen Menschen, die bewusst ohne Auto fahren». Das sind schon besondere Menschen, also das sind schon besondere Leute, mit einer besonderen Geschichte, wo ich denke, das sind auch echt spannende Leute. Also das kann ich nicht anders sagen. Nicht nur was verbindet einen, Geldbeutel oder kein Geldbeutel, sondern die Autofreiheit verbindet uns.*
> Woman, 50, couple with children, Weißenburg (W8_F: 27)

Living car-free ties the residents together unlike in other housing developments with no common ground. As a proof, this was mentioned even in the "conventional"—non-cooperative—housing development of Sihlbogen:

> *Wir haben eine Gruppe in Facebook. Ich denke das ist gut, es gibt ein gemeinsames Gefühl, vielleicht weil wir kein Auto haben oder da es einen Kinderspielplatz hat, viele Leute gehen dort hin im Sommer mit den Kindern.*
> Man, 30, couple with children, Sihlbogen (SI4: 86)

Generally, car-free mobility also facilitates social contacts and communication, whereas a car "*encloses people*" (and when residents park their car in an underground garage and directly access their flat by the elevator, the potential for social contacts even outside the car is small)—it is somehow a circular reason chain:

> *Das ist einfach so, dass durch diese Ruhe, durch diese Autofreiheit auch ein ganzes Stück mehr Möglichkeiten gegeben sind, dass die Nachbarschaften sich überhaupt bilden können. Denn wie oft sind Autos und Strassen, der ruhende Verkehr, die Blechlawine, wie oft sind diese auch, zerschneiden sie Lebensgemeinschaften, Nachbarschaften und Siedlungen. […] Ich will nicht sagen, dass das Auto allein verantwortlich ist, aber das Auto trägt doch einen ganz schönen Teil dazu bei, dass wir eben tatsächlich in den Städten, in unseren Nachbarschaften, anonymer geworden sind, würde ich jetzt mal so sagen. Wenn die Leute im Auto wohnen, ist eine Käseglocke, das ist nichts mit Kommunikation.*
> Man, 55, childless couple, Weißenburg (W6_M: 52/55)

> *Die Leute haben ja auch hier längere Wege als wenn sie mit dem Auto vor die Haustür fahren und die Einkäufe reinbringen. Hier ist einfach klar, die Leute sind auf dem Fahrrad und zu Fuss unterwegs und laufen durch die Siedlung, da kommt man einfach schneller in Kontakt und ins Gespräch.*
> Woman, 50, childless couple, Weißenburg (W6_F: 54)

There is another link between material and immaterial aspects: the "material artefacts" of car-free housing can result in the empowerment[72] of households living without a private car, as a resident explains:

> *Das war schon interessant, die Reaktion von Leuten mit Auto. Das war für sie echt ein Fragezeichen, wie wir ohne Auto leben, gerade mit zwei Kindern. Wir sind immer mit den Kindern Treppe hoch, Treppe runter. Ich mag einfach gerne selber bewegen. Besonders wenn man in so einem Wohnprojekt wohnt, ich fühle mich hier gestärkt durch diese Umgebung.*
> Woman, 45, couple with children, Klein Borstel (K6_F: 79)

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[72] "*The capacity of individuals, groups and/or communities to take control of their circumstances, exercise power and achieve their own goals, and the process by which, individually and collectively, they are able to help themselves and others to maximize the quality of their lives.*" (Adams, 2008, p. xvi)

10.3.2. The broader social and cultural context for car-free living

As it appeared in the last citation, on a more general level, the importance of societal norms regarding the car is still central. Residents reported particularly that a family should own a car:

Dann merke ich eben auch dass das Denken noch sehr sehr hinterher ist, es war ja auch am An-fang, also die Art der Planung der Genossenschaft aber auch die Reaktion der Leute: «Meine Güte, wie macht ihr das denn?» Damit werden wir ständig konfrontiert und was auch immer so ist, dass Leute sich entschuldigen, dass sie Auto fahren. Also wenn du irgendwo bist als Autofreier: „Ja, ich bin mit dem Auto gekommen, es ging nicht anders, ich war noch in irgendwo.“ Das ist doch nicht mein Problem [lachen]. Aber das ist Standard, die Leute entschuldigen sich bei dir, weil sie Auto fahren und aber gleichzeitig, was jetzt nachgelassen hat, bei allen die uns kennen, dieses «wie macht ihr das denn?» Dieses Projekt hat lange die Schwierigkeit gehabt, die Wohnungen zu beset-zen weil viele Familien gesagt haben: «Autofrei mit Kind, wie das denn?» Das ist auch gesellschaft-licher Konsens, dass man dann mit Kindern Autos braucht. Meine Güte, ganz viele Leute in Ham-burg sind autofrei, das ist nicht besonders irre. Aber wir haben schon den Status einer linksextre-mistischen Terrorzelle gehabt hier. Wer autofrei ist, da weiss man nicht ganz genau. Das hat sich bestimmt gegeben in den letzten Jahren, wir haben viel Öffentlichkeitsarbeit gemacht.
Woman, 45, couple with children, Klein Borstel (K3: 33)

Ich weiss noch als mein Sohn im Kindergarten war und in der Grundschule auch, ich glaube wir waren zu diesem Zeitpunkt die einzigen Eltern, die kein Auto hatten. Und gerade wenn das so als Statussymbol betrachtet wird: «Oh Gott, die haben kein Auto». Und mein Sohn sagte immer, wir haben kein Auto weil wir es nicht wollen [lachen]. Aber ich merke es auch heutzutage, in Gesprä-chen mit Menschen die man nicht kennt, ich sage ich habe kein Auto, ich sage normalerweise auch ich habe keinen Führerschein. […] Dann sehe ich sofort, dass die Leute kucken: «Oh Gott, was ist das für ein Mensch.» Und dann sage ich, ich wohne in einem Projekt autofreies Wohnen, und dann bin ich schon in einer anderen Schublade.
Woman, 55, childless couple, Saarlandstraße (SA06: 50)

As the last citation showed, children were often directly confronted with this social norm by other children. This was not only the case years ago as in the case of the woman above, but still was in the last years, as the mother of teenager girls reported:

Am Anfang war sehr interessant, als die Kinder mit der Grundschule angefangen haben, gab es Jungs, die sehr gerne angeben: «wir haben zwei Autos, und du hast kein Auto?» Unsere Kinder ha-ben sogar in der Schule eine Präsentation gemacht über das Wohnprojekt, ihre Klasse kam hier mit dem Lehrer, ich habe das autofreie Wohnprojekt gezeigt. […] Aber trotzdem, für Grundschulkinder, besonders bei Jungs, kam nicht so richtig an – «Du hast kein Auto, dann bist du arm!» [lachen] und solche Sachen. Anfangs fanden die Kinder ziemlich störend, dass die Mitschüler so sie als arme oder so sehen. Da habe ich immer wieder mit den Kindern gesprochen, was das ist. Ich musste die ganze Zeit das Wohnprojekt rechtfertigen. Aber mit der Zeit, sehen sie ja, dass sie nicht die einzigen sind und was für ein tolles Wohnprojekt es ist.
Woman, 45, couple with children, Klein Borstel (K6: 37)

These aspects were more stressed in German housing developments than in the Swiss case stud-ies. This may be due to younger children in the latter, who do not already have such experiences, or to the fact that in Swiss cities, overall, more households live car-free. In other words, the "car culture" in Switzerland may be a bit less hegemonic than in Germany.

However, in both countries, the urban context and particularly its mobility culture, at least slightly different from the overall car-centred society, was also emphasised. Often, residents con-sciously chose to live in a city where car-free living is possible and "normal":

Danach bin ich dann nach Münster gezogen […] Das war für mich dann perfekt, auch aufgrund der Fahrradfahrerei. Also kann man schon sagen, dass ich mir immer mehr einen Ort ausgesucht habe, da ist es so eine Normalität, man muss sich nicht unbedingt richtig richtig überwinden, jetzt aufs Fahrrad zu steigen, sondern es ist so normal, macht jeder.
Woman, 50, couple with children, Weißenburg (W8_F: 57)

10.4. Discussion of the hosting potential for car-free living

This last part of the analysis presented the results of the fifth research question: "What is a territory's hosting potential needed to live car-free?" The findings show that different "material artefacts" are crucial: access to urban public transport (bus/tram or local train), good infrastructures to walk and cycle (including paths connecting the housing development to its surroundings and parking for bicycles) as well as local supply (proximity to shops for daily needs) and a recreation area in the surroundings. To sum up, as a resident says, the basic prerequisites for car-free living are access to public transport and local supply:

> *Das sind Grundvoraussetzungen für eine autofreie Siedlung, dass die Anbindung an den ÖPNV,*
> *insbesondere auch an den Bahnhof für den Fernverkehr, und eine komplette Versorgung in den ein-*
> *zelnen Sektoren, das muss einfach gegeben sein. Sonst hat eine autofreie Siedlung von vornherein*
> *verloren, dann würde es auch gar nicht klappen.*
> *Man, 55, childless couple, Weißenburg (W6_M: 126)*

Three types of "material artefacts" are important: mobility (infrastructure in the development as well as location and mainly access of the development), the surroundings' infrastructure (including mainly shops for daily needs and recreation areas) and characteristics of the development itself. The last aspect also particularly links to the social dimension—immaterial aspects important for car-free living. Actually, it appeared, especially in collaborative housing developments, that the other residents play an essential role for many to live car-free and the built environment must therefore allow and facilitate various social activities and encounters by providing common outdoor spaces and rooms. This proves the importance of cultural and social dimensions of a territory's society highlighted by different authors (Döring et al., 2014; Kellerman, 2012; Klinger et al., 2013; Thomas, 2013). And it is in line with the study of the car-free housing development in Vienna-Floridsdorf which found that social cohesion and social contacts were stronger than in the reference settlement and contribute to environmental behaviour (Ornetzeder et al., 2008). Furthermore, the requirement for car-free residential areas to attract residents willing to live in an alternative way has also been stressed (Thomsen & Löfström, 2011, p. 970).

The aim of this chapter was to test if the characteristics highlighted by experts, market surveys or inhabitants in particular existing housing developments are relevant for residents of car-free housing in general. The findings confirm the importance of high-quality public transport as well as safe and direct infrastructure for cycling (including parking) and walking and sufficient local supply (Baier et al., 2004; Blechschmidt, 2016; Dittrich & Klewe, 1996; ILS, 2001; P. Moser & Stocker, 2008; Scheurer, 2001b). Thus, the location is not limited to central sites but rather to good access by public transport and a cycling distance to the city centre (ILS, 2001). Carsharing and mobility services, instead, were evaluated much less important than expected in the literature.

Information and communication technologies mentioned in the theoretical framework need to be added. They have been analysed in the skills' chapter, but constitute at the same time an aspect of the hosting potential of a territory. Even if some smartphone and web applications cover large areas, a lot of mobility-related services (especially for public transport, but also car- or bikesharing) are restricted to a certain city, region or country.

Finally, car-free housing with its hosting potential can result in the empowerment of households living without a private car not only due to the infrastructures which facilitate it, but also thanks to the social context of a community of persons living in the same different way from the overall population. This also helps to emphasise the quality of life of car-free living. In order to develop car-free living, no moral arguments but the positive aspects of lifestyles based on proximity need to be stressed (Holzapfel, 1997, p. 85).

11. Conclusions

The last part of this thesis summarises the results and discussions. The first chapter contains a synthesis of the main findings. Then follows an outlook, including limits of this thesis (as well as of car-free housing) and further research needed. Finally, taking up the attempt of a transdisciplinary research, this thesis proposes five more practice-oriented main messages with different recommendations.

11.1. Main findings

This chapter presents a summary of the different findings, based on a questionnaire survey conducted in nine car-free housing developments in Switzerland and Germany and in-depth interviews with residents in six of these developments. Therefore, this thesis is the first large-scale study of residents of car-free housing developments and sheds light on this type of housing in more than one particular context.

The nine housing developments can be grouped into three types. They all respect certain ecological building standards. The first and main type of car-free housing is part of the growing sector of collaborative housing, it includes six developments. There are three housing cooperatives (FAB-A, Giesserei and Oberfeld) while in Klein Borstel and Saarlandstraße cooperatives and "housing projects" ("Wohnprojekte") exist. Burgunder is formally a rental development, but as residents benefit of partial self-administration, it can be considered a co-housing type. Second, there are two developments that are rather conventional housing developments (Sihlbogen only rental, Stellwerk60 also includes owners), located in big cities and not based on particular organisational aspects. This is also the case for the renters in the second part of Saarlandstraße. A third type is subsidised housing. Weißenburg is a completely subsidised rental development, and in Klein Borstel, Saarlandstraße as well as Stellwerk60 there are subsidised parts. In brief, the housing developments reflect the whole range of car-free housing, also in terms of size (ranging from 20 to 426 dwellings), age (completed between 2000 and 2014) and localisation (in cities of different sizes and in central or peripheral locations within the cities).

Car-free housing developments represent "models" of a "post-car system" (Dennis & Urry, 2009). They emerged in response to the negative impacts of the "system of automobility" (Urry, 2004). Given the impact of car use on air pollution, climate change, but also energy use and space in urban areas, car-free housing developments are real-world laboratories of a mobility transition to overcome the car-centred society in which we live. My research has shown that this is not only a hypothetical ideal, but these developments "work" and can, thus, be seen as "real utopias" (E. O. Wright, 2011). In addition to the light shed on this particular form of housing, my findings also allow to better understand these households living deliberately without a private car. Their strategies to live car-free can actually be generalised to the urban population and do not only apply to residents of particular housing developments. These findings on how to do without a (private) car are relevant to achieve the transition towards low-carbon mobility.

The remainder of this chapter is structured by the five research questions of this thesis. First, the profiles of the residents are addressed, then their motivations and practices how to live car-free as well as the types of lifestyles found among them. Subsequently, the "territory's hosting potential" for car-free living is summed up and, finally, a general conclusion completes the chapter. All relevant empirical findings from the different analyses' chapters are combined in order to answer the five research questions.

11.1.1. Who lives in the car-free housing developments

The residents in the nine car-free housing developments have very particular profiles. In short, families are overrepresented, residents are characterised by a high degree of cultural capital and ethical or altruistic values are important to them.

First, nearly half of the households studied are families (41% are couples with child(ren) and 7% are single-parent families). In three developments (FAB-A, Klein Borstel and Weißenburg) they represent even more than two-thirds of the households. In Burgunder, Oberfeld and Stellwerk60, instead, about one-third are persons living alone—similar to their importance in the nine developments altogether (32%). In the three remaining developments, Giesserei, Saarlandstraße and Sihlbogen, the main types of households (families, persons living alone and couples) are more equally distributed. These distributions also depend on the dwelling sizes available, particularly in the recent developments, and are in most developments based on the will to create family homes which are often lacking in cities. The attractiveness especially for families with young children is reflected by the residents' age. Overall, about one third are less than 20 years old, only 4% aged 20 to 29, half between 30 and 60 years and 10% older. The mean age varies between 28 in Burgunder and 46 in Giesserei, where the aim of a multi-generational house was achieved. At move-in, even more residents were young adults between 30 and 39 with small children.

Second, the residents have a high degree of cultural capital. Nearly two-thirds of the residents aged 15 and older hold a university (or equivalent) degree. Their proportion ranges from 50% in Giesserei up to 78% in Burgunder and is, everywhere, at least the double of the shares in the different cities. Nearly all active residents work in the service sector, the most important types are "professional, scientific and technical activities" (24%; including architects, lawyers, translators or consultants), "human health and social work activities" (18%), "education" (17%) and "information and communication" (11%). Instead, only few residents work in financial or insurance companies. This already shows the third characteristic that will be discussed below: specific values seem to play an important role, working in particular sectors is not a coincidence.

Conversely, the residents are characterised by a rather ordinary economic capital. This may be explained by the high levels of part-time work: in the Swiss case studies (except in Sihlbogen), fewer than 30% of the active residents work full-time and in Germany about half do so. The residents' net household incomes are relatively equally distributed around the overall means in both countries and in line with the housing developments' particular characteristics and the income levels of their respective cities. Even if higher income categories are slightly overrepresented (but relativised by the fact that they mainly appear in large households), all levels of economic capital are found in car-free housing developments, indicating that financial reasons do not seem to be at the origin of the decision to live car-free.

These results based on nine developments with a total of over 1,200 dwellings confirm former research on residents of individual car-free housing developments (Baier et al., 2004; Brosig et al., 2015; Ernst, 2008; Ganitta, 2011; Mantau, 2010; P. Moser & Stocker, 2008; Ornetzeder et al., 2008; Scheurer, 2001a). In contrast, it appears that residents of car-free housing differ from car-free households in general who are mainly persons living alone with low education levels and incomes (Haefeli & Bieri, 2008; Kühne et al., 2018; Mitra & Saphores, 2017; Preisendörfer & Rinn, 2003). However, the residents' profiles are not only specific to car-free housing, research on collaborative housing also found that residents are mainly well-educated middle-income households (Bresson & Denèfle, 2015). Moreover, in urban new-build housing, families with children, high education levels and household incomes are generally overrepresented (Jarass & Heinrichs, 2014; Rérat, 2010; van Raalten, 2012). Lastly, the over-representation of families in car-free housing developments contrasts with the fact that living without a private car appears most difficult for households with young children (Thomsen & Löfström, 2011).

The third key characteristic of car-free housing residents is the importance they attribute to ethical and altruistic values. Their voting intentions indicate extremely high scores for left-wing parties (between 80% and 100%), except in Sihlbogen where they reach 60% and which is the only development where right parties got any votes (11%). Yet, these scores are high even in the urban context of the car-free housing developments where left-wing parties reach about 25% in Germany (Grüne and Linke) and 32% to 53% in Switzerland (mainly SP and Grüne). These voting patterns can be seen as a clear expression of the importance of social and ecological values.

Indeed, the "basic human values" (Schwartz, 2001) surveyed show that the value group of "self-transcendence" is the most important for car-free housing residents. It includes the two value types "universalism" and "benevolence", the three most important items are *"equal treatment and opportunities for every person"* (88% of "(very) important" answers), *"take care of nature, protect the environment"* (82%), and *"devote myself to people close to me, be loyal to them"* (79%). The second important value group, "openness to change", includes more personal values of "hedonism", "self-direction" and "stimulation". The two other value groups, instead, "conservation" and "self-enhancement" reach less than 20% of "(very) important" answers (except one item) showing that "security", "tradition", "conformity" but also "personal achievement" and "power" do not *"serve as guiding principles"* (Schwartz, 1996, p. 2) in most residents' lives.

Furthermore, the residents' leisure activities support the importance of altruistic values, too, as nearly 60% actively co-operate in an association (e.g. environmental organisations or residents' associations). Another aspect is the share of cooperative members which is particularly high (40% of all households) compared to its proportion in the cities studied (the maximum is Zurich with 16%). Considering that the owners in Klein Borstel and Saarlandstraße are part of "housing projects" ("Wohnprojekte") and the renters in Burgunder partly self-administer their development, the part of collaborative and non-conventional housing residents is even higher. Moreover, in the rental developments of Stellwerk60 and Weißenburg, there are residents' associations. Hence, Sihlbogen is the only development without any "particular" social organisation. This may explain why its residents' values differ significantly from the others.

Thus, it is not surprising to find a high importance of values related to the community and environment as these are central or at least part of the concepts of these housing developments. Similar findings were made by research on co-housing projects in France (Bresson & Denèfle, 2015). Finally, the results related to values tend to understand car-free housing residents' motivations as a voluntary choice of a car-free lifestyle or even a political statement. The fact that a majority of residents moved in just after completion (except in Weißenburg and Stellwerk60, explained by rental or subsidised housing) and the low turnover also underline this.

11.1.2. Why households live (in a) car-free (housing)

Before addressing the motivations to live without a private car and to move to a car-free housing development, it is important to note that the results actually confirm that nearly all residents voluntarily live without a private car. Moreover, many respondents stressed that this represents no sacrifice or restriction for them, in line with former qualitative research on carless households (Burwitz et al., 1992; Sattlegger & Rau, 2016; Villeneuve, 2017). A car does not represent a status symbol for the residents. While for some it is a practical or useful tool for some particular situations such as transporting material, most residents are either indifferent to cars or associate a negative meaning with them, e.g. air pollution or the space they take in the city. This attitude towards cars has not always been the same, for some residents it changed when they first moved to a city from the rural area in which they grew up. This transformation of the meaning of a car from a symbol of freedom to feeling more autonomous without owning one has also been stressed by other scholars (Holzapfel, 1997; Kent & Dowling, 2013).

11.1.2.1. Motivations to live car-free

The survey as well as the interviews showed that there are two important types of motivations to live car-free: personal and practical ones. For the first type, convictions (mainly environmental, but also the will to be a good example), preferences (for other mobility modes, former car owners also mentioned the liberty or relief of living car-free) and a negative attitude towards cars (in general or related to cars in cities, based on more emotional or rational considerations) play a role. Practical reasons are either individual, i.e. no need for a car, car-free habits, negative aspects of driving or owning a car (particularly in the city) and the preference for sharing and using instead of owning a vehicle. They can also be related to the context, which provides enough alternative mobility modes or, in general, the fact that a city is adapted for car-free living. In contrast, financial reasons, do not play a decisive role for most residents, but are mentioned in the sense of a preference to spend money (or time) on other things than a car. Health problems and old age are even less important reasons, explained by the profiles of the residents.

The answers of the closed and open question on motivations to live car-free in the survey allow to quantify the importance of the different reasons. In the closed question, nearly all respondents agreed to have no need for a car and access to a sufficient alternative mobility offer, still 85% prefer to spend their money on other things (while only 18% cannot afford a car). 74% agreed to have no car for environmental reasons and only 9% do not drive (anymore) for health reasons. In the open question, environmental reasons were the most frequently mentioned aspect (by 40% of the respondents), followed by no need (38%) and different alternatives (36%). The share of other personal reasons (20%) highlights the importance of this aspect, whereas the mention of the car ban in the development indicates that 12% of the respondents were, apparently, not looking for car-free housing initially.

These results on motivations to live car-free based on a comprehensive study of residents in nine developments allow to confirm previous research on specific car-free housing projects highlighting the particular importance of environmental reasons not only when asked for (Ernst, 2008; Foletta & Henderson, 2016). The analysis of the spontaneous answers in the open survey question highlights the role of ecology, which plays a clearly less important role for car-free households (Preisendörfer & Rinn, 2003). For other reasons, the significance of the absence of a need and the quality of the alternatives confirm general findings, whereas costs, health, and age are clearly less important for car-free housing residents than for car-free households in general (O. Reutter & Reutter, 1996; Müller & Romann, 1999; Preisendörfer & Rinn, 2003; infas, 2018; Brown, 2017). This underlines the particularity of residents in car-free housing developments who are motivated by altruistic reasons and not only by practical ones.

However, the interviews showed that different motivations are generally combined. For nearly half of the residents, personal reasons were predominant and practical reasons secondary, in other words: they want and are able to live car-free. For about one fifth, it is the opposite, they mainly neither need a car nor want one. For a similar group, a combination of practical, personal but also financial aspects explains their decision. Only a few respondents mentioned they do not need and could not afford a car. Recent qualitative research on voluntary car-free households confirms the idea of a combination of reasons and found different types, including predominance of personal reasons (Lagrell et al., 2018; Rigal, 2018; Sattlegger & Rau, 2016) as well as of practical reasons (Deleuil et al., 2017).

11.1.2.2. Motivations to move to a car-free housing development

The motivations underlying the housing choice also refer to practical and personal reasons and are influenced by ecological and particularly by social values. For most residents, the features of the development were essential, particularly in collaborative housing projects. Community or

multi-generational living, participation, self-administration and a cooperative or "housing project" ("Wohnprojekt") played a central role for many residents, but also construction features (energy efficiency as well as shared or common spaces) and child-friendliness. By contrast, the dwelling's characteristics (size, properties, price, etc.), albeit of high importance, were not predominant for a majority of the respondents, in contrast to average residential motivations (Gebhardt et al., 2005, p. 275). However, this is in line with former research on car-free housing (Brosig et al., 2015; Ernst, 2008; Mantau, 2010; P. Moser & Stocker, 2008; Scheurer, 2001b) or collaborative housing (Bresson & Denèfle, 2015).

Similarly, car-freeness in itself is not among the central motivations (Bürgi & Hari, 2013; Ernst, 2008; Mantau, 2010; Ornetzeder et al., 2008). But, inherently, all the related aspects allowing or facilitating car-free living have a very high importance for residential choice: the available mobility offer (public transport and carsharing) as well as the possibility to walk and cycle in everyday life and the location of the development. This is the case not only in car-free housing, but confirmed in an important number of studies on housing choice in urban areas in Western Europe, in the context of the renewed attraction of cities (Beckmann et al., 2006; Hjorthol & Bjørnskau, 2005; Jarass & Heinrichs, 2014; Rérat et al., 2013; Rérat & Lees, 2011; Sandfuchs, 2009). Moreover, often it was not the precise location, but the proximity to local recreation areas, shops, children's schools or the former place of residence that played a role, even if they are less important than the former motivations.

Finally, there are also personal reasons explaining residential choice: mainly the will to live independently from cars and in an environment-friendly way, not only on an individual level, but as a whole community of neighbours, and sharing certain facilities and activities. Residents also highlight what they consider as quality of life: a green, calm, car-free environment favouring social activities. Moreover, quality of life is not only perceived to be higher without owning a car in the immediate residential environment (where green spaces replace parking lots), but also when moving in the city with alternative transport modes.

However, not all residents were initially looking for or had a positive attitude towards a car-free housing development. While for some households already living without a car it did not play any role, others even gave up their car (25% overall) because the social and ecological characteristics of the housing project were more important for them than car ownership. Similarly, the strong wish to live in a community-based housing estate made different households move to a place at the outskirts of a city, a location they would not have considered otherwise. Thus, "residential self-selection" did not apply for all residents. Nonetheless, for most residents it was the case, as living in a city offering a context for car-free living was an important underlying motivation.

Actually, the residential biographies of the inhabitants show that the majority (66% overall, even over 80% in the German developments) already lived in the same city before. Based on the interviews, four residential trajectories can be distinguished: First, residents who grew up and have always lived in the same city. Second, residents who grew up in the city, went away for a certain period (mainly related to education or a job) and came back. Third, residents who grew up elsewhere (in a rural or urban context) and moved to the city before. And fourth, residents moving to the city when moving to the car-free housing development. About two thirds of the interviewees belong to the third group, while only very few are included in the first and a bit more in the second and in the last trajectory. Thus, most of the residents already knew the city before. The importance of collaborative housing among the car-free developments explains this, they require a certain local knowledge and, in most cases, future residents are implicated already before move-in. Nonetheless, the presence of all these different types of residents shows that car-free housing attracts not only former car-free and urban households.

11.1.3. How to live without a (private) car—mobility strategies for car-free living

Based on my theoretical framework, the residents' mobility practices were analysed together with their mobility capital. Drawing on the concepts of "spatial capital" (Lévy, 2003a) and "motility" (Kaufmann, 2011), I defined mobility capital as a combination of accesses and skills necessary to use different transport modes in order to be mobile in space. To understand how this potential mobility is realised, or not, different types of mobility or more general practices implying mobility were investigated: daily mobility, shopping, leisure, and holidays.

I use the term "mobility practices" instead of "mobility behaviour" to highlight an open approach, not based on behaviourism but, among others, inspired by some elements of "social practice theories". Defining practices as consisting of material, competences and meaning (Shove et al., 2012) links them to "a territory's hosting potential" and to mobility capital. Furthermore, practice theories insist on the active role of the individual while not neglecting the importance of the social and material context and the individual's biography (Heisserer & Rau, 2017), linking to the importance of the life course to understand present mobility practices. This approach is particularly adapted as I observed the importance of all these aspects in my empirical work.

This section presents the different underlying mobility strategies that residents adopt to successfully live car-free. Following other researchers in social sciences (Boterman, 2012; Lagrell et al., 2018; Rau & Sattlegger, 2018), based on de Certeau (1988), strategies represent the individuals' leeway, intentional and reflexive decisions taken to control and appropriate space and time. They rely on the importance of habits and routines for mobility practices (Buhler, 2015; Gärling & Axhausen, 2003). To cope with the absence of a private car, the residents apply strategies which can be grouped into four types: first, (augmented) alternative transport modes, second, mobility and transport services, third, car-free accessibility and proximity, and, fourth, the community of car-free residents.

11.1.3.1. (Augmented) alternative transport modes

The first strategy includes access and use of (augmented) alternative transport modes to a private car, including bicycles, public transport and walking. All these transport modes need more or less specific accesses and skills.

The bicycle is a fundamental transport mode for many car-free households. The equipment with cycles is particularly high, even compared to the cities they live in. Only 9% of the households do not own any "normal" bicycle and nearly half of them have more than one bicycle per person. Different types of bicycles serve different uses, including racing bikes, touring bicycles, folding bikes as well as old city cycles to leave at a train station. Particularly in the form of a cargo bike they are often considered as a substitute of the car and even better than an automobile in cities. 5% of the households own a cargo bike, but they are frequently shared between residents and, thus, accessible to many. Similarly, bicycle trailers contribute to upgrading and augmenting transport capacity and allow to carry children or material. For heavy loads, long distances, hilly topographies or persons with limited physical abilities, e-bikes represent another alternative to augment and extend the radius of the bicycle. 13% of the households own one or two e-bikes, up to 30% in Klein Borstel and Giesserei and 20% in Oberfeld—three of the least centrally located developments.

Further equipment such as high-quality rainwear or adapted bikes for wintery conditions permit cycling all year long. Good knowledge of the city's safe and attractive bicycle routes are an im-

portant skill related to cycling, as well as the necessary physical ability to do so. Furthermore, in the cities they exist, bikesharing schemes represent another type of access to a bicycle.

Finally, the residents do not only own bicycles, they also use them more than the average urban population for work-related trips. Compared to data for Swiss and German core cities, the share of cycling is about triple in car-free housing. For daily mobility including all purposes, about two thirds of the residents cycle "(almost) every day" and nearly none never do so. Cyclists highlight the bicycle's flexibility, independence, and velocity in an urban context as well as more personal motivations such as active movement outdoors, in the fresh air, environmental reasons and simple enjoyment.

The other main alternative for car-free mobility is public transport. Depending on the intensity of use, "flatrate" passes on the regional or national level represent the main strategy to facilitate this, adopted by about 60% of the residents. For these cards allowing unlimited access to public transport, there are important differences between the two countries: in the Swiss case studies, between 27% and 45% of the residents own a "GA travelcard", whereas less than 5% in the German developments hold a "BahnCard 100". Instead, between 22% and 64% own a regional pass, compared to only 3% to 31% in Switzerland (except 64% in Sihlbogen). These differences reflect the public transport systems of the relative cities and countries, but are in most developments clearly higher than for the overall urban, even car-free, population. For less frequent users, discount cards (Half-Fare card in Switzerland, BahnCard 25 or 50 in Germany) reduce the fares—overall, about 60% of the residents own one.

Even if some competences are necessary to make use of public transport, knowledge of networks and routes are less important today with the improvement of technological supports (see next type of strategy). However, all residents use public transport, over half use it almost daily. They stress the possibility to use travel time, comfort, transport heavy bags, but also the absence of attractive alternatives (e.g. missing cycling infrastructure).

Inter- or multimodal practices are highlighted as a strategy to combine the advantages and cope with the inconveniences of both modes, such as flexibility or high velocity for long distances. Many residents regularly use both the bicycle and public transport, either on different days or seasons, or for different activities or destinations and distances (multimodal practices), either combined in the same journey (intermodal practices). To reach work or school, about half of the residents combine different transport modes, either for the same journey or on different days.

Walking, an often-underestimated mobility mode, represents another central strategy for car-free residents. Of course, this depends on the spatial context and knowledge of the city, for example to make use of shortcuts or walking between two points instead of waiting for a bus to ride one or two stations. Actually, it is often combined with public transport as soon as trips become longer. "*Walk and carry*" was also mentioned being one of the main practices for shopping, and here, similarly to the bicycle, particular equipment can facilitate transport of heavy goods or luggage for holidays: shopping trolleys or trolley bags but also simply backpacks.

The high shares of accesses to all transport modes stress the particularity of the car-free housing residents within the overall carless population, but confirm on a large scale former individual evaluations of car-free housing developments reporting the importance of bicycles (Bürgi & Hari, 2013; Mantau, 2010; G. Moser, 2009; Scheurer, 2001b) as well as the general availability of public transport passes (Bürgi & Hari, 2013; Ornetzeder et al., 2008).

11.1.3.2. Mobility and transport services

The second type of strategy for car-free living is the use of services to move oneself or transport goods, including car *use*. As a precondition for this, overall, 84% of the adult residents hold a

driving licence, even if the interviews revealed that, today, not all of them would drive anymore. 44% of the respondents have a carsharing subscription, ranging from less than 20% in Saarlandstraße up to 64% in Stellwerk60. This is in line with individual evaluations of car-free housing developments reporting high shares of carsharing members (Brosig et al., 2015; Bürgi & Hari, 2013; Ernst, 2008). Furthermore, 36% of the respondents borrow private cars from relatives or friends and in particular cases (especially for holidays) some rely on rental cars. However, looking at the mobility practices, it appears that most respondents use cars selectively: mainly to transport big or heavy things (71%) or to a lesser extent to visit relatives or friends (48%) and for leisure activities (49%). Overall, at least 90% of the residents use a car less than once per month for any of these reasons.

Still using cars while living car-free may partly be explained by the fact that the majority of the residents has not always lived without a private car. Only 17% overall grew up in a car-free household, which relativises somehow the importance of socialisation during childhood and youth, even if most residents are already accustomed to public transport and cycling since their early years, facilitating the switch to car-free living. After leaving their parents' home, some never owned a car themselves, while others have had one earlier in life, but often only for short periods. They gave it up because of different "key events" such as moving to a city or a new job with other transport modes better adapted to their daily life. A frequently mentioned "key event" not discussed in the literature is not replacing an old car due to various reasons i.e. no need or ecology. A quarter of the households gave up a car just before moving to the car-free housing development (over 35% in Klein Borstel, FAB-A and Stellwerk60, less than 20% in Giesserei and Oberfeld). Hence, car-free housing attracts not only households without private cars but, instead, moving there can represent a "key event" to give up ownership of a motor car or a strategy enabling life without a private car.

Formal services, such as taxis or rideshares, or informal services, such as soliciting a ride from a friend, is a type of car use open to all residents. However, for most of them, taxis are mainly a last resort used only in particular situations such as to reach the train station to go on holiday with luggage or in case of injuries.

For all mobility services as well as the alternative transport modes presented above, there is an important aspect facilitating car-free life nowadays: digitalisation. Information and communication technologies, particularly smartphones, appeared to be crucial for car-free living. They provide several benefits: mobility-related, real-time information, e.g. timetables, location and availability of shared vehicles, maps, but also weather forecast or rain radar important for cycling. Moreover, they offer the possibility to access car-, bike- and ridesharing services or buy public transport tickets. Both aspects facilitate multi- and intermodality, but also to spontaneously adapt trips if necessary. Moreover, digital devices also allow commuters to make use of time spent on public transport, e.g. many can work while on the train thanks to digital devices.

Digitalisation also facilitates shopping. Online shopping allows nowadays to get nearly anything without leaving home. However, based on their social and ecological values, many residents are aware of the negative aspects of the delivery industry and try to use it with parsimony as it also includes considerable car use, although not directly by themselves. Otherwise, when shopping practices are not adapted to the available alternative transport modes, e.g. combined to everyday trips and carried on foot or bicycle, delivery services also play an important role, including vegetable- or fruit-basket subscriptions from regional farms. They are used especially for heavy or large goods. In Hamburg, cargo taxis represent another solution to transport, for example, furniture. Similarly, for holiday travels, there are also services to resolve the luggage issue: sending heavy luggage by post or train before travelling easily without suitcases.

11.1.3.3. Car-free accessibility and proximity

A third type of strategy to cope with the absence of a private car is to favour accessibility by alternative transport modes. This includes proximity which ensures accessibility even by foot. It consists of considering the location and particularly its accessibility without a car for the different activities of everyday life. The location plays the most important role for activities where people can choose and are not restricted by other factors, such as leisure and holidays.

However, many residents also considered the accessibility of their workplace when looking for a new job. As most residents have a high education level and work in the service sector where jobs are mainly located in city centres or at least urban areas, access without a private car is generally possible. In the Swiss case studies, up to 60% work outside the city region in which they live, and, thus emphasise the accessibility of cities in the railway network. In contrast, in the German car-free developments, proximity is preferred, as at least 86% of the employed residents work in the same city (even if they are much bigger than in Switzerland). Another aspect favouring proximity regarding work, allowed by digitalisation, is homeworking and, thus, less frequently working at the office, a common practice for several car-free housing residents.

For leisure activities, accessibility and proximity play an important role. All residents report different activities at home and many also spend an important amount of their free time with their neighbours in the development, particularly in collaborative housing where different community activities happen. Simultaneously, most residents have various leisure activities taking place outside their residential environment, such as attending cultural events (e.g. cinema, theatre, or opera), meeting friends and relatives, sports and outdoor activities such as hiking. As these practices can generally be chosen, most residents consider travelling without a private car whenever possible. Often, the dwelling's surroundings provide enough possibilities for all types of leisure activities. When it is not the case, either residents travel longer distances by bicycle or public transport, or they use rental cars, even if most try to avoid it and do this only when there is no alternative.

For shopping, favouring proximity is the strategy adopted by most car-free housing residents. They mainly do grocery shopping in the surroundings of their place of residence or on markets in the city or district centre they can reach by bicycle or public transport. In some developments, there are even shops or market stands. Accessibility of the shops also comes into play for the other frequent shopping strategy which consists of combining frequent shopping with other everyday trips, such as on the way home from work.

For holiday travels with overnight stays—a frequent activity of residents as about half have done more than five trips in the year before the survey—car-free accessibility also plays an important role. Whenever possible, most residents choose destinations reachable by public transport, which does not mean that they do not travel further, they use, for example, night trains where they still exist. Indeed, to reach their destinations, nearly all residents have used public transport in the year before the survey, but about half have also used cars or flights within Europe. Nevertheless, in the interviews, an important part of the residents reported avoiding using cars and aeroplanes for environmental reasons. However, although on a different scale, the majority of residents favour proximity for holidays: most stayed in their home country or at least in Western Europe.

More fundamentally, the accessibility of the place of residence to satisfy the wish to be independent of a car is crucial, and as seen above represents a central "residential strategy" (Bonvalet et al., 1999). Proximity to different places of everyday life is often researched to allow to move by bicycle or foot. This also relates to social norms and mobility cultures facilitating car-free life in cities, not only available transport infrastructure and short distances. Proximity is often also given in small or rural towns but not linked to using alternative transport modes.

11.1.3.4. Community of car-free residents

A last type of strategy important for car-free living is to be part of a community of open and like-minded persons who collaborate to cope with certain difficulties that the absence of private cars could entail. This is the case particularly in collaborative housing projects.

One aspect is sharing mobility equipment with neighbours. As mentioned above, not every household needs to own a bicycle trailer or cargo bike when neighbours know each other and communicate. Digital solutions such as mailing lists or online forums facilitate residents sharing vehicles or accessories also in a larger group.

Another aspect of the community relates to grocery shopping which represents a challenge for most households living without a private car, particularly for families. As mentioned above, in most cooperative housing developments, the residents organised either a market stand from an organic farmer coming once a week to the housing development, a grocery shop in the development or some form of grouped delivery.

Moreover, different, often informal, social activities probably play the most important role of the community. Common activities taking place in the housing development do not generate any movement (but necessitate common rooms and spaces). Finally, neighbourly help, such as carrying heavy goods for elderly residents or looking after children when parents need to go somewhere, are little practices facilitating living without a private car perceived by many other persons as the only transport mode permitting such activities.

11.1.4. Lifestyles of car-free housing residents

In the analysis of the residents' profiles, clear tendencies appeared regarding their socio-demographic and -economic characteristics as well as the values important to them. However, even if an often important majority stays behind these general trends, there are also considerable differences among the residents. Thus, a typology of lifestyles was established, as this concept allows to understand differences between individuals of similar social status. It also illustrates the different findings related to the residents. As in other similar studies, lifestyles are defined as a combination of values and (especially mobility) practices (Kemper et al., 2012; N. Schneider & Spellerberg, 1999).

The qualitative typology of lifestyles is based on the interviewed residents' values or motivations to live car-free and their mobility practices. On the value axis, there are three types of residents: ecological, pragmatic and utilitarian. For the mobility practices, two types exist: cyclists and multimodals. Drawing on the different individuals present in the six types of lifestyles, the following paragraphs portray a representative "model case" (Kuckartz, 2016, p. 158) illustrating each lifestyle. This case does not represent a person, but similar to an ideal type, illustrates the characteristics and practices of the individuals of each lifestyle.

The "ecological cyclists" live together with their partner and have strong ecological convictions that guide their practices. Therefore, cycling is their preferred transport mode and used whenever possible. Otherwise, they use trains for longer distances and cars a few times per year, only when there is no alternative available. They have never owned a car. Holidays are also influenced by ecological considerations and aeroplanes and cars avoided. Ecological as well as social values also appear in these green cyclists' leisure activities. They do volunteer work in an environmental organisation, often spend time with neighbours in the development, like to meet friends and relatives and practice outdoor sports.

The "ecological multimodals" are persons living alone for whom ecological and social values are guiding principles in life. They like to cycle in the neighbourhood or for leisure, but in winter and

for longer distances, they use public transport. They have a driving licence but do not drive anymore. Instead, their diverse mobility capital allows them to resolve situations where a car would be needed, they use taxis or delivery services. Their ecological convictions also influence holiday travels, they avoid flying and travel mainly in Western Europe. For leisure, they have various activities ranging from outdoor sports to going to the theatre and the cinema. They often participate in activities in their housing development and do volunteer work such as supporting refugees.

The "pragmatic cyclists" have a family and attribute a certain importance to ecological values, but for them, social values are also important. When it comes to mobility, practical motivations also come into play. They use a shared car when it is necessary, but their preferred transport mode is the bicycle. They have a bicycle trailer to transport their children or for shopping. For holiday, they travel by various transport modes, including cars and aeroplanes, even if they try to avoid them. They spend their leisure time mainly with the children, often also with neighbours in the housing development.

The "pragmatic multimodals" are retired persons living with their partner. They find community-related values important and also have ecological convictions. They play a role for their everyday practices, but practical motivations are at least as important: they simply have no need for a car as they live in the city where enough alternatives exist. They can drive and owned a car they gave up long before. Now they use one only exceptionally, either in the form of carsharing or taxis, and plan their activities mainly around public transport. They also walk longer distances or use the bicycle, outdoor activities such as hiking are one of their preferred leisure activities. They often spend time with neighbours or other friends and relatives.

The "utilitarian cyclists" are active persons living with their family in Weißenburg, in the cycling city of Münster. Their daily mobility practices are mainly guided by practical and financial reasons, making the bicycle the first choice. They recognise its ecological value, but it is not decisive for their modal choice. They have a cargo bike to transport their children and for shopping. Cars are a useful alternative for them, either when they are more comfortable or cheaper than public transport to travel with the whole family. Their leisure activities take place in the development or outdoors and holidays are spent in the country, where they mainly travel by train for longer distances.

The "utilitarian multimodals" are persons living alone in a rented dwelling. For them, ecological values do not play an important role. Their mobility practices are based on rational motivations how to move best in the city, in terms of speed and money. They could afford a car, but as they do not need it in everyday life, they use carsharing when public transport is not available or attractive enough. They are not very rooted in the development and spend their leisure time either at home or outside. For holidays, they travel throughout the world and, thus, often by aeroplane.

All six lifestyles are similarly frequent, the pragmatic types a bit more (eleven cyclists, ten multimodals) than the others (sixteen each, nine ecological cyclists and nine utilitarian multimodals). Instead, their distribution in the different housing developments is very different. In Weißenburg, only the three cyclist lifestyles exist (and half are utilitarian) and in Sihlbogen only the three multimodals (three out of five are utilitarian). In Saarlandstraße with its three different parts, all lifestyles are present, while in the three remaining developments, there are mainly pragmatic or ecological lifestyles. These differences reflect the characteristics of the housing developments, in subsidised housing more utilitarian lifestyles are found and in co-housing projects, ecological lifestyles are more frequent. Furthermore, they also relate to the city's "mobility culture": in Münster, there are only cyclists and in Zurich only multimodals. Thus, these results confirm the importance of infrastructures, but also the social context—leading over to the last research question of this thesis.

11.1.5. A territory's hosting potential for car-free living

Besides individual aspects, the spatial and social contexts—"a territory's hosting potential" (Kaufmann, 2012)—also need to be addressed to understand residents in car-free housing developments and what is necessary for a life without a private car. The hospitality potential includes "material artefacts" including transport and other infrastructures as well as immaterial aspects, relating to laws and particularly social norms.

Before addressing these different elements, it is important to relate the residents' positive evaluation of the suitability of their housing developments to live without a private car: about two-thirds answered "very suitable" and nearly 30% "suitable". Only three of the 484 respondents answered "not at all" or "rather not suitable". However, different deficiencies related to the particular developments were mentioned, they will be addressed in the following paragraphs. Furthermore, all but one of the interviewed residents reported no plans to move in the near future. This is another indication of their satisfaction and proof that car-free housing "works" and is considered in the long term. Similarly, nearly all residents interviewed were generally very satisfied with their housing development, but nonetheless mentioned particular aspects which should be improved to facilitate car-free living. Many parents' satisfaction was directly related to their children. They see a car-free housing development as a perfect context for them to grow up.

The "material artefacts" can be divided into three types: mobility infrastructure, the surrounding neighbourhood's infrastructure and characteristics of the development itself. Overall, the survey showed that a bus or tram stop at a maximum of five minutes away, proximity to a local train station, safe and easily accessible bicycle parking, safe and direct walking and cycling infrastructure in the surroundings, shops for daily needs, and a local recreation area are the five most important "material artefacts" for car-free living. They were all evaluated as "(very) important" by over 60% of the residents. A series of aspects are secondary: carsharing in the development, proximity to a long-distance train station and the city centre as well as services, nurseries and schools at a maximum five minutes' walk. Restaurants, cafés and bars as well as mobility services in the development are, instead, unimportant for most residents.

For mobility, the infrastructure in the development and its location, or particularly its access, are relevant. For the first type, bicycle parking was stressed. It needs to be of high quality, e.g. with drivable ramps to access underground parking, or at least provide enough covered and secured parking spaces. As the average number of bicycles per household is very high, parking must be of consequent dimensions. Given the importance of cycling, bicycle workshops as well as (informal) cargo-bike or bicycle trailer sharing are other material artefacts facilitating car-free life. The availability of carsharing—within the car-free housing development or at a short distance—was often addressed.

While the location of the housing development in itself appeared insignificant, its accessibility by public transport as well as by bicycle is essential. This includes, on the one hand, short distances to urban public transport lines (but also easily accessible vehicles and platforms, including ramps or elevators at stations e.g.) with a high service level and, on the other hand, attractive bicycle routes to reach the city centre or other important places of everyday life. Thus, the distance to the city centre (including a long-distance train station, more important in Switzerland with high shares of inter-urban commuters) seems limited by an average cycling distance or the extension of the urban public transport network. As many residents are multimodal and both transport modes have their advantages and inconveniences, both should always be considered, even in cities with a strong cycling or public transport culture.

The important role of these material artefacts related to transport infrastructure is also reflected by the differences appearing in the mobility practices between the housing developments. In

Sihlbogen in the "public transport city" of Zurich, residents mainly use this mode and 20% of them cycle less than before move-in. In three developments, instead, the bicycle is clearly dominating and public transport less used: in FAB-A (mainly due to its location in the centre of a medium-sized city) as well as in Stellwerk60 (relatively distant from rail bound public transport, 60% cycle more often than before move-in) and Weißenburg (explained by the strong cycling culture existing in Münster). Similarly, in the developments with the longest distances to the city centres the increase in train and bus rides reaches up to 45% (overall, 27% use more and 8% less public transport). Furthermore, even if overall, a majority has not changed their driving practices, about 44% of the residents have reduced car use (up to 73% in Klein Borstel) and only very few drive more than before (due to the availability of carsharing on site, but also other coincidental changes such as the birth of a child). Remembering that most residents already lived in the same city before, the fact that for a large majority, mobility practices have not changed, also backs the importance of the built environment (as well as the one of habits and routines for mobility practices).

For the surroundings' infrastructure, local supply—shops and services for everyday needs—is considered a basic condition for car-free living. Another important aspect are recreation areas nearby such as parks or woods. Other facilities, instead, are less important as they do not concern every household. But given the high presence of families, schools or nurseries play a certain role—many developments even include a nursery which is central for many parents. Cultural or gastronomic infrastructures are clearly less important as they are visited less frequently. Conversely, a larger car-free or at least car-reduced environment is wished by most residents to benefit from the absence of motor cars not only within their housing development.

Finally, beyond mobility-related aspects, the development itself has a certain number of relevant characteristics. It should be preferably located on a calm and emission-free site. The importance of local supply can also be met within the development, it can take several forms such as a weekly market stand, a food cooperative or even a grocery shop. Waste management should also be facilitated and recycling stations provided as this can constitute another complicated issue for car-free households. Then, the design of the development should include large, diverse and high-quality outdoor spaces to favour different (common) leisure activities. This was mainly highlighted in collaborative housing, but applies to all developments. Similarly, the residents stressed the importance of shared amenities (e.g. common halls, guestrooms) to allow collective activities.

For many residents, social aspects are crucial to live car-free because they can facilitate or avoid mobility, for example shared spaces and neighbours with whom you like to spend time. Moreover, the group of other households living without a private car also empowers this way of life and creates a sense of community because the residents are different from the majority of the society (although not in all cities, at least compared to the regional or national level). Finally, overarching social and cultural norms were also mentioned, especially for families it is still perceived "normal" to own a car. However, a certain change is observed and especially the cities these car-free households live in provide a mobility culture where it is more and more common and as "normal" to live car-free and cycle or use public transport as to own and drive a car—or even becoming the new "normal" urban way of life.

11.1.6. Conclusion: a system of car-free mobility

Even if there are some variations between the nine housing developments, my research suggests that, overall, environmental and social values influenced households in their housing choice and the more general decision to live car-free to a considerable degree. However, for many of them, the practical aspects facilitating car-free living were important as well. In other words: pragmatic reasons may explain the desire to live without a private car, but ecological and social motivations

may explain the long-term commitment that is only reversible by moving out of a car-free housing development. To sum up, it is a combination between willingness and feasibility to live car–free, on a personal level and according to the spatial context.

Hence, to overcome the "system of automobility" (Urry, 2004), different individual strategies as well as a territory's hosting potential allowing car-free living are necessary. Four types of strategies to live car-free have been found in the analysis of car-free housing residents' mobility capital and practices: (augmented) alternative transport modes, mobility and transport services, car-free accessibility and proximity, and community. They reflect the strategies found in other studies on car-free households, including communicative, organisational but also accessibility aspects, in particular "accessibility by proximity" (Lagrell et al., 2018; Rau & Sattlegger, 2018).

Finally, to achieve the mobility transition, not a single strategy, but a whole system of car-free mobility with alternative solutions for every need has to be set up by car-free housing residents— and allowed by the territory's hosting potential (see Figure 50). In analogy to the "automobile system", a resident mentioned that he created a system of car-free mobility in his life:

> *Das ist ein Systemdenken. Während für einen Automobilisten nichts ohne das Auto denkbar ist, ist es für mich umgekehrt: das Auto ist sowas von sinnlos, wertlos. Ich habe alles ums andere herum gebaut, ich habe jedes Problem für sich gelöst.*
> Man, 50, living alone, Sihlbogen (SI1: 36)
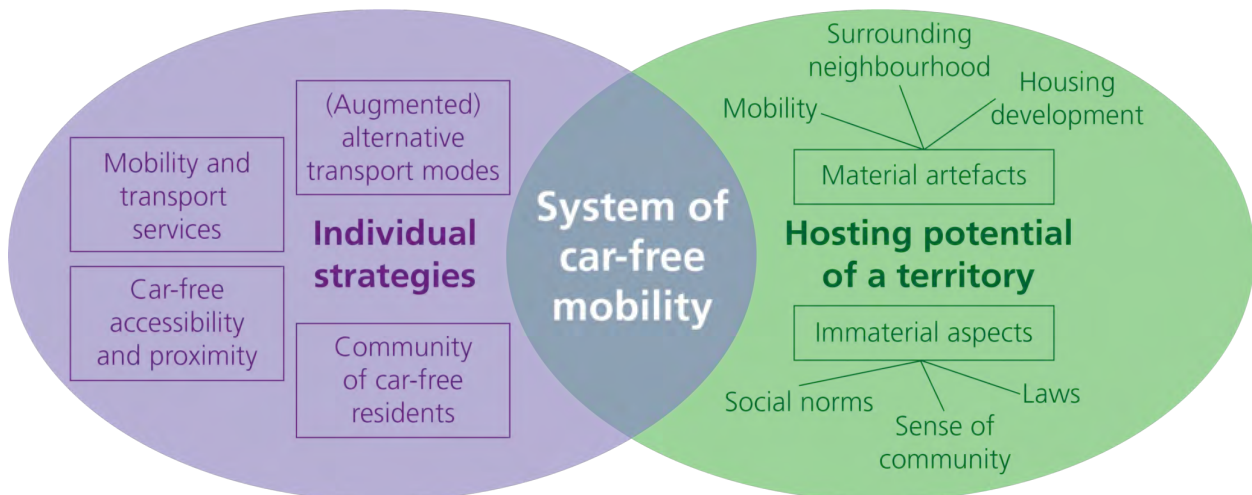
Figure 50: System of car-free mobility

Indeed, only few households reported difficulties with car-free living, and mostly very limited to particular situations (e.g. a relative with health problems or a disability) or places which need to be reached (e.g. for leisure activities, parties or holidays) but are not accessible without a car or not adapted to carsharing use. However, most residents state this does generally not represent a problem and often just needs some more organisation or planning, emphasising the importance of competences to build up a "system of car-free mobility" (or at least without car ownership) to satisfy all mobility needs. Indeed, car-free living—particularly for former car owners—is often perceived as more complicated than satisfying all mobility needs with one transport mode, even if the benefits quickly appear, as Holzapfel (1997, p.15) noted already over 20 years ago[73].

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[73] *"Leben ohne Auto erfordert von Autonutzern Umstellungen, etwa bessere Organisation und Vorplanung, doch nach einer Weile lassen sich Vorteile (etwa die Arbeitsmöglichkeit in Zügen) nutzen und das Autoleben wird als Chaos identifizierbar."* (Holzapfel, 1997, p. 15)

11.2. Limits and future research needs

As any research, this study has some limits which represent topics for future research. Even though the results were compared to overall urban data or studies on other new-build neighbourhoods, it focused only on car-free housing developments. Thus, a direct comparison between similar housing developments in the same city would allow to address different topics more in detail, as Ornetzeder et al. (2008) did over ten years ago in Vienna. Their study points at another aspect that I had deliberately not addressed in my thesis: quantitative analysis of energy consumption or the carbon footprint of car-free housing residents. This should also be compared to other (urban and/or car-free) lifestyles in order to calculate if car-free housing residents live more sustainably. Based on my results, car-free living represents an important potential to contribute substantially to more sustainable mobility, as it is generally based on ecological motivations influencing also the residents' other practices such as holiday travels. However, as we have seen, there are also other lifestyles including residents who regularly fly and have an important carbon footprint.

A completely different perspective should also be further developed: detailed qualitative work on residents' mobility biographies. I integrated this approach in the interviews, but as it was one aspect among others to answer my different research questions, it was not detailed as much as it could—and should—be to understand in detail the residents' life courses with all their transitions and "key events" as well as the underlying reasons.

The organisation of car-free housing developments, including the resident's commitment to car-free living, social control, but also the whole planning process with the different actors are other questions which should be further investigated to understand car-free housing.

Moreover, I studied only two countries which are not completely different but share a common culture, at least compared to other contexts. Therefore, it would be interesting to investigate car-free housing developments—even if they are quite rare—in other national and cultural contexts to understand if there are differences related to these. Furthermore, the effects of car-free city centres and existing neighbourhoods that are realised or at least planned in several cities represent another interesting topic to complete our knowledge about the contribution of car-free areas to mobility practices and urban development.

Future research would also be needed to better understand other types of (voluntarily) car–free households, their motivations and practices. And, in a perspective of an ecological transition incompatible with a car-centred society, it would be necessary to analyse why households in cities still own cars and how they could change their practices.

On a societal scale, further scientific research on car-free housing, but also car-free neighbourhoods and city centres, is an important contribution to visualise and encourage these "real utopias" (E. O. Wright, 2011).

Finally, leading over to the practice-oriented part of the conclusions, car-free housing as such has also limits. Residents need to be willing to accept the restriction of not to being allowed to own a car. In the case of private (or even public) ownership of the development, it is crucial that car-freeness is not only seen as a detail or even problematic, but supported and actively communicated in order to prevent to attract car-owning households not willing to *play the game* of car-free living.

As mentioned before, a certain spatial, but also social, context is needed for not being restricted in everyday life without a private car. These conditions are given in most urban contexts in Western Europe, but there are important differences related to distances, public transport, cycling infrastructure and local supply. Future research could also further investigate the territory's hos-

pitality potential for car-free living to understand in which spaces it is possible and what needs to be adapted and proposed to make it attractive in less central urban areas.

Another question is to understand if car-free housing developments—and my empirical results—can be "upscaled", in a spatial perspective, to a bigger neighbourhood or even an entire city, or, on an individual scale, to a broader population. The particular profiles of the residents living now in car-free housing developments may be seen as an argument against this. However, early adopters of a phenomenon probably never reflect the average population. The residents have now proven that car-free housing is realisable and works without (major) restrictions. Thus, it has in my view the potential to grow from a niche to a new standard of urban development. As my results show, there is already a diverse population in developments which are not based on a particular organisational form such as co-housing. Therefore, I think that a current limit of car-free housing—its unattractiveness for individuals not looking for the social aspects characterising collaborative housing—needs to be overcome to address the whole society. Further development of all types of housing forms without car parking may also attract more households currently owning a car because they live in a context where it would be difficult without. Many of my results are independent of particular values, but based on practical issues which can and should be upscaled in order to further develop car-free or at least car-reduced and less car-dependent urban areas with all their potential benefits. Furthermore, these results could also be adapted to existing neighbourhoods, especially those built before the democratisation of the car with structures which—potentially— highly facilitate car-free living and where often already many residents do not own cars.

11.3. Main messages and recommendations

This research proposes five main messages in order to link the diverse aspects raised by the residents in the survey and in the interviews conducted. As mentioned in the introduction, these messages are more practice-oriented. This is in line with the transdisciplinary approach by which this thesis was inspired, i.e. addressing a real-world problem which was defined including practical experts and with the aim to create knowledge that is transferable to both scientific and societal practice (D. J. Lang et al., 2012, p. 27). Accordingly, recommendations are proposed for every message. There are two levels, corresponding to the territory's hosting potential and an individual's mobility capital. On the spatial and infrastructural level, cities (and even whole countries) need to adapt to car-free living, i.e. freeing public spaces from cars and overcoming the car-centred spatial development established in the last century. On the individual level, practices can also be adapted independently from the socio-spatial context in which one lives, and new skills acquired if necessary. Thus, the recommendations are addressed to interested individuals as well as at the different actors of mobility, housing, and urbanism, including especially policymakers.

11.3.1. Ecological convictions are important, but not necessary

> Car-free living and housing are often based on ecological convictions, but it is also possible without—it does not represent a sacrifice, but can be based on pragmatic and utilitarian motivations to have access to and use all forms of mobility.

Even though some particular profiles are clearly overrepresented, a diverse population is present in car-free housing developments. The majority may attribute high importance to ecology and community living, but also residents for whom altruistic and ethical values are not essential to live in car-free housing developments. The six types of lifestyles also show the diversity of practices and values among the residents.

This is reflected by the three types of car-free housing. While the majoritarian type is collaborative housing, a particular form not suitable for everyone, as it is based on social values. Instead, the two other types show that these particular values are helpful, but not necessary. Car-freeness can also work in conventional (rental or even owner-occupied) housing based only on practical aspects: in dense urban areas, mobility and other infrastructures and services facilitate car-free living to an extent that it becomes desirable (or at least imaginable or not questionable) for broad parts of the urban population. In the third type of car-free developments, subsidised housing, households with limited financial resources benefit from and are encouraged by an environment adapted to car-free living and not restricted in their daily life by the absence of a private car. Actually, in almost all nine developments at least 90% (except 80% of Sihlbogen) live deliberately without a private car.

Different recommendations can be derived from the message that car-free housing represents an alternative in most urban areas. First, the territory's hospitality potential must be adapted in the whole city, not only in small housing developments, to make car-free living attractive.

When practical aspects and quality of life are highlighted and particular services provided or easily accessible, car-free housing can be attractive for most urban residents. Hence, dwellings for all types of households should be provided, not only big flats for families (often missing in cities), nor only small residences for young adults or elderly persons more often living alone. The material artefacts necessary for car-free living are more important in the absence of ecological or social motivations to live car-free or in a co-housing project and, thus, need to be as complete as possible.

For an individual, the access barriers to car-free mobility should be as small as possible. In the context of a growing sharing economy and in the "age of access" (Rifkin, 2000), mobility services (including carsharing, carpooling or bikesharing, but also public transport) must be easily available when they are needed. This is more and more developed under the term "Mobility as a Service (MaaS)" (Jittrapirom et al., 2017)[74]. In this sense, a mobility offer including all types of transport modes, affordable for all households must be further developed and, at best, linked to housing as this is the case in some car-free housing developments (e.g. public transport vouchers in Sihlbogen). An all-in-one offer would certainly convince more citizens, independently of ecological or social values.

11.3.2. Car-free living can be learned

Car-free living and housing needs certain accesses and skills which can be acquired and learned at any moment in the life course.

Living without a private car without being restricted needs certain accesses and mobility skills. For the former, this means mainly owning bicycles and public transport passes, but to access cars also a driving licence and a carsharing subscription e.g. Furthermore, a series of skills are necessary to make use of these alternatives in every situation. They should particularly not represent an important effort, compared to owning and driving a car for all trip purposes.

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[74] MaaS packages are increasing. In Switzerland, for example, "zenGo" was launched at the regional level in Geneva and Lausanne, combining a public transport pass and a bikesharing subscription with vouchers for taxis, car rental and carsharing (zenGo, 2019). On the national level, there is "Green Class" including a General Pass for public transport, car- and bikesharing subscriptions, but also a pass for parking at the railway station and a private electric car – thus, it is accessible only for relatively wealthy customers (SBB, 2019).

Car-free living is not limited to individuals who have never lived in a car-owning household. Only a small majority of the residents has grown up without a car in the household and always lived car-free ever since. Most residents had to learn, a quarter of them after moving to the car-free housing development. And with all the new developments in the mobility offer (car- and bikesharing, smartphone apps, etc.), all had to acquire new skills to make use of them. However, this does not mean that previous experiences, especially during childhood and youth, are unimportant. On the contrary, my research confirmed that socialisation with alternative mobility modes or multi-/intermodal practices seems to favour car-free living. Actually, it appears that, overall, most residents used all transport modes before in their life, all types of trajectories including car-owning and car-free phases are observed. This also shows that different "key events" can take place at any moment in a resident's life course and lead them to give up (or not buy) a car, despite car purchase being a common reaction to the birth of a child for most parents, for example.

This message implies that car-free living is an option for most urban residents and not only for a minority which never got used to car ownership and its advantages and has the accesses and skills to be mobile without. Furthermore, it highlights the importance of socialisation with all transport modes. Thus, as this is the case in Switzerland and Germany, but challenged by some evolutions such as parents more and more driving their children to school, kids should learn to be mobile on their own as soon as possible, for example, walking, cycling or using public transport to go to school. Hence, they get used to these different mobility modes, and, as habits are crucial for daily mobility, are more likely to continue to use them. They also acquire all the necessary skills to use alternative transport modes to the car. Moreover, accesses and competences to be mobile without a private car-free should be as easy as possible to facilitate adopting them also later during the life course. In addition, courses for particular services and groups, such as those already existing for elderly people on how to use public transport, should be further developed.

11.3.3. Digitalisation facilitates car-free living

Digitalisation, and particularly smartphones, facilitate car-free living and housing.

The most important aspect simplifying car-free life nowadays is digitalisation. Information and communication technologies (ICT), particularly mobile devices such as smartphones with their applications, are crucial for car-free living.

These technologies provide not only relevant real-time information (e.g. maps and timetables) and access to all the different transport modes, but also allow to handle transport issues (via online shopping and delivery or luggage services). Furthermore, digitalisation enables to work at home or to make use of time spent in public transport. More basically, they simply allow direct communication nearly everywhere which can also be essential to plan and organise trips—and adapt them when something unexpected happens. Finally, digitalisation and smartphones are also the precondition to develop "Mobility as a Service".

Recommendations based on this message imply different types of "material artefacts". First, a powerful ICT infrastructure (including for mobile communication) is the foundation for all digital services. Second, such mobility services are needed. An increasing number of smartphone applications have already contributed to this, but can still be improved and developed. An application including all transport modes, proposing for a given itinerary all alternatives available and, moreover, allowing to book, access, use and pay them is still far from being available on a large scale[75],

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[75] First applications have been launched on a regional scale, such as "Jelbi" in Berlin, including public transport, car-, electric scooter-, and bikesharing and planning to add ridesharing, taxis, and e-scooters (Jelbi, 2019).

but would facilitate car-free living. In the absence of such an encompassing solution, small improvements would already be helpful. For holiday travel, it is often much easier (and also cheaper) to find and book a flight to any destination in the world than an international train journey, especially when it includes more than two countries.

On an individual level, access to digital devices and the necessary skills to use them are needed. However, they seem to be given, except maybe in the elderly generations for whom it could be necessary to offer workshops.

11.3.4. Car-free living needs more than infrastructure and services

Car-free living and housing needs more than infrastructures and services, it must also be possible socially—hence, a community of car-free residents is helpful.

Car-free living in general and car-free housing developments in particular rely on certain infrastructures and services. Without them, both are impossible. A built environment allowing to move on foot, bicycle, or public transport is for example necessary. Local supply and not only shopping centres difficult to reach without a car are essential for car-free households. Public transport must not only be nearby and accessible (both stations and vehicles), but also proposing high quality, i.e. frequent services, reliability, a dense network to reach any place at any time, etc. However, all these necessary "material artefacts" proved to be only one side of the coin, at least to make car-free living and housing an option for broad parts of the population and not only for a small group of convinced ecologists. The other is a social context making it possible. This includes two different aspects. On the one hand, a social community of residents sharing car-free living is an important first step. It empowers less convinced individuals and facilitates living without a private car for all residents through neighbourly help and common activities taking place in the housing development. On the other hand, this also points to social norms. Even if they are changing more and more, car-free households (and particularly families) still represent a minority in the car-centred societies of both Switzerland and Germany.

Two types of recommendations can be derived from this message. The first relates to "material artefacts" necessary for car-free living. Even if the analysed urban areas already offer an acceptable context to live without a private car, there is still much to be done. Cycling infrastructure is generally incomplete, or at least insufficient, even in cycling cities such as Münster. Cycling parking is another important issue to be addressed, particularly in the context of growing diffusion of e- and cargo bikes. Then, public transport could in most cities also be further improved, an attractive offer is needed not only during rush hour but also on Sundays and evenings or even during the nights in bigger cities. Besides mobility, decentralised infrastructure is needed for shops and services. Additionally, car-free (or at least car-reduced) city centres or neighbourhoods can contribute to increase security and visibility of alternative transport modes, and, thus, to "normalise" them.

This leads over to the other type of recommendations which relates to social and cultural aspects. They are more difficult to address and change, even if municipalities can influence them with image campaigns or by adapting laws. Construction laws need to be changed, for example, making car-free housing not a particularity anymore, but similarly arguing why car parking is needed when new dwellings (or shops, offices, etc.) are built. However, in free, democratic countries social norms essentially need to change from within society. In this context, car-free housing contributes to not viewing car-free living as utopian anymore, but considering it as a viable (or even the most common) form of urban living. Municipalities and mobility service providers can also encourage this with experiments where car-owning households can test and, thereby, experience car-free

living. A recent example in Hamburg shows that this can lead many households to giving up their car (Schröder, 2019).

11.3.5. A contribution to current challenges

Car-free housing developments represent a solution for current challenges such as the climate crisis, an ageing and individualising population, or the housing crisis in many cities.

On a more general level than the former messages, the analysis of the nine car-free housing developments and their residents has shown that they may represent a solution for many current challenges urban Western societies are facing.

First and foremost, they offer a response to the different problems related to the climate crisis (and also more generally the automobile system). As detailed, cars and car-related mobility and spaces have a long list of negative outcomes which no technological evolution will be able to resolve, such as the important space needed for driving and parking. Thus, an urban form not based on personal cars, or even car-related mobility in general, constitutes an essential part of an ecological transition, given the weight of transport in energy consumption and greenhouse gas emissions. Car-free residents also contribute to socially and economically sustainable neighbourhoods by favouring local supply and neighbourly help. Of course, they only have an overall positive effect if their other practices, particularly holiday travels, are also in line with their everyday life.

Other challenges met by car-free developments are related to housing. In many cities, there is a housing crisis, due to an excess of demand and a shortness of supply. When (spatial and financial) resources are not attributed to cars, but to dwellings for people, the housing shortage can be resolved faster. Moreover, car-free housing also contributes to the necessity for new buildings to correspond to our changing needs of flexibility, openness, and space for community—even more important as only about 1% of the housing stock in Switzerland is renewed every year (Glaser & Hagn, 2018). So, new-build housing should not continue to add to the housing market what is already sufficiently available but less required, such as car parking in urban areas (Plattform autofrei/autoarm Wohnen, 2019c).

Car-free housing also constitutes an answer to societal changes such as overageing as it is adapted to elderly people: it allows to be mobile and reach shops and services without a car and, therefore, creates no problems when residents cannot drive anymore due to health reasons. Particularly in its collaborative form, car-free housing also addresses the increase in (elderly) persons living alone but showing a desire for community—"sociable individualists" (Breit, 2018).

This message encourages thinking of broader issues, such as the climate crisis. Recommendations mainly address politics which need to encourage and facilitate car-free housing, or, at best, car-free living in general as part of an ecological transition.

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Appendix

1. Survey questionnaire (Swiss version)

Ihr Leben in einer autofreien Siedlung und Ihre Mobilität

Ihr Haushalt und die Wahl Ihres Wohnorts

1. In welcher Art von Haushalt leben Sie?

1 O Ein-Personen-Haushalt   2 O Paar ohne Kinder   3 O Paar mit Kind(ern)

4 O Alleinerziehend mit Kind(ern)   5 O Wohngemeinschaft   6 O Anderes: ....

2. Wie viele Personen leben in Ihrem Haushalt (Sie eingeschlossen)? [   ] Person(en)

3. Wie wichtig waren für Sie und die anderen Mitglieder Ihres Haushalts die folgenden Merkmale bei der Wahl Ihrer Wohnung?

	Überhaupt nicht wichtig	Nicht wichtig	Eher nicht wichtig	Eher wichtig	Wichtig	Sehr wichtig
Merkmale der neuen Wohnung (z.B. Grundriss, Grösse, Komfort, Preis)	1 O	2 O	3 O	4 O	5 O	6 O
Merkmale der Siedlung (z.B. ökologischer Baustandard, Gestaltung, Gemeinschaftsräume)	1 O	2 O	3 O	4 O	5 O	6 O
Autofreiheit der Siedlung	1 O	2 O	3 O	4 O	5 O	6 O
Bewohnerschaft der Siedlung	1 O	2 O	3 O	4 O	5 O	6 O
Kindgerechtes Umfeld (Spielplätze, Kitas, Schulen, usw.)	1 O	2 O	3 O	4 O	5 O	6 O
Lage der Siedlung	1 O	2 O	3 O	4 O	5 O	6 O
Nähe zum Arbeitsort	1 O	2 O	3 O	4 O	5 O	6 O
Möglichkeit, sich im Alltag mit dem Velo oder zu Fuss fortzubewegen	1 O	2 O	3 O	4 O	5 O	6 O
Mobilitätsangebot (öffentlicher Verkehr, Carsharing)	1 O	2 O	3 O	4 O	5 O	6 O

3a. Gibt es andere Punkte, die bei der Wahl Ihrer Wohnung wichtig waren?

....

4. Wie viele Zimmer hat Ihre Wohnung? *(ohne Küche und Bad)* [ ],[ ]

5. Wann sind Sie in diese Wohnung eingezogen? Monat: [ ][ ] Jahr: [ ][ ]

6. Sind Sie...

1 O Mieter*in   2 O Eigentümer*in   3 O Genossenschafter*in

Ihr Leben ohne eigenes Auto

7. Gibt es in Ihrem Haushalt ein Auto?

1 O Ja: → *7.1. Weshalb haben Sie in Ihrem Haushalt ein Auto?*

....

7.2. Haben Sie vor, Ihr Auto abzuschaffen?

1 O Ja → *Weshalb und wann?* ....

2 O Nein → *Weshalb nicht?* ....

→ *Bitte gehen Sie weiter zu Frage 8.*

2 O Nein: → *Bitte beantworten Sie alle folgenden Fragen:*

7.3. Weshalb leben Sie in Ihrem Haushalt ohne eigenes Auto? *Bitte höchstens drei Gründe angeben.*

....

9. Wie wichtig sind für Sie die folgenden Merkmale einer Siedlung grundsätzlich, um ein Leben ohne eigenes Auto zu führen?

	Überhaupt nicht wichtig	Nicht wichtig	Eher nicht wichtig	Eher wichtig	Wichtig	Sehr wichtig
Folgende Einrichtungen in der Siedlung oder höchstens 5 Minuten zu Fuss davon entfernt:						
– Läden für den täglichen Bedarf	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
– Dienstleistungen (z.B. Post, Arzt)	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
– Restaurants, Cafés, Bars	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
– Kitas und Schulen	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
– Bus- oder Tram-Haltestelle	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Carsharing-Standort in der Siedlung	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Mobilitätsdienstleistungen in der Siedlung (z.B. Veloanhänger-Verleih)	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Sichere und leicht zugängliche Velo-Abstellanlagen in der Siedlung	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Sichere und direkte Fuss- und Velo-Wege im Umfeld der Siedlung	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Nähe zu einem S-Bahnhof	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Nähe zum Fernverkehrs-Bahnhof	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Nähe zum Stadtzentrum	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Nähe zu einem Naherholungsgebiet (z.B. Park, Wald)	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○

✍ Gibt es weitere wichtige Merkmale einer Siedlung für ein Leben ohne eigenes Auto?

....

....

10. Wie geeignet ist die autofreie Siedlung, in der Sie wohnen, Ihrer Meinung nach für ein Leben ohne eigenes Auto?

1 ○ Sehr geeignet 2 ○ Geeignet 3 ○ Eher geeignet 4 ○ Eher un-geeignet 5 ○ Eher un-geeignet 6 ○ Unge-eignet 8 ○ Sehr un-geeignet

✍ Haben Sie Bemerkungen zur Eignung Ihrer autofreien Siedlung?

....

7.4. Hatten Sie oder eines der Mitglieder Ihres Haushalts vor dem Einzug in die autofreie Siedlung ein Auto, das Sie abgeschafft haben?

1 ○ Ja
2 ○ Nein

7.5. Ist das Leben ohne eigenes Auto für Sie mit Schwierigkeiten verbunden (z.B. Aktivitäten, auf die Sie verzichten)?

1 ○ Ja: → Mit welchen? ....

....

2 ○ Nein

7.6. Treffen die folgenden Gründe für ein Leben ohne eigenes Auto auf Sie und Ihren Haushalt zu oder nicht?

	Trifft zu	Trifft nicht zu
Mein Haushalt braucht kein eigenes Auto.	1 ○	2 ○
Ich fahre / Wir fahren aus Gesundheitsgründen nicht (mehr) Auto.	1 ○	2 ○
Es gibt genügend gute Alternativen zum eigenen Auto.	1 ○	2 ○
Mein Haushalt kann sich kein Auto leisten.	1 ○	2 ○
Mein Haushalt gibt das Geld lieber für anderes aus.	1 ○	2 ○
Mein Haushalt hat aus Umweltschutzgründen kein Auto.	1 ○	2 ○
Mein Haushalt lebt freiwillig ohne Auto.	1 ○	2 ○

8. Wie viele Zweiräder gibt es in Ihrem Haushalt? *Bitte in allen Kästen die Anzahl angeben.*

1 [ ] Velo(s)   2 [ ] Elektrovelo(s)   3 [ ] Lastenvelo(s)

4 [ ] Motorräder, Roller, Mofas   5 [ ] Andere: ....

Ihre Mobilität

11. Inwiefern stimmen Sie mit diesen Behauptungen überein?

	Überhaupt nicht einverstanden	Nicht einverstanden	Eher nicht einverstanden	Eher einverstanden	Ziemlich einverstanden	Völlig einverstanden
Die Fahrpläne des öffentlichen Verkehrs sind einfach zu verstehen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Wenn ich unterwegs bin und etwas Unvorhergesehenes passiert, kann ich meinen Weg mühelos anpassen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Ohne eigenes Auto fühle ich mich in meiner Mobilität eingeschränkt.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Ich habe Mühe, mich räumlich zurechtzufinden und zu orientieren.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Das Internet erleichtert mir die Planung meiner Mobilität.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Von meinem Wohnort aus erreiche ich alle meine Aktivitäten, die ich möchte, ohne Auto.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Ich bin in meiner Mobilität körperlich eingeschränkt (z.B. gehbehindert).	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○

12. Wie häufig benutzen Sie normalerweise folgende Fortbewegungsmittel?

	Nie	Weniger als 1 Mal pro Monat	Etwa 1-2 Mal pro Monat	Etwa 1-2 Mal pro Woche	(Fast) jeden Tag
Öffentlicher Verkehr	1 ○	2 ○	3 ○	4 ○	5 ○
Velo	1 ○	2 ○	3 ○	4 ○	5 ○
Elektrovelo	1 ○	2 ○	3 ○	4 ○	5 ○
Eigenes / privat geliehenes Auto	1 ○	2 ○	3 ○	4 ○	5 ○
Carsharing-Auto	1 ○	2 ○	3 ○	4 ○	5 ○
Wege zu Fuss (mind. 10 Minuten)	1 ○	2 ○	3 ○	4 ○	5 ○
Anderes:	1 ○	2 ○	3 ○	4 ○	5 ○

13. Wie hat sich Ihre Mobilität nach dem Einzug in die autofreie Siedlung verändert?

Fahren Sie...	Öfter	Gleich oft	Weniger oft
... mit öffentlichen Verkehrsmitteln	1 ○	2 ○	3 ○
... Velo	1 ○	2 ○	3 ○
... Auto	1 ○	2 ○	3 ○

14. Wie oft benutzen Sie für die folgenden Tätigkeiten ein Auto?

	Nie	Weniger als 1 Mal pro Monat	Etwa 1-2 Mal pro Monat	Etwa 1 Mal pro Woche	Mehr als 1 Mal pro Woche
Für alltägliche Einkäufe (z.B. Lebensmittel)	1 ○	2 ○	3 ○	4 ○	5 ○
Für besondere Einkäufe (z.B. grosse oder schwere Sachen)	1 ○	2 ○	3 ○	4 ○	5 ○
Für Besuche von Verwandten oder Freund*innen	1 ○	2 ○	3 ○	4 ○	5 ○
Für Freizeitaktivitäten	1 ○	2 ○	3 ○	4 ○	5 ○
Aus beruflichen Gründen	1 ○	2 ○	3 ○	4 ○	5 ○

15. Wie oft haben Sie in den letzten 12 Monaten in Ihrer Freizeit Reisen mit mindestens einer Übernachtung unternommen?

1 ○ nie → weiter zu Frage 17   2 ○ 1 - 2 Mal   3 ○ 3 - 4 Mal   4 ○ 5 Mal und mehr

16. Welche(s) Verkehrsmittel haben Sie dabei für die Hin- bzw. Rückreise benutzt?

	Nie	1 - 2 Mal	3 Mal & mehr
Öffentliche Verkehrsmittel (Bahn, Bus, usw.)	1 ○	2 ○	3 ○
Car	1 ○	2 ○	3 ○
Auto	1 ○	2 ○	3 ○
Flugzeug: innerhalb von Europa	1 ○	2 ○	3 ○
Flugzeug: ausserhalb von Europa	1 ○	2 ○	3 ○
Velo	1 ○	2 ○	3 ○

(Fortsetzung) Wie wichtig sind Ihnen die folgenden Werte?

	Überhaupt nicht wichtig	Nicht wichtig	Eher nicht wichtig	Eher wichtig	Wichtig	Sehr wichtig
Mich immer an Regeln halten, selbst wenn es niemand sieht.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Menschen zuhören, die anders sind. Andere Meinungen verstehen wollen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Zurückhaltend und bescheiden sein. Die Aufmerksamkeit nicht auf mich lenken.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Spass haben. Mir selbst etwas gönnen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Selbst entscheiden, was ich tue. Frei und unabhängig von anderen sein.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Den Menschen um mich herum helfen, für deren Wohl sorgen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Sehr erfolgreich sein. Für meine Leistungen anerkannt werden.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Ein starker Staat, der meine persönliche Sicherheit gewährleistet.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Das Abenteuer suchen und gerne Risiken eingehen. Ein aufregendes Leben haben.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Mich immer korrekt verhalten. Nichts tun, was andere für falsch halten könnten.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Von anderen respektiert werden. Ich will, dass die Leute tun, was ich sage.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Mich für Menschen einsetzen, die mir nahe stehen. Loyal zu ihnen sein.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Zur Natur Sorge tragen, die Umwelt schützen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Mich an Traditionen meiner Religion oder meiner Familie halten.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Dinge tun, die mir Vergnügen bereiten.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○

19. Wenn nächsten Sonntag Nationalrats-Wahlen wären, welcher Partei würden Sie hauptsächlich Ihre Stimme geben (auch wenn Sie nicht wahlberechtigt sind)?

1 ○ SP   2 ○ Grüne   3 ○ GLP   4 ○ CVP   5 ○ FDP   6 ○ BDP   7 ○ SVP

8 ○ Andere: ....

Ihr Alltagsleben

17. Wie oft führen Sie die folgenden Freizeitaktivitäten durch?

	Nie	Weniger als 1 Mal pro Monat	Etwa 1-2 Mal pro Monat	Etwa 1-2 Mal pro Woche	(Fast) jeden Tag
In Bars, Cafés oder Restaurants gehen	1 ○	2 ○	3 ○	4 ○	5 ○
Freund*innen oder Verwandte treffen	1 ○	2 ○	3 ○	4 ○	5 ○
Sport treiben	1 ○	2 ○	3 ○	4 ○	5 ○
Spazieren, Wandern, Velotouren	1 ○	2 ○	3 ○	4 ○	5 ○
Ins Kino gehen	1 ○	2 ○	3 ○	4 ○	5 ○
Ins Theater oder in die Oper gehen	1 ○	2 ○	3 ○	4 ○	5 ○
Basteln, Handarbeiten, Gartenarbeiten	1 ○	2 ○	3 ○	4 ○	5 ○
Fernsehen	1 ○	2 ○	3 ○	4 ○	5 ○
Zeit im Internet und am PC verbringen	1 ○	2 ○	3 ○	4 ○	5 ○
In einem Verein aktiv mitarbeiten	1 ○	2 ○	3 ○	4 ○	5 ○
An gemeinschaftlichen Aktivitäten in der Siedlung teilnehmen	1 ○	2 ○	3 ○	4 ○	5 ○

18. Wie wichtig sind Ihnen die folgenden Werte?

	Überhaupt nicht wichtig	Nicht wichtig	Eher nicht wichtig	Eher wichtig	Wichtig	Sehr wichtig
Sachen auf meine eigene Art und Weise machen, kreativ sein.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Reich sein, teure Sachen besitzen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Gleichbehandlung und Chancengleichheit für alle Menschen.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Meine Fähigkeiten zeigen können, von den Leuten bewundert werden.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Alles vermeiden, was meine Sicherheit gefährden könnte.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○
Überraschungen und Abwechslung im Leben haben.	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○

Die Mitglieder Ihres Haushalts

20. Welches sind die Merkmale jedes Mitglieds Ihres Haushalts? *Bitte schreiben Sie in die Randspalte oder auf die letzte Seite, wenn Ihr Haushalt mehr als vier Personen umfasst.*

	SIE SELBST	Person 2	Person 3	Person 4
Geburtsjahr:				
Geschlecht:				
Nationalität(en) *Wenn mehrere, bitte alle angeben:*	1□ CH 2□ Andere:	1□ CH 2□ Andere:	1□ CH 2□ Andere:	1□ CH 2□ Andere:
Auto-Führerausweis:	1○ Ja 2○ Nein	1○ Ja 2○ Nein	1○ Ja 2○ Nein	1○ Ja 2○ Nein

Abonnemente *Mehrere Antworten möglich:*

	SIE SELBST	Person 2	Person 3	Person 4
Strecken- / oder Zonen-Abonnement	1	1	1	1
Generalabonnement (GA)	2	2	2	2
Halbtax-Abonnement	3	3	3	3
Carsharing-Abo (Mobility)	4	4	4	4

Erwerbsstatus *Mehrere Antworten möglich:*

	SIE SELBST	Person 2	Person 3	Person 4
Hausmann, Hausfrau	1	1	1	1
Auf Stellensuche	2	2	2	2
Rentner*in	3	3	3	3
In Ausbildung	4	4	4	4
Berufstätig:	5	5	5	5
➜ **wenn berufstätig:** zu welchem Prozentsatz?	%	%	%	%

➜ in welchem Beruf?

Arbeits- oder Ausbildungsort
Bitte Postleitzahl und Ortsnamen angeben:

Fortbewegungsmittel um den Arbeits- bzw. Ausbildungsort zu erreichen *Mehrere Antworten möglich:*

	SIE SELBST	Person 2	Person 3	Person 4
	1□ Velo	1□ Velo	1□ Velo	1□ Velo
	2□ Elektrovelo	2□ Elektrovelo	2□ Elektrovelo	2□ Elektrovelo
	3□ zu Fuss	3□ zu Fuss	3□ zu Fuss	3□ zu Fuss
	4□ öffentlicher Verkehr	4□ öffentlicher Verkehr	4□ öffentlicher Verkehr	4□ öffentlicher Verkehr
	5□ Anderes:	5□ Anderes:	5□ Anderes:	5□ Anderes:

Höchster Bildungsabschluss:

	SIE SELBST	Person 2	Person 3	Person 4
(noch) kein Abschluss	1	1	1	1
Obligatorische Schule	2	2	2	2
Maturität, Fach-/Berufsmaturität	3	3	3	3
Berufslehre (EFZ, EBA)	4	4	4	4
Höhere Fachschule, Meisterdiplom	5	5	5	5
Universität, ETH, Fachhochschule	6	6	6	6
Anderes:	7	7	7	7

Wo haben Sie vor dem Umzug in die autofreie Siedlung gewohnt? *Bitte Postleitzahl und Namen des Wohnorts angeben.*

Sind Sie in einem autofreien Haushalt aufgewachsen? 1○ Ja 2○ Nein

21. Wie hoch schätzen Sie das Netto-Monatseinkommen Ihres gesamten Haushaltes?
1○ Weniger als 3'000 CHF 2○ 3'001-6'000 CHF 3○ 6'001-9'000 CHF 4○ 9'001-12'000 CHF 5○ Mehr als 12'001 CHF 8○ Keine Antwort

✍ Haben Sie weitere Bemerkungen oder Ergänzungen zu dieser Befragung?

....
....
....
....
....
....
....
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....
....

Herzlichen Dank für Ihre Teilnahme!

☒ **Bitte senden Sie den Fragebogen bis spätestens «Rücklaufdatum» mit dem beiliegenden vorfrankierten Couvert zurück.**

➜ **Wenn Sie Interesse an den Resultaten der Umfrage haben und / oder bereit sind, mir 2017 oder 2018 bei einem Gespräch Auskunft zu geben, können Sie hier Ihre Kontaktangaben hinterlassen** *(Dieser Teil des Fragebogens wird von Ihren Antworten getrennt, Ihre Anonymität ist gewährleistet)*:

❑ Ich habe Interesse an den Resultaten.

❑ Ich bin bereit, 2017 oder 2018 an einem Interview teilzunehmen.

Name und Vorname: ....

E-Mail-Adresse (oder Telefonnr.): ....

Kontakt: Daniel Baehler
             daniel.baehler@unil.ch
             079 397 71 01

«Code» *(Dieser Code dient nur der Rücklaufkontrolle, Ihre Anonymität ist gewährleistet.)*

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2. Cover letter of the survey

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Universität Lausanne
Institut für Geographie & Nachhaltigkeit
Géopolis – IGD
CH-1015 Lausanne

"Anrede"
"Name"
"Adresse" "Nummer"
"Ort"

Lausanne, Versanddatum

Studie zu Ihrem Leben in einer autofreien Siedlung und Ihrer Mobilität

«Briefanrede»

Was braucht es für ein Leben ohne eigenes Auto? Herauszufinden, wie Bewohner*innen autofreier Wohnsiedlungen in der Schweiz und Deutschland leben und mobil sind, ist das Ziel meiner Doktorarbeit an der Universität Lausanne.

Dazu bin ich auf Ihre Mitarbeit angewiesen. Ich würde mich sehr freuen, wenn Sie sich etwa 15 Minuten Zeit nehmen, um den beiliegenden Fragebogen auszufüllen. Ihre Antworten werden helfen, autofreies Wohnen weiter zu fördern und bestehende oder neue Siedlungen besser auf die Bedürfnisse der Bewohner*innen anzupassen.

Die Genossenschaft / Verwaltung / BewohnerInnen-Verein XY unterstützt die Befragung und ist an den Resultaten ebenfalls sehr interessiert. Die Fragebögen werden ausschliesslich an der Universität ausgewertet, Ihre Angaben werden vertraulich behandelt. Die Ergebnisse der Befragung werden allen Interessierten zur Verfügung stehen, hinterlassen Sie dazu Ihre Kontaktangaben am Ende des Fragebogens oder senden Sie mir eine E-Mail.

Bitte senden Sie den ausgefüllten Fragebogen im vorfrankierten Couvert **bis spätestens Rücklaufdatum** zurück.

Wenn Sie Fragen haben, nehmen Sie Kontakt mit mir auf: daniel.baehler@unil.ch oder (Tel.-Nr.).

Herzlichen Dank für Ihre Unterstützung und freundliche Grüsse

Daniel Baehler

Doktorand
Universität Lausanne
Institut für Geographie und Nachhaltigkeit (IGD)

3. Reminder letter of the survey

Unil

UNIL | Université de Lausanne

Universität Lausanne
Institut für Geographie & Nachhaltigkeit
Géopolis – IGD
CH-1015 Lausanne

"Anrede"
"Name"
"Adresse" "Nummer"
"Ort"

Lausanne, 4. November 2016

Erinnerung: Studie zur Wahl Ihres Wohnorts und Ihrem Leben in einer autofreien Siedlung

«Briefanrede»

Schon wieder ein Fragebogen, haben Sie sich vielleicht Anfang Oktober gesagt, als Sie Post von mir erhalten haben. Falls Sie den Fragebogen in der Zwischenzeit ausgefüllt und zurückgeschickt haben, danke ich Ihnen ganz herzlich dafür. Wenn nicht, würde ich mich sehr freuen, wenn Sie sich so bald wie möglich etwa 15 Minuten Zeit nehmen, um den Fragebogen auszufüllen. Eine hohe Antwortquote ist sehr wichtig für die Aussagekraft der Resultate und damit auch für den Erfolg meiner Doktorarbeit. Weil es sich dabei um die erste vergleichende Studie von autofreien Wohnsiedlungen in der Schweiz und in Deutschland handelt, ist ein hoher Rücklauf in allen Siedlungen umso wichtiger.

Sie können den Fragebogen nun auch **online beantworten**: URL

Wie im ersten Brief erwähnt, unterstützt die Wohnbaugenossenschaft XY meine Umfrage. Ihre Antworten werden vertraulich behandelt und nur an der Universität ausgewertet. Die Ergebnisse der Befragung werden allen Interessierten zur Verfügung stehen, hinterlassen Sie dazu Ihre Kontaktangaben am Ende des Fragebogens oder senden Sie mir eine E-Mail.

Wenn Sie Fragen haben, nehmen Sie Kontakt mit mir auf: daniel.baehler@unil.ch oder (Tel.-Nr.)

Herzlichen Dank für Ihre Unterstützung und freundliche Grüsse

Daniel Baehler

Doktorand
Universität Lausanne
Institut für Geographie und Nachhaltigkeit (IGD)

4. Characteristics of the interviewed residents

	Development	Occupancy status	Type of household	Sex	Age[76]
B1	Burgunder	Tenant	Couple with child(ren)	m	40
B2	Burgunder	Tenant	Childless couple	m&w	70
B3	Burgunder	Tenant	Childless couple	m	35
B4	Burgunder	Tenant	Couple with child(ren)	w	40
B5	Burgunder	Tenant	Couple with child(ren)	w	35
B6	Burgunder	Tenant	Couple with child(ren)	m	40
B7	Burgunder	Tenant	Couple with child(ren)	w	35
O1	Oberfeld	Cooperative member	Childless couple	m	70
O2	Oberfeld	Cooperative member	Person living alone	m	70
O3	Oberfeld	Cooperative member	Single-parent family	w	65
O4	Oberfeld	Cooperative member	Couple with child(ren)	m	45
O5	Oberfeld	Cooperative member	Person living alone	w	55
O6	Oberfeld	Cooperative member	Person living alone	w	50
O7	Oberfeld	Cooperative member	Couple with child(ren)	m	45
O8	Oberfeld	Cooperative member	Single-parent family	w	35
SI1	Sihlbogen	Tenant	Person living alone	m	50
SI2	Sihlbogen	Tenant	Person living alone	m	70
SI3	Sihlbogen	Tenant	Childless couple	m	35
SI4	Sihlbogen	Tenant	Couple with child(ren)	m	30
SI5	Sihlbogen	Tenant	Flat share	w	30
K1	Klein Borstel	Cooperative member	Single-parent family	w	50
K2	Klein Borstel	Cooperative member	Person living alone	w	65
K3	Klein Borstel	Cooperative member	Couple with child(ren)	w	45
K4	Klein Borstel	Owner	Couple with child(ren)	w	55
K5	Klein Borstel	Owner	Couple with child(ren)	w	50
K6	Klein Borstel	Owner	Couple with child(ren)	w	45
K7	Klein Borstel	Owner	Couple with child(ren)	w	55
K8	Klein Borstel	Owner	Person living alone	w	75
K9	Klein Borstel	Owner	Couple with child(ren)	m	40
SA01	Saarlandstraße	Cooperative member	Person living alone	w	55
SA02	Saarlandstraße	Owner	Childless couple	m	55
SA03	Saarlandstraße	Cooperative member	Single-parent family	w	50
SA04	Saarlandstraße	Cooperative member	Person living alone	m	60
SA05	Saarlandstraße	Cooperative member	Couple with child(ren)	m	45
SA06	Saarlandstraße	Tenant	Childless couple	w	55
SA07	Saarlandstraße	Owner	Couple with child(ren)	m	55
SA08	Saarlandstraße	Cooperative member	Person living alone	w	65
SA09	Saarlandstraße	Owner	Childless couple	w	75

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[76] The age is rounded for anonymity reasons.

SA10	Saarlandstraße	Owner	Person living alone	m	60
SA11	Saarlandstraße	Cooperative member	Person living alone	w	55
SA12	Saarlandstraße	Owner	Person living alone	w	70
W1	Weißenburg	Tenant	Childless couple	m	60
W2	Weißenburg	Tenant	Childless couple	w	65
W3	Weißenburg	Tenant	Couple with child(ren)	w	40
W4	Weißenburg	Tenant	Person living alone	m	55
W5	Weißenburg	Tenant	Person living alone	w	60
W6	Weißenburg	Tenant	Childless couple	m&w	55/50
W7	Weißenburg	Tenant	Couple with child(ren)	m&w	40
W8	Weißenburg	Tenant	Couple with child(ren)	m&w	50
W9	Weißenburg	Tenant	Childless couple	m	65

5. Interview guide for residents

– Interview im Rahmen meiner Doktorarbeit; Themen (Vertiefung der Umfrage); Anonymität
– Sind Sie einverstanden damit, dass ich das Interview aufnehme?

Einzug in die autofreie Siedlung

➔Warum sind Sie in die autofreie Siedlung gezogen?

Gründe	– Rolle der Autofreiheit? Andere Mobilitätsaspekte? Weitere Gründe?
Wohnbiographie	– Wo haben Sie früher gewohnt (➔übers ganze Leben)? – Weshalb diese Umzüge?
Umzugspläne	– Haben Sie Pläne, (bald) wieder wegzuziehen? Wenn ja: weshalb / wohin?

Warum autofrei leben

Bedeutung des Autos	– Was bedeutet Ihnen das Auto? – War das immer so oder gab es Veränderungen dieser Bedeutung?
Autofrei leben?	– Was bedeutet für Sie „autofrei leben"?
Motivationen	– Warum leben Sie ohne eigenes Auto? – Praktische Gründe vs. / und Werte wie Umweltschutzgründe?
Autofrei-Biographie	– Seit wann leben Sie autofrei (➔übers ganze Leben)? – Wenn Veränderungen: Wann? Gründe für die Abschaffung des Autos?

Wie autofrei leben

➔Was machen Sie, um (erfolgreich / problemlos) ohne eigenes Auto zu leben?

Alternativen	– Welche stehen Ihnen zur Verfügung (Velos, öV-Abos, Carsharing, Führerschein…)? – Warum diese und nicht andere? – Veränderungen (➔übers ganze Leben)?
Probleme	– durch die Autofreiheit? (z.B. Kinder, Einkäufe, Freizeitaktivitäten, Reisen)
Strategien	– um keine Probleme zu haben? (z.B. Wahl der Aktivitäten und Ziele; Hilfsmittel zur Planung wie Smartphone, Internet)
Autonutzung	– Wie oft? Weshalb (welche Aktivitäten)? Veränderungen (➔übers Leben)?
Alltagsmobilität	– Wie sind Sie im Alltag mobil (Arbeit/Ausbildung, Einkäufe…)? Weshalb? – Veränderungen nach dem Einzug in die autofreie Siedlung? Weshalb? – Veränderungen früher (➔übers ganze Leben)? Weshalb?
Freizeitaktivitäten	– Welche und wo (in einer durchschnittlichen Woche inkl. Wochenende)? – Wie kommen Sie hin? – Mobilität = Kriterium für die Auswahl der Aktivitäten? – Verzicht auf Aktivitäten / Orte usw.? – Veränderungen nach dem Einzug? Veränderungen früher? Weshalb? – Leben in der Siedlung: Teilnahme an Gemeinschaftsaktivitäten?
Urlaub / Reisen	– Wohin? Welche Mobilität für die Anreise? – Veränderungen (➔übers ganze Leben)? Weshalb?

Räumlicher Kontext fürs autofreie Leben

– Wie zufrieden sind Sie mit der autofreien Siedlung (dem Quartier/der Stadt), in der Sie leben?
  – Was ist positiv, was ist negativ?

– Was braucht es (nicht), um autofrei zu leben?

– Was bräuchte es? (Zugänge, Infrastrukturen, (Mobilitäts-)Angebote …)

Kurzportrait des Haushalts

– Personen (Alter, Erwerbsstatus, Ausbildung, Aktivitäten…), Biographien…

6. Interview guide for car-free housing representatives

1. Entstehung

1.1. Wer stand am Anfang des Projekts ? Wie wurde das Projekt entwickelt (Entwickler der das Projekt aufgebaut und entwickelt hat, Investor der es finanzier oder gekauft hat, …)?

1.2. Welches waren die Rollen der verschiedenen beteiligten Projektpartner, insbesondere der zukünftigen Bewohner*innen?

1.3. Welche Rolle hat die Autofreiheit gespielt?

1.4. Wie ist die Autofreiheit gegenüber den Behörden geregelt?

2. Betrieb

2.1. Wer sind die Besitzer*innen der Siedlung?

2.2. Wie ist heute der Betrieb der Siedlung organisiert?

3. Mobilität

3.1. Wie ist die Autofreiheit gegenüber den Bewohner*innen geregelt? Im Mietvertrag, einem Zusatz, ist es eine moralische oder gesetzliche Verpflichtung, usw.

3.2. Welche Rolle spielt die Autofreiheit bei der Vermietung / dem Verkauf (z.B. einfach/schwierig zu verkaufen/vermieten, usw.)?

3.3. Wie funktioniert die Autofreiheit in der Realität? Gibt es Probleme? Wenn ja: wie werden diese geregelt?

3.4. Welchen Platz hat das Auto (z.B. Anzahl Parkplätze für Bewohner*innen, Besucher*innen, Standort, usw.)?

3.5. Wie ist die Fahrrad-Parkierung geregelt?

3.6. Welche alternativen Mobilitäts-Angebote werden den Bewohner*innen zur Verfügung gestellt? (Fahrradanhänger, Leihräder, ÖPNV-Abonnemente, usw.)

3.7. Welche Mobilitätsangebote sind im Quartier vorhanden? Wurden diese entwickelt oder verändert?

4. Bewohner*innen

4.1. Welches sind die Profile der Bewohner*innen?

4.2. Welches sind ihre Motivationen, hier zu leben?

4.3. Welches sind ihre Mobilitätsverhalten? Welche Strategien sind erkennbar?

4.4. Welches sind ihre Lebensstile?

4.5. Welche (gemeinschaftlichen) Aktivitäten werden im Quartier angeboten oder ausgeübt?

7. Additional results of the survey

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
0–9 years	35%	29%	12%	24%	19%	16%	6%	22%	25%	**21%**
10–19 years	0%	10%	6%	12%	2%	27%	20%	13%	13%	**12%**
20–29 years	2%	2%	4%	3%	13%	1%	7%	2%	10%	**4%**
30–39 years	35%	18%	13%	22%	43%	2%	9%	14%	10%	**18%**
40–49 years	18%	31%	14%	15%	13%	27%	9%	28%	15%	**19%**
50–59 years	6%	8%	14%	10%	5%	21%	31%	12%	20%	**14%**
60–69 years	4%	0%	16%	7%	3%	5%	13%	5%	7%	**7%**
70–79 years	2%	2%	16%	6%	2%	2%	5%	2%	0%	**4%**
80+ years	0%	0%	3%	1%	1%	0%	1%	1%	0%	**1%**
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	**100%**
Mean	28	29	46	33	30	33	41	33	31	**34**

Table 63: Age of the household members (N=1,151)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Total
SP	38%	19%	47%	41%	36%	**39%**
Grüne	43%	56%	39%	33%	12%	**34%**
SP/Grüne	4%	19%	4%	9%	0%	**6%**
GLP	9%	0%	0%	9%	12%	**7%**
CVP	2%	0%	0%	0%	0%	**0%**
FDP	0%	0%	0%	1%	12%	**3%**
BDP	0%	0%	2%	0%	2%	**1%**
SVP	0%	0%	0%	0%	10%	**2%**
Others	4%	6%	8%	7%	17%	**8%**

Table 64: Voting intentions in the Swiss case studies (N=230)

	Klein Borstel	Saarlandstraße	Stellwerk60	Weißenburg	Total
Linke	28%	14%	23%	28%	**22%**
Grüne	54%	66%	52%	52%	**56%**
Linke/Grüne	0%	9%	1%	0%	**3%**
SPD	10%	5%	4%	0%	**5%**
CDU	8%	2%	6%	3%	**5%**
FDP	0%	0%	4%	3%	**2%**
AfD	0%	0%	0%	0%	**0%**
Others	0%	4%	9%	14%	**7%**

Table 65: Voting intentions in the German case studies (N=214)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg
Bern	63%	11%	0%	47%	2%	0%	0%	0%	0%
Bern agglomeration	8%	0%	0%	34%	0%	0%	0%	0%	0%
Biel/Bienne	0%	79%	3%	1%	0%	0%	0%	0%	0%
Other places in the canton of Bern	2%	0%	0%	3%	0%	0%	0%	0%	0%
Winterthur	3%	0%	52%	0%	2%	0%	0%	0%	0%
Zurich	13%	3%	15%	1%	72%	0%	0%	0%	0%
Zurich agglomeration	4%	0%	13%	1%	9%	0%	0%	0%	0%
Other places in the canton of Zurich	1%	0%	4%	0%	2%	0%	0%	0%	0%
Other places in Switzerland	6%	3%	11%	10%	6%	0%	0%	0%	0%
Berlin	0%	0%	0%	0%	0%	1%	0%	0%	10%
Hamburg	1%	0%	0%	0%	0%	86%	96%	1%	0%
Hamburg agglomeration	0%	0%	0%	0%	0%	1%	2%	0%	0%
Northern Schleswig-Holstein	0%	0%	0%	0%	0%	4%	0%	0%	0%
Münster	0%	0%	0%	0%	0%	0%	0%	0%	82%
Region of Münster	0%	0%	0%	0%	0%	0%	0%	1%	3%
Cologne	0%	0%	0%	0%	0%	0%	0%	83%	0%
Region of Cologne	0%	0%	0%	0%	0%	0%	0%	1%	0%
Aachen-Bonn-Düsseldorf-Wuppertal	0%	0%	0%	0%	0%	0%	0%	5%	2%
Other places in North Rhine - Westphalia	0%	0%	0%	0%	0%	0%	0%	2%	2%
Other places in Germany	0%	0%	2%	0%	0%	8%	1%	5%	2%
Other countries	0%	5%	0%	3%	7%	1%	1%	2%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 66: Former place of residence of the household members (N=942)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Environmental reasons	26%	50%	57%	38%	17%	61%	51%	49%	18%	**40%**
No need	60%	43%	34%	41%	37%	28%	31%	31%	27%	**39%**
Alternative mobility offer	26%	36%	43%	44%	46%	28%	20%	29%	36%	**36%**
Other personal reasons	18%	7%	19%	23%	7%	39%	40%	17%	9%	**20%**
Other financial reasons	12%	14%	19%	21%	17%	33%	17%	23%	27%	**19%**
Unnecessary/ impractical in the city	12%	7%	11%	9%	11%	22%	14%	17%	36%	**13%**
Car ban in the development	12%	14%	0%	9%	30%	28%	9%	6%	18%	**12%**
Too expensive	8%	21%	13%	1%	13%	6%	26%	26%	9%	**12%**
Negative aspects of the car	6%	29%	6%	6%	4%	6%	14%	14%	9%	**9%**
No driving licence	4%	7%	9%	13%	2%	0%	9%	9%	18%	**7%**
Never owned a car	6%	7%	9%	10%	2%	0%	6%	3%	9%	**6%**
Old age	2%	0%	9%	4%	0%	0%	0%	3%	0%	**3%**

Table 67: Reasons to live car-free, results of the open question (N=327)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
There are enough alternatives to a private car.	98%	100%	98%	99%	98%	100%	97%	95%	91%	**97%**
My house-hold doesn't need a private car.	98%	100%	100%	97%	88%	98%	98%	96%	91%	**96%**
My house-hold prefers to spend the money on other things.	85%	87%	90%	88%	72%	85%	88%	81%	97%	**85%**
My house-hold doesn't have a car for environ-mental reasons.	70%	73%	84%	84%	38%	88%	88%	68%	80%	**74%**
My house-hold can't afford a car.	17%	7%	22%	9%	12%	22%	23%	18%	37%	**18%**
I/we don't drive (anymore) for health reasons.	2%	0%	17%	13%	2%	17%	10%	7%	7%	**9%**

Table 68: Reasons to live car-free, results of the closed question (N=468 to 481)

		Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Characteristics of the dwelling	Important	256%	56%	41%	43%	28%	44%	37%	41%	38%	**38%**
	Very important	57%	19%	31%	32%	65%	46%	40%	47%	50%	**45%**
Characteristics of the development	Important	30%	19%	33%	35%	29%	58%	35%	24%	29%	**32%**
	Very important	39%	69%	49%	46%	6%	15%	35%	14%	24%	**30%**
Car-freeness	Important	17%	19%	35%	23%	12%	22%	28%	24%	21%	**23%**
	Very important	22%	38%	22%	28%	2%	27%	49%	32%	44%	**29%**
Residents	Important	26%	19%	38%	36%	22%	36%	38%	37%	42%	**34%**
	Very important	22%	50%	28%	23%	4%	28%	25%	6%	9%	**18%**
Surroundings suitable for children	Important	19%	38%	20%	18%	20%	25%	28%	27%	21%	**23%**
	Very important	37%	19%	26%	31%	16%	33%	17%	21%	47%	**26%**
Location	Important	28%	56%	51%	39%	34%	38%	39%	49%	50%	**42%**
	Very important	46%	31%	14%	13%	44%	22%	35%	34%	32%	**30%**
Proximity to workplace	Important	31%	25%	27%	30%	34%	21%	31%	35%	24%	**30%**
	Very important	21%	25%	9%	13%	32%	8%	12%	19%	27%	**18%**
Possibility to walk and cycle	Important	32%	19%	24%	29%	35%	38%	25%	40%	21%	**31%**
	Very important	54%	75%	65%	60%	41%	45%	66%	49%	71%	**56%**
Mobility offer	important	26%	25%	47%	32%	28%	48%	35%	42%	35%	**36%**
	Very important	61%	31%	51%	61%	61%	38%	59%	44%	38%	**51%**

Table 69: Importance of housing choice reasons per dwelling (N=466 to 486)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
0 other two-wheelers	78%	69%	7%	82%	96%	76%	79%	86%	77%	**82%**
1 other two-wheeler	15%	13%	18%	6%	4%	12%	15%	9%	15%	**11%**
2 other two-wheelers	4%	13%	4%	4%	0%	7%	2%	4%	6%	**4%**
3+ other two-wheelers	4%	6%	0%	8%	0%	5%	5%	1%	3%	**3%**
1 motorbike, scooter, moped	2%	0%	2%	1%	2%	0%	0%	1%	9%	**2%**

Table 70: Households with other two-wheelers and a motorbike, scooter or moped (N=487)

		Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Public transport	Never	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
	<1x/month	0%	0%	0%	1%	0%	0%	2%	6%	24%	**3%**
	1-2x/month	8%	0%	6%	6%	2%	15%	19%	21%	35%	**13%**
	1–2/week	31%	56%	30%	35%	9%	24%	17%	36%	15%	**28%**
	(Almost) every day	62%	44%	64%	58%	89%	61%	63%	37%	27%	**56%**
Bicycle	Never	2%	0%	15%	9%	23%	0%	8%	3%	9%	**8%**
	<1x/month	8%	0%	2%	6%	17%	2%	2%	6%	3%	**8%**
	1-2x/month	10%	0%	2%	6%	19%	0%	5%	4%	0%	**6%**
	1–2/week	17%	13%	23%	14%	21%	15%	11%	5%	0%	**13%**
	every day	64%	88%	58%	65%	19%	83%	75%	82%	88%	**69%**
E-Bicycle	Never	86%	92%	66%	57%	65%	88%	95%	96%	75%	**80%**
	<1x/month	0%	0%	7%	3%	18%	8%	2%	0%	0%	**4%**
	1-2x/month	2%	0%	5%	6%	10%	3%	2%	0%	6%	**4%**
	1–2/week	6%	0%	11%	16%	2%	0%	0%	1%	6%	**5%**
	every day	6%	8%	11%	19%	4%	3%	2%	3%	13%	**7%**
Private lent car	Never	52%	60%	64%	54%	63%	63%	71%	70%	79%	**64%**
	<1x/month	44%	40%	32%	45%	31%	32%	28%	26%	18%	**33%**
	1-2x/month	4%	0%	5%	2%	6%	5%	0%	2%	0%	**3%**
	1–2/week	0%	0%	0%	0%	0%	0%	0%	2%	3%	**01%**
	every day	0%	0%	0%	0%	0%	0%	12%	0%	0%	**0%**
Carsharing car	Never	28%	47%	47%	32%	35%	59%	69%	24%	36%	**40%**
	<1x/month	61%	40%	47%	46%	40%	24%	23%	29%	24%	**37%**
	1-2x/month	11%	13%	4%	22%	23%	17%	8%	31%	27%	**19%**
	1–2/week	0%	0%	2%	0%	2%	0%	0%	15%	6%	**4%**
	every day	0%	0%	0%	0%	0%	0%	0%	0%	6%	**0%**
Walking (at least 10 min.)	Never	0%	0%	0%	1%	2%	2%	2%	1%	0%	**1%**
	<1x/month	0%	0%	2%	3%	0%	0%	5%	3%	3%	**2%**
	1-2x/month	2%	0%	2%	10%	6%	2%	8%	5%	18%	**6%**
	1–2/week	28%	6%	28%	31%	20%	39%	29%	28%	32%	**28%**
	every day	70%	94%	69%	56%	71%	56%	57%	63%	47%	**63%**
Other	Never	38%	0%	0%	50%	50%	43%	29%	55%	38%	**40%**
	<1x/month	25%	0%	50%	17%	38%	43%	29%	15%	25%	**27%**
	1-2x/month	0%	0%	33%	0%	0%	14%	36%	15%	25%	**17%**
	1–2/week	25%	0%	17%	0%	13%	0%	0%	10%	13%	**9%**
	every day	13%	0%	0%	33.3%	0%	0%	7%	5%	0%	**7%**

Table 71: Frequency of mobility modes used for daily mobility (N= 453 to 478; 77 for "other")

		Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Daily shopping (e.g. food)	Never	91%	100%	96%	93%	86%	88%	95%	74%	91%	**88%**
	Less than once per month	9%	0%	4%	6%	14%	10%	3%	14%	3%	**8%**
	About 1–2 times per month	0%	0%	0%	1%	0%	2%	0%	6%	3%	**2%**
	About once per week	0%	0%	0%	0%	0%	0%	2%	5%	3%	**2%**
	More than once per week	0%	0%	0%	0%	0%	0%	0%	1%	0%	**0%**
Particular shopping (e.g. big or heavy)	Never	20%	27%	32%	20%	27%	39%	60%	17%	27%	**29%**
	<1x/month	78%	73%	66%	76%	65%	59%	38%	74%	64%	**66%**
	1-2x/month	2%	0%	2%	4%	8%	2%	2%	6%	6%	**4%**
	1x/week	0%	0%	0%	0%	0%	0%	0%	2%	3%	**1%**
	>1x/week	0%	0%	0%	0%	0%	0%	0%	1%	0%	**0%**
Visit relatives or friends	Never	57%	67%	59%	57%	57%	61%	62%	3%	34%	**52%**
	<1x/month	41%	33%	37%	37%	33%	37%	30%	48%	47%	**39%**
	1-2x/month	2%	0.0%	4%	6%	10%	2%	8%	16%	13%	**8%**
	1x/week	0%	0%	0%	0%	0%	0%	0%	3%	6%	**1%**
	>1x/week	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Leisure activities	Never	52%	57%	73%	53%	45%	49%	65%	34%	42%	**51%**
	<1x/month	44%	43%	21%	41%	47%	49%	31%	42%	42%	**40%**
	1-2x/month	4%	0%	4%	4%	8%	2%	5%	18%	6%	**7%**
	1x/week	0%	0%	2%	1%	0%	0%	0%	4%	9%	**2%**
	>1x/week	0%	0%	0%	0%	0%	0%	0%	2%	0%	**0%**
Professional reasons	Never	67%	67%	80%	76%	76%	76%	89%	67%	70%	**74%**
	<1x/month	19%	20%	16%	13%	6%	20%	10%	22%	21%	**16%**
	1-2x/month	11%	7%	2%	6%	4%	2%	2%	7%	0%	**5%**
	1x/week	2%	7%	2%	3%	10%	0%	0%	3%	0%	**3%**
	>1x/week	2%	0%	0%	3%	4%	2%	0%	1%	9%	**2%**

Table 72: Reasons for car use and frequency (N=469 to 477)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Go to bars, cafés or restaurants	0%	0%	2%	3%	2%	0%	2%	2%	0%	**2%**
Meet friends or relatives	0%	0%	0%	0%	2%	0%	0%	0%	0%	**0%**
Do sports	17%	7%	13%	6%	10%	3%	3%	9%	16%	**9%**
Go for a walk, hike, bicycle tour	2%	0%	4%	1%	0%	3%	0%	2%	0%	**2%**
Go to the cinema	12%	20%	10%	10%	27%	7%	10%	12%	21%	**13%**
Go to the theatre or opera	38%	31%	26%	30%	56%	24%	19%	37%	42%	**34%**
Do handicrafts, gardening	13%	19%	34%	7%	46%	7%	22%	32%	19%	**23%**
Watch TV	17%	27%	37%	24%	13%	22%	3%	12%	9%	**17%**
Spend time in the internet and at the PC	2%	0%	2%	3%	0%	2%	2%	5%	3%	**3%**
Actively co-operate in an association	25%	38%	32%	44%	77%	24%	37%	53%	28%	**42%**
Participate in community activities in the development	6%	0%	4%	3%	81%	2%	6%	41%	16%	**20%**

Table 73: Leisure activities, share of activities never done (N=465 to 477)

	Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Public transport	100%	100%	96%	100%	87%	100%	97%	98%	93%	**97%**
Coach	2%	0%	8%	21%	8%	17%	37%	14%	29%	**16%**
Car	40%	46%	41%	53%	57%	58%	46%	71%	64%	**55%**
Aeroplane (inside Europe)	54%	36%	42%	44%	82%	47%	62%	62%	33%	**55%**
Aeroplane (outside Europe)	27%	33%	22%	26%	44%	11%	21%	31%	28%	**27%**
Bicycle	24%	50%	37%	45%	12%	45%	49%	28%	26%	**34%**

Table 74: Mobility modes used at least once for holiday travels in the last 12 months (N=370 to 457)

Burgunder: 15 out of 24 mentions concerned unsuitable and insufficient bicycle parking facilities, showing an important problem in this development. On the other hand, the proximity to public transport was mentioned by three households and several other elements by one household each, for example carsharing, space for children to play or the quality of public transport.
FAB-A: Only eight points were added, three highlighted the proximity of the city centre and two the importance of nearby recreation areas.
Giesserei: Here, four households mentioned the importance of carsharing and three the good bicycle parking facilities. The too long distance to supermarkets and public transport were cited on the negative side.
Oberfeld: Five households would prefer a more central location, four a better public transport offer and two highlighted the fact that the development is situated on a slope. Carsharing is seen as positive but could also be improved, and a bigger car-free area is wished for.
Sihlbogen: Two households complained about the insufficient bicycle parking and several other elements were mentioned by one household each, for example the quality of public transport, carsharing, a shared e-bike or traffic noise.
Klein Borstel: Three households mentioned the proximity to public transport and the need of a bigger car-free or -reduced space around the housing development. The community, self-administration, the shared bikes and the bicycle workshop were also highlighted.
Saarlandstraße: The community and self-administration was mentioned by five households and a larger car-free/reduced environment by four. Three households highlighted the noise coming from cars and aeroplanes sometimes, the same number also stressed proximity to public transport.
Stellwerk60: Eight households complained about the too long distance to public transport, six about a specific problem of this development: access to the buildings for delivery or when someone moves is difficult and complicated to obtain. The distance to supermarkets and shops was also mentioned as a negative point, as well as the bicycle infrastructure to reach the city centre.
Weißenburg: Here, again, bicycle parking facilities are an important problem, highlighted by seven households (about one third of the 24 mentions in total). Positive elements are the proximity to the city centre, public transport and carsharing on the site. Three households also mentioned the necessity that the residents are willing to commit to car-free living (which is not the case for all, due to subsidised housing, some households in this development seem not to choose to live car-free).

Table 75: Summary of the comments on the suitability of each car-free housing development

		Burgunder	FAB-A	Giesserei	Oberfeld	Sihlbogen	Klein Borstel	Saarlandstr.	Stellwerk60	Weißenburg	Total
Max. 5 min. walk to: bus or tram stop	Important	28%	38%	29%	28%	18%	23%	49%	32%	35%	31%
	Very important	59%	6%	59%	68%	78%	39%	40%	43%	38%	52%
Proximity to local train station	Important	33%	31%	28%	29%	14%	28%	39%	38%	7%	29%
	Very important	56%	31%	65%	16%	73%	65%	59%	49%	13%	49%
Safe & easily accessible bicycle parking	Important	33%	38%	26%	33%	35%	30%	26%	34%	21%	30%
	Very important	56%	38%	57%	44%	26%	50%	59%	41%	50%	49%
Safe & direct foot & bicycle paths around the developm.	Important	48%	31%	31%	36%	34%	33%	46%	31%	24%	36%
	Very important	33%	25%	51%	39%	36%	30%	35%	48%	50%	40%
Max. 5 min. walk to: shops for daily needs	Important	32%	44%	42%	46%	22%	33%	39%	42%	53%	39%
	Very important	44%	38%	30%	29%	63%	35%	17%	36%	32%	35%
Proximity to local recreation area	Important	32%	19%	35%	31%	33%	33%	33%	37%	41%	34%
	Very important	34%	56%	37%	45%	41%	18%	18%	13%	9%	28%
Carsharing site in the development	Important	25%	6%	19%	29%	20%	13%	9%	35%	27%	23%
	Very important	15%	6%	17%	16%	28%	10%	0%	37%	32%	20%
Max. 5 min. walk to: nurseries and schools	Important	22%	44%	27%	24%	24%	30%	20%	23%	32%	25%
	Very important	35%	19%	10%	19%	12%	18%	6%	19%	12%	17%
Proximity to long-distance train station	Important	35%	44%	30%	29%	18%	10%	19%	32%	21%	26%
	Very important	26%	31%	14%	6%	35%	0%	3%	14%	9%	14%
Proximity to city centre	Important	41%	44%	43%	24%	41%	10%	17%	37%	29%	31%
	Very important	20%	31%	6%	14%	26%	0%	9%	10%	18%	13%
Max. 5 min. walk to: services	Important	24%	44%	29%	17%	31%	28%	32%	28%	12%	27%
	Very important	6%	6%	10%	11%	20%	10%	3%	19%	15%	12%
Mobility services in the development (e.g. bicycle trailer rental)	Important	11%	0%	22%	10%	12%	11%	6%	26%	18%	15%
	Very important	2%	6%	8%	3%	8%	3%	2%	15%	0%	6%
Max. 5 min. walk to: restaurants, cafés, bars	Important	11%	44%	22%	9%	8%	3%	17%	21%	3%	14%
	Very important	2%	6%	2%	1%	6%	0%	2%	11%	3%	4%

Table 76: Importance of a housing development's characteristics to live car-free (N=475 to 484)

Weißenburg, Münster (©Daniel Baehler)

Saarlandstraße, Hamburg (©Daniel Baehler)

Klein Borstel, Hamburg (©Daniel Baehler)