CASUAL
Co-creating Attractive and Sustainable Urban Areas and Lifestyles

WP 2-2: Mobility patterns and lifestyles in Vienna

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1.1 Introduction

Mobility patterns describe the habitual behaviour of individuals in order to satisfy their mobility demand. Mobility patterns can be differentiated in terms of use or ownership of transport vehicles (e.g. car ownership versus car-pooling) on the one hand and the willingness to use different transport modes on the other (intramobility using one transport mode versus intermobility using different transport modes).[1]

The aim of the study at hand is to understand the linkages between housing form, mobility patterns and lifestyle with focus on leisure activities using the example of Vienna/Liesing. By means of a broad literature review we identify the main factors that influence travel behaviour, with a focus on lifestyles, leisure behaviour and mobility types. We show general trends in urban mobility and analyse the importance of urban green spaces for residents. During the empirical part we investigate if there is empirical evidence for differing mobility behaviour depending on lifestyle. Furthermore, we analyse how mobility behaviour of leisure activities is linked to the availability of local recreational facilities in the Viennese district of Liesing and if the availability of private and semi-private green space affects mobility behaviour.

Main hypothesis and research questions are:

- Hypothesis 1: People are most free to decide where to go and what transport mode to use when it comes to leisure activities (in contrast to working or education activities). Lifestyle parameters influence both, the selection of leisure activities as well as the mobility behaviour (e.g. modal choice).
  - Research question 1: Is there a linkage between life-style issues and mobility patterns for leisure activities?
  - Research question 2: Can sustainable mobility patterns be promoted by providing certain leisure infrastructure in Liesing? If so: What is needed in respect to local lifestyles?
- Hypothesis 2: The provision of attractive green spaces holds citizens in their neighbourhood and decreases the frequency and travel distance of leisure trips.
  - Research question 3: Can the provision of private, semi-private and public green spaces in the residential environment influence mobility patterns?

The results help to answer the following questions:

- Lessons learned: What are the barriers/opportunities to promote the "sustainable city" (production of the built environment) and "sustainable lifestyles" (consumption of the built environment) in general, in Vienna and in particular in Liesing?
- To what extent do the results of this working paper no. 7 clash or comply with the findings of working paper no. 3?

[1] Diez, W., Reindl, S. Brachat, H: (2001) Grundlagen der Automobilwirtschaft, Auto Business Verlag, München.

1.2 Mobility patterns in urban areas – Status Quo and general trends

1.2.1 Mobility patterns and parameters influencing it

Mobility patterns describe the habitual behaviour of individuals in order to satisfy their mobility demand. In the context of this study, transport mobility is strongly in focus, whereas mobility in terms of relocation is marginally discussed. Mobility patterns are discussed as the individual's choice of transport modes, transport distance (i.e. choice of trip destination) and the frequency of trips.

The causes for individuals developing certain mobility patterns are very complex. Main parameters influencing mobility behaviour are characteristics of the individual person as well as characteristics of the built environment.

Regarding the built environment, the urban form and the dispersion of urban functions are relevant on the one hand, as well as the transport infrastructure and its quality. Mobility patterns are strongly linked to the urban form, as the density, size and distribution of different urban functions (housing, working, education, shopping, leisure, administration etc.) effect the distances that have to be overcome by urban citizens, commuters, visitors etc. (SUME, 2009[2]). Furthermore, the transport infrastructure and the transport system are shaped by the urban configuration, as well as the other way round; existing transport infrastructure influences the development of the urban configuration.

At individual level, objectifiable parameters like socio-demographic characteristics show strong influence on mobility patterns.[3] However, subjective parameters of lifestyle, habits or environmental awareness are increasingly discussed within mobility research, even if it is unclear how empirically significant the explanatory potential of lifestyle parameters (goals in life, importance of spheres of life, values) is compared to the objective parameters.[4] The reason behind this uncertainty is that lifestyle parameters are often linked to objective socio-demographic characteristics like age, gender or income.

In the current paper, the focus lies on how subjective parameters like lifestyle, mobility orientations, leisure behaviour and the importance of certain routines are interlinked with mobility behaviour in a given urban built environment.

[2] SUME (2009): Deliverable D 1.1. Urban development and urban metabolism: A spatial approach, p. 112f

[3] Wittwer, R. (2010): Potenziale des Radverkehrs für den Klimaschutz. Vortrag im Rahmen der 31. Universitätstagung Verkehrswesen in Berlin.

[4] Hammer, A., Scheiner, J. (2006): Lebensstile, Wohnmilieus, Raum und Mobilität – Der Untersuchungsansatz von StadtLeben. In: Beckmann, K., Hesse, M., Holz-Rau, M. (Hrsg.) (2006): StadtLeben – Wohnen, Mobilität und Lebensstil. Neue Perspektiven für Raum- und Verkehrsentwicklung.

1.2.2 Lifestyles, leisure behaviour, mobility types and travel

The study **"MOBILANZ"**[5] analysed the ability of an attitude-based target group approach to predict the ecological impact of mobility behaviour. The study identified five different "mobility types" of people:

(1) Public transport rejecters. These believe public transport provides little sense of control or excitement. They are not open to change and see access to mobility as very important.

(2) Car individualists. Similar to public transport rejecters, but are open to change and consider privacy more important. Owning a car is of a highly symbolic significance.

(3) Weather-resistant cyclists. Positive towards bicycles and will cycle even in bad weather. Only group that assesses the car rather negative.

(4) Eco-sensitised public transport users. Positive towards public transport and highly influenced by their environmental conscience.

(5) Self-determined mobile people. Perform the highest percentage of trips by foot; they do not consider mobility important and are not open to change.

The differences in attitudes and values of the five mobility types are reflected in their mobility behaviour, especially their travel-mode choice (see following table). Public Transport Rejecters make the highest percentage of trips by private motorized modes, followed by Car Individualists. Public Transport Rejecters show the lowest percentage of public transport usage, whereas the Eco-Sensitized Public Transport Users show the highest public transport usage levels. The latter are also characterized by a very balanced modal split. The Weather-Resistant Cyclists make the largest share of trips by bicycle, using it for even more trips than they use private motorized modes. In contrast, the Self-Determined Mobile People have the highest percentage of trips by foot.

Regarding distances, Public Transport Rejecters and Car Individualists differ significantly from the other three types by greater distances. They cover more than two times the distance by private motorized modes annually than Weather-Resistant Cyclists and more than 3 times than both Eco-Sensitized Public Transport Users and Self-Determined Mobile People.

Table 1: Differences in mobility behaviour of different mobility types

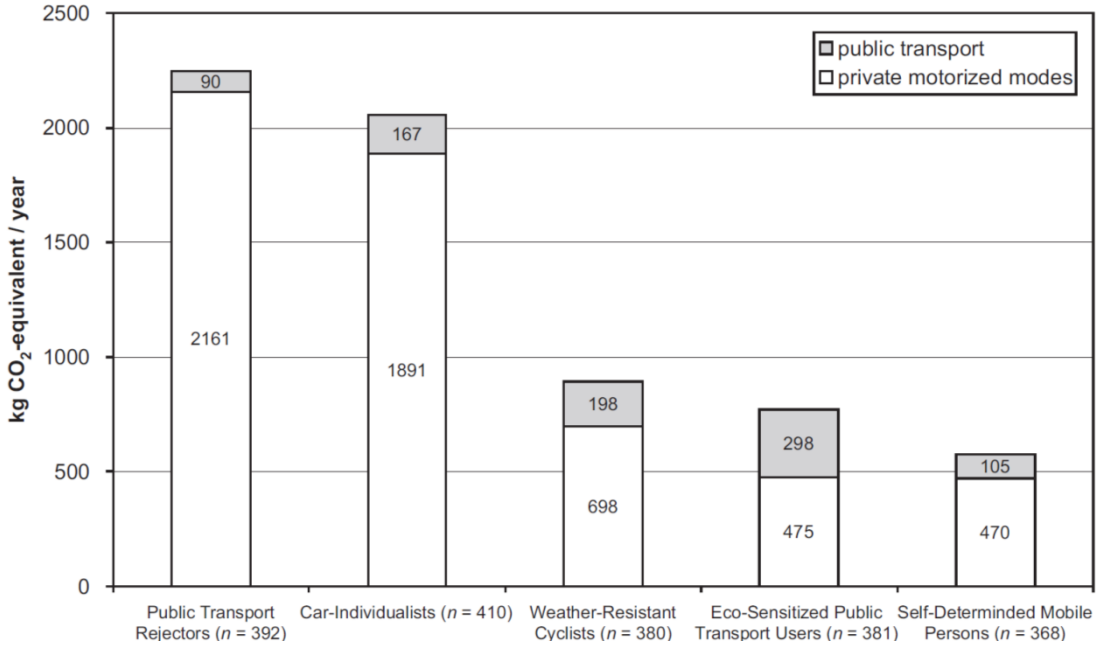
Mobility behaviour	Public Transport Rejecters	Car Individualists	Weather-Resistant Cyclists	Eco-Sensitized Public Transport Users	Self-Determined Mobile People
Private motorised modes (%)	74.5	67.3	31.6	27.1	35.7
Public transport use (%)	4.8	11.1	10.8	26.7	15.3
Bicycle use (%)	6.0	8.0	38.9	18.0	12.7
By foot (%)	14.8	13.6	18.7	28.1	36.3
Distance (km) travelled by private car per year[1]	11,858.8	11,289.3	5,210.3	3,677.5	3,461.4
Greenhouse gas emissions (kg CO_2)	2252.2	2072.4	896.2	773.4	575.3

[1] km per person per year, excluding holidays, [2] kg CO_2-equivalent per year, Source: Hunecke M. et al. (2009)

[5] Hunecke M., Haustein S., Böhler S. and Grischkat S. (2008): MOBILANZ – Möglichkeiten zur Reduzierung des Energieverbrauches und der Stoffströme unterschiedlicher Mobilitätsstile durch zielgruppenspezifische Mobilitätsdienstleistungen. On behalf of the German Federal Ministry of Education and Research (BMBF) in the program ‚Social-Ecological research'.

The connection between the ecological assessment and mobility types is presented in the following figure. Public Transport Rejecters and Car Individualists differ significantly from all other types: They produce the most total greenhouse gas emissions as well as the most greenhouse gas emissions resulting from the use of private motorised modes. Eco-sensitized Public Transport Users show the highest emissions resulting from public transportation use. In this respect, they differ significantly from Public Transport Rejecters and Self-Determined Mobile People.

Figure 1: Ecological assessment of mobility types



Source: Hunecke M. et al. (2009)

Results of the study:

- The attitude towards mobility has more influence on how environmentally friendly people organize their everyday mobility, as their living situation in the different residential areas within cities (inner-city district, city-border district, suburban district). The mobility type was found to have a large effect on the use of private motorized modes, a medium-sized effect on distance travelled and a small effect on ecological impact.
- People from three district types differ only moderately in terms of distance travelled, and they do not differ significantly with regard to their resulting greenhouse gas emissions.

The study "**JUGLEIST** – User group-specific affordability and preference for alternative means of transport"[6] has found that the need of mobility for adolescents is strongly characterised by their environment and regional structures. Parental home, school situation and peer group mark the first comprehension of mobility. JUGLEIST revealed which argumentations and measures are suitable to make juveniles more sensitive to environment-friendly means of transport. In order to take into account the needs and inclinations of juveniles, the study identified three mobility

[6] Wolf-Eberl S., Seisser O. et al. (2008): JUGLEIST – User group-specific affordability and preference for alternative means of transport. On behalf of the Austrian Federal Ministry for Transport, Innovation and Technology (bmvit), financed by the programme line ways2go. Vienna 2008.

types: "public transport-minded", "private transport constraint" and "private transport orientated".

The type "public transport-minded" ascribe the public transport many positive aspects. Positive experiences in using the public transport system enforce the positive mental attitude of the users. The direct advantages are in early self-determination of the young people, the pride of early autonomy and the shared experience founded. "Public transport-minded" adolescents are – in comparison to others – intensive users and ask for positive strengthening and discount systems. In spite of achieving their driving licence, this group will – due to the positive basic setting – favour the public transport. "Public transport-minded" young people are important as multipliers and mentors. Within the communities they are able to authentically and reliably support the deflection of traffic to environmentally friendly transport carriers.

The group "private transport constraint" is, because of inadequate possibilities of public transport, in the unpleasant position to use the car. Their experiences with public transport are modest; the used school bus has negative connotations. The prospect to win this group for public transport, is primary located therein that these young people have a comparatively high sensitisation for environmental interests. Common initiatives like the support of private Car-Pools and the optimization of shuttle services can strengthen the public transport. Multimodality is also a possibility to address this focus group.

The third type can be described as "private transport orientated". The adolescent pleasure in motion and speed, combined with high technology interest, often leads to intensive use of private transportation. To lead those juveniles to public transportation seems difficult. Almost one fifth of young people who belong to this group are firmly public transport objectors. Biographically, it comes true that juveniles pursue the habits and attitudes of their parents and favour private transportation. On this type all currently known dimensions which favour the automotive sector, like status symbolism and self-expression over the car, as well as compensation of inferiority, experience (excitement, adventure, speed) and autonomy/freedom, are applicable.

In general, JUGLEIST concludes that measures to make juveniles more sensitive to environmentally-friendly means of mobility have to be orientated towards the needs of the different mobility-referred youth types and that the so-called New Media need to be included. Communication among adolescents follows in many cases the logic of self-aggrandizement (facebook) and can be used for dissemination of (socially sustainable) messages.

The study "Sustainable Urban Infrastructure, Vienna Edition – Role Model for Complete Mobility" (MRC Europe, 2009) identifies the **user-oriented marketing strategy** of "Wiener Linien" as a key aspect of achieving high CM rankings of Vienna's public transport system. For many years now, the city of Vienna has been organizing a resident satisfaction survey which polls around 5500 people every year. The results of the survey are used to match transport provisions even more closely to what customers need and demand. Knowledge of user needs and attitudes results in clearly segmented target offers for specific segments of customers. Wiener Linien even dedicated a website to young travellers (www.rideontime.at), which has in the meantime been replaced by the Wiener Linien facebook-account (www.facebook.com/wienerlinien). One prime example of user-driven development in Vienna is the development of the Astax system. Citizens living in less densely populated areas and at times of sparse demand can call for a taxi to cover their trip.

A study by **Ohnmacht et al.**[7], who carried out a representative survey for the urban population living in the French and German-speaking parts of Switzerland, presents an approach for researching mobility styles in leisure time. The authors argue that it is often assumed that travel is a pre-determined demand derived from various factors, but leisure travel is not affected as strongly by necessities as for instance labour-related transport. They criticise that the dimension of attitudinal issues and lifestyle, and its effect on travel behaviour, especially in the leisure context, has not been taken adequately into account – be it the perceived value of a particular means of transport in terms of symbolising a socio-cultural position, or its commodiousness (e.g. reading a book on a train).

Firstly, the authors argue that differing orientations with regard to people's preferred leisure activities and their attitude to different modes of transport are reflected in their "mobility styles in leisure time". Their paper views the concept of mobility styles during leisure time in terms of attitudes, values, and orientations pertaining to the domain of mobility and leisure pastimes, in other words a specified area of lifestyle. By applying cluster and factor analysis to this data, four leisure mobility styles were identified:

- "The Sporty Types" (pro bicycle)
- "The Fun and Distraction Seekers" (pro car)
- "The Culture Oriented" (critical of car and multimodal) and
- "The Neighbourly Home-Lovers" (pro car and public transport)

Secondly, the hypotheses of Ohnmacht et al. is that there is a correlation between the mobility style-groups and various parameters of travel, such as trip rate, mode split, trip purposes and travel distances for leisure and in general. They hypothesise that mobility styles are significantly related to habitual practices and are thus part of expressing lifestyles which may also be manifest in travel behaviour. The assumption was tested that transport behaviour in leisure time can be better explained through the analysis of lifestyle-specific orientations and mobility styles. Multivariate analysis has indicated that the mobility style dimension can indeed make an additional contribution towards clarifying variance in travel behaviour. Mobility styles in leisure turned out to have a significant influence on the following travel figures when controlling for other variables:

- undertaking trips in general and for the purpose of "visiting friends and relatives" in particular
- share of bicycle and car used on trips
- share of car use against distance travelled and
- distance travelled for leisure.

[7] Ohnmacht, T., Götz, K., Schad, H., Haefeli, U. and Stettler, J. (2008) Mobility Styles in Leisure Time — Target Groups for Measures Towards Sustainable Leisure Travel in Swiss Agglomerations, Conference Paper, presented at the 8th Swiss Transport Research Conference, Monte Verità/Ascona.

A paper of **Acker et al.**[8] presents an overview of how lifestyle is defined and measured in transport studies, and how travel behaviour is influenced by lifestyles. In this paper, pragmatic definitions of lifestyles in health and consumer research are given as well as theoretical approaches in sociology:

- Sociologists such as Weber (1972), Bourdieu (1984), Ganzeboom (1988) and Schulz (1992) agree on the communicative character of lifestyles: individuals express their social position through specific patterns of behaviour, consumption and leisure. These behavioural patterns are shaped by underlying opinions and orientations, including beliefs, interests and attitudes. Thus, travel behaviour is not simply determined by price, speed and comfort but is also related to attitudes, status and preferences. Travel behaviour is then one example of a behavioural pattern in which lifestyles are expressed.

A typical modern definition of "lifestyle" in marketing is:

- Lifestyle is expressed in both work and leisure behaviour patterns and (on an individual basis) in activities, attitudes, interests, opinions, values, and allocation of income. It also reflects people's self image or self concept; the way they see themselves and believe they are seen by the others. Lifestyle is a composite of motivations, needs, and wants and is influenced by factors such as culture, family, reference groups, and social class.[9]

1.2.3 Societal change as driver of lifestyles and mobility behaviour

Societal change has a major impact on the mobility behaviour of all age groups. Whereas in rural areas traditional mobility behaviour seems to change very slowly, new mobility trends are driven primarily by societal changes in urban areas. (Waldhör, 2012)

The entire transportation system is facing fundamental reforms, with new concepts and structures. The general trend is heading towards a multimodal utilisation of transportation, people will use more than just one means of transport for their daily trips.

1.2.3.1 Mobility trends of young adults

Societal change alters especially the attitude of the young generation towards cars and leads to a more flexible and purpose-oriented use of multimodal transport. Mobility behaviour will be characterised by using transport services instead of owning. Today especially young adults living in urban areas place less importance on owning a car than previous generations did. The young, urban "smartphone" generation is more open to novel mobility concepts, such as car sharing or bicycle rental. On the basis of German and international studies the following trends can be identified regarding the mobility of young people: a slight decline in the ownership of driving licences, the age for acquiring the driving license is increasing, a decreased car ownership as well as a decreased car usage, a greater use of public transport, walking and cycling and a general trend towards multi-modal travel patterns. The trend towards lower auto mobility is more

[8] Van Acker V., Goodwin P., Witlox F. (2015): Key Research Themes on Travel Behaviour, Lifestyle and Sustainable Urban Mobility. Submitted to the International Journal of Sustainable Transportation.

[9] http://www.businessdictionary.com/definition/lifestyle.html

pronounced among men than among women. Differences in mobility behaviour between young men and women are gradually disappearing. (Schönduwe R. et al., 2012; ifmo 2013)

In Germany, car registration of young male drivers is declining since the 1980s and 1990s, whereas young women first caught up with their male peers, but also show a decline of car ownership since 2000. The decrease of car ownership might be softened by the fact that cars from parents or grandparents are available, but additionally the share of young women with driving licences stagnated at 69% and the share of their mail peers reduced even from 69% to 66% between 2006 and 2010. (Kuhnimhof T. et al., 2011)

For Austria, statistics show, that the share of young people between 16-24 years obtaining a driving license stagnated between 2006 and 2012. However, in Vienna the share of young people obtaining a driving license decreased from 82% in 2006 to 79% in 2012, while their peers in the rest of Austria stagnate at constant share of 92-93% (Statistik Austria, 2013).

The ongoing change in consumer habits – usage is replacing ownership – will transform private transportation. The market of shared mobility will grow considerably in the coming years. Experts anticipate annual growth rates between 20% and 35% through 2020 in the new business fields of car, bike and ride sharing and shared parking. Vehicle manufacturers, transportation and logistics firms and airlines are already responding to this trend of reduced car ownership and offer a wider range of sharing systems (Roland Berger Strategy Consultants, 2014).

The key factors behind the above mentioned societal change are financial reasons, job uncertainties, high flexibility in terms of job and residential location, young people are tending to enter the job market and start a family later in life (Tully C., 2013, Lenz B., 2012, Schönduwe R. et al., 2012). In the face of rising fuel prices and vehicle taxes driving a car has become more expensive and also uncomfortable, because of limited public space and congestions in city centres. (Diez W., 2013) At the same time, numerous policy measures fostering the use of public transport and non-motorised means of transport and discouraging driving by car have begun to show effect, at least in urban areas. The setting-up of low emission zones, short-term park zone charges and even road tolls in city centres led to declining car traffic in inner cities. (Erdmenger C., 2010; VCÖ, 2012)

It has to be mentioned that rural areas are still characterised by traditional mobility patterns. This is not only due to people's actual dependence on cars according to insufficient public transport services, but has also societal reasons. Acquiring the driving license and owning a car are symbols for independence and freedom and symbolise a great step for becoming an adult. (Waldhör, 2012) For residents in rural areas it is assumed that they will still behave car-oriented. Due to the declining of populations in rural areas the provision of attractive public transport will become even more difficult in the future. (Ahrens, 2011)

1.2.3.2 Mobility trends of older generations

Not only mobility behaviour of the young generation is characterized by the above mentioned fundamental changes, also mobility patterns of the older generation will change. In all European countries, the share of older people in the total population continually increases. Due to increasing life expectancy future elderly need to work longer, they change their activity patterns with most growth occurring in the social/leisure activity category. They may introduce more

spatial diversity in terms of their residence location. These behavioural and spatial changes lead to a significant increase in travel demands as well as temporal, spatial and modal shifts in mobility patterns. The older population will cover more trips per day than they do today and will have more access to cars. Because the mobility of the elderly is generally less than average, the aging of the population counteracts these mobility generation effects to a certain extent. (Arentze T. et al., 2008)

The coming decades will see the ageing of generations accustomed to car use and with travel-intensive lifestyles. It is expected that people will try to maintain their high mobility levels. They make more and longer trips than comparable age groups today. This is partly due to an increasing motorisation of older people, particularly among women. With increasing mobility costs and cutbacks in public welfare, public transport will become crucial to maintain quality of life and active participation in society. As a consequence, transport systems and products have to be adapted to the needs of an ageing society. Public transport will have to attract older passengers and also familiarise them with the usage of the services. The image of public transport among older people needs to be improved. It is crucial that staff is approachable and public transport is easy to use. Older people expect barrier-free and easy access to public transport services. Modern customer-friendly information systems have to be adapted to the requirements of older people. These requirements are not primarily of a technical nature. Thus, integrated concepts are necessary that combine "hard" aspects such as infrastructure and vehicles with "soft" aspects such as service, safety and communication. (Fielder M., 2007)

1.2.4 Effects of car sharing on mobility behaviour

Car sharing is a mode of transport where vehicles are owned by a separate firm or an organization, and shared amongst a number of people throughout the day. Car sharing meets the mobility gap between public transport, taxi, bike, car rental and private car traffic.

A study in Switzerland (Interface, 2012) looked at the effects of car sharing on mobility behaviour of its customers and at the corresponding environmental impacts in terms of energy usage and carbon emissions. The survey was based on 1171 private customers and 331 business customers. The survey showed that car sharing leads to more car-free households. 70% of private customers currently own neither a car nor a powered two-wheeler. Before subscribing to car sharing the percentage was lower, at 54%. The positive environmental impact of car sharing is due to greater use of public transport and reduced use of private transport. Car sharing users rely on public transport for almost 50% of their daily mobility needs and motorised private transport for a little over 40%. The rest of the population holding a driving licence relies on motorised private transport for almost 75% of their daily mobility needs and on public transport for no more than 18%. As a result of car sharing the average annual distance driven by each household in motor vehicles drops, conversely the public transport distances rise. The mobility behaviour of the average private car sharing customer is currently resulting in almost 300 kilograms less CO_2 being emitted compared to a non-car sharing person. The major social benefits of car sharing are fewer vehicles on the road. The reduction in numbers of vehicles achieved by car sharing means lower space consumption and less travel congestion in urban areas. Studies have shown that each shared vehicle replaces between 8 and 15 personally owned vehicles.

In Vienna car sharing is gaining increasing importance. At the moment (March 2014) there are shared cars from three companies available:

- Carsharing.at/zipcar with more than 7000 users, 130 cars and 90 reserved parking spaces on public parking areas, further extension over the next months.
- Car2go with about 48000 users and 700 cars, no reserved parking spaces, free parking on public parking areas, further extension over the next months.
- Flinkster with reserved parking spaces at the rail station "Westbahnhof", further extension over the next months.

The Vienna City Administration is pushing forward car sharing and provides for example public parking spaces for the exclusive use of car sharing companies. Vienna's public transport provider Wiener Linien and Austrian Federal Railways (ÖBB) offer special car sharing discounts for owners of annual season tickets.

1.2.5 Importance of urban green spaces for residents

There is a broad body of literature in psychology and medicine that analyses the effects of urban green on people's health and well-being (see Tzoulas et al., 2007 for an overview). In addition to psychological benefits, as for example reducing stress, there are also direct health benefits such as increased longevity and improved self-reported health. Urban green spaces are also beneficial for social well-being as they may increase social cohesion and identity within the urban neighbourhood (Newton, 2007). Green spaces foster a connection between community residents and the natural environment that surrounds them, thus allowing a more liveable city.

In addition, the social value of urban gardening is not negligible. Urban gardens show several benefits (van Leeuwen et al., 2011; Vogl C. R., 2003):

- Social aspect: Urban Farming initiates new networks of communication and collaboration between inhabitants of residential areas. The group of persons who rent an urban garden is very diverse with both low income and high income families, old and young, and with different nationalities. Urban gardens serve as meeting points for people, allowing for the exchange of opinions, information and knowledge. People are actively involved in the development of their near urban neighbourhood.
- Health aspect: being outside, working in the garden is beneficial to both the physical and mental health of people.
- Educational aspect: both adults and children are educated in horticulture and plant species, e.g. they see and learn how different kinds of vegetables and flowers grow in different seasons. Urban gardens serve as small experimental stations in the fields of traditional horticultural techniques, urban ideas on permaculture, sustainable land use and participatory farming.
- Environmental aspect: from a planning point of view, urban gardens can be welcome green oases in urban neighbourhoods, with the same climatic and regulating effects that other urban green areas have.

In the following, the implications of urban green space, recreational areas and other leisure time activities on mobility behaviour is described.

Urban green space and recreational areas improve the quality of the urban neighbourhoods in general, the quality of life of each resident, and thus avoid urban sprawl, which is usually associated with increasing private car volumes. Urban green space can prevent the urban population from shifting their residential locations from the city into suburban areas and also resist the trend to secondary residences in the hinterland. Due to the fact that green space areas in the near urban neighbourhood can be reached on foot, they reduce private car use to more distant leisure and recreational facilities. Leisure and recreational facilities in the hinterland of the cities are in many cases not accessible by public transport.

Surveys have shown that the use of private car is the dominating means of transport in leisure time traffic particularly with regard to distances over 5 kilometres. Generally, about 40% of all leisure time activities are done by car. Almost every leisure destination can be reached by car today, but not by bicycle, on foot or by public transport (Wuppertal Institute, 2008). The share of private car increases at distances of more than 50 kilometres to more than 80 percent. Only up to five kilometres environmentally friendly means of transport (walk, bicycle) are in the majority (70 percent). This data confirm the importance of urban green space, recreational areas and other leisure time activities in urban neighbourhoods.

Empirical studies on housing satisfaction in Vienna revealed that having an attractive residential location helps people relate with their neighbourhood. Attractive public areas at short distance as well as the size and design of green and free space reduce recreational traffic and increases housing satisfaction. Satisfaction also depends on factors such as the quality and number of community facilities within easy reach as well as access to local amenities and social infrastructure. Other important factors include access to public means of transport, absence of cars, and parking space for bicycles and cars.

1.2.6 Urban transport mobility problems

Urban transport problems tend to intensify with the growth of urban areas, as an increasing number of interactions concentrates in a particular area. As space is limited in the existing urban forms as well as the capacity of the existing infrastructure, several bottlenecks emerge. These manifest as traffic congestion and especially for motorized transport in a shortage of parking space. As a consequence travel and commuting times elevate and public space loses its quality for social interaction (markets, etc.) or recreation. Increasing motorization leads to competition for urban space resulting in quality loss for non-motorized transport – either because these modes get displaced by noise, exhaustion or security reasons of motorized transport, or by the fact that these modes are hardly considered during the construction of new urban areas and their transport infrastructure.[10]

In the case of Vienna the ongoing and further growth of population of the city and its urban hinterland will lead to growing spatial conflicts between different groups of interest, e.g. avail-

[10] Rodrigue, J.-P. (2013): The geography of transport systems. New York: Routledge.

able space for different transport modes: availability of public parking slots versus provision of public transport lanes, bicycle lanes and pavements. There also arise conflicts between city growth and demand for housing on the one side and increasing demand for "quality of life" and more green and open areas in the city on the other side.

The ongoing change in consumer habits – e.g. reduced car ownership, a wider range of sharing systems as well as new forms of greening the city (urban gardening) – will make important contributions to alleviate urban transport problems.

1.3 Conclusions of theoretical backgrounds and previous research

The following conclusions can be drawn from the literature review on the links between mobility or travel behaviour, lifestyles and the built environment:

Travel behaviour is influenced by:

- Lifestyles and preferred leisure activities
- Mobility orientations, styles and attitudes towards different modes of transport
- Socio-demographic characteristics, such as age, gender, education, profession, income, stage of life, household composition, etc.
- The built environment: housing form, availability of green space, transport infrastructure (public transport, parking space, car availability). The integration of this spatial dimension of lifestyle practice is of great interest in CASUAL

Initiatives to change mobility behaviour need to be tailor-made for different people, focusing particularly on those whose circumstances, preferences and constraints are changing for other reasons. How to best distinguish between different people still needs further research.

In the long run, lifestyle choices are not "given": social attitudes about mobility do change; sometimes quite quickly. Lifestyles must therefore be considered as dynamic rather than as static and given.

Transitions in family composition and major changes due to the stage of life (i.e., employment status, marital status, children, age, and death of a family member) often lead to changes in travel behaviour. People, whose lives are changing, experience more volatile and rapid changes in their patterns of travel.

The range of lifestyles will become wider. The dominance of a small number of socially accepted lifestyles will diminish, and heterodoxy in lifestyle will be accompanied by a wider range of different travel arrangements. This is a helpful social trend in the context of new sustainable transport strategies.

Lifestyle classification will be helpful in drawing up different target groups for whom different approaches and strategies will be successful.

2 Empirical part: Mobility patterns, mobility orientations and lifestyles in Liesing, Vienna

2.1 Characteristics of Vienna

2.1.1 Mobility patterns

For many years Vienna has been scoring highly in international comparisons regarding liveability and sustainability. One of the success factors is the high quality of public transport, which has been achieved during the past decades. Another factor is that Vienna resisted the general trend of rising car ownership. Since 2001 Vienna experienced a decrease in motorization from 414 cars per 1000 inhabitants to 390 in 2013. Especially in the inner districts of the city car ownership went down considerably.

In 1993 29% of public transport users stood against 40% car use while by 2012 these figures had changed to 39% public transport users versus 29% car users. The objective of the city of Vienna is to increase the share of public transport to 40% by 2020 and to reduce private car traffic to 25% of all journeys.

Table 2: Choice of transport mode in Vienna

Mode of transport	Modal split					
	1993	2012	2020*	2025**	2030**	2050**
Private motor vehicle	40%	27%	25%	20%	15%	<15%
Public transport	29%	39%	40%			
Walking	28%	28%	27%	80%	85%	>85%
Cycling	3%	6%	8%**			

* Transport Master Plan Vienna 2003 ** Smart City Wien Framework Strategy

Source: Wiener Linien (2013); City of Vienna, MA18 (2014): Smart City Framework Strategy

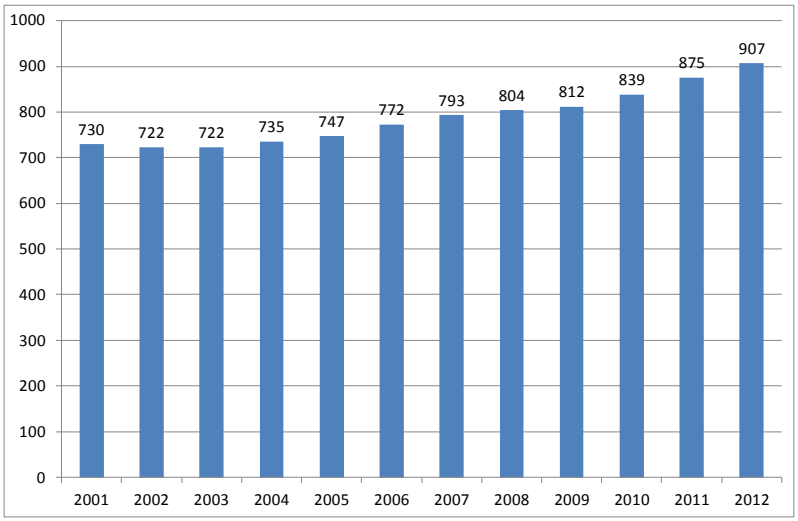
The Transport Master Plan Vienna 2003 defined ambitious objectives for the City of Vienna to shift the main thrust of traffic from motorised individual traffic to public transport and bike traffic. In concrete figures, this means: reducing private car traffic to 25% of all journeys made by 2020, increasing the share of public transport to 40% by 2020, increasing the share of bike traffic to 8% by 2015 and keeping the share of trips undertaken on foot at the level of 27% until 2020. The current shares of transport modes are in line with the defined objectives in the Transport Master Plan 2003. The "Smart City Framework Strategy", published 2014, went even further to diminish the share of private car traffic to 15% by 2030 and even further by 2050. However, this ambitious goal can only be achieved by raising the share of walking and cycling in the city.

Regardless the development of mobility patterns form Viennese citizens, commuter traffic from the urban hinterland into the city has been steadily increasing over the last years. Between 1996 and 2010 commuting by car increased by 16%, public transport by 9%. Public transport is only attractive in suburban centres with good railway connections to Vienna. The increasing com-

muter traffic from the urban hinterland of Vienna into the city is expected to remain a major challenge over the coming years.

The number of passengers using public transport in Vienna increased between 2001 and 2012 by 25% – from 730 million up to 907 million people. The number of annual ticket owners increased from 298,000 in 2001 up to 600,000 in 2014 – this is partly due to the price reduction for the annual ticket from 449 to 365 Euros in 2012. Studies confirm that public transport in Vienna enjoys a very high level of acceptance among the population as a whole.

Figure 2: Public transport in Vienna – Number of passengers (million)



Source: Wiener Linien (2013)

The success factors of Vienna's transport policy are the following:

- The high quality of public transport infrastructure benefits from a long-term strategy. In contrast to many other major cities worldwide Vienna took the political decision in the 60s and 70s to retain the tram network and plan the expansion of the Metro system.
- This long-term strategy is based on substantial investments in public transport infrastructure: new metro-, tramway- and buslines, modernization of train stations, Park&Ride and Bike&Ride facilities
- Investments in modern rolling stock such as the Ultra Low Floor trams
- Frequent and reliable public transport services
- Integrated ticketing with uniform tariffs
- Fares policy that favours frequent users of public transport (annual ticket for 365 Euros)
- In Vienna, one public transport operator ("Wiener Linien") is responsible for transport planning and network configuration, operation, quality management, time schedules, transport surveys and market research, integrated ticketing, marketing, customer information services, etc. This high concentration of competences makes it possible to react quickly to observed user demand changes as well as to encourage changes in mobility pattern when appropriate.
- Direct marketing offers to specific segments of customers

- Integrated master planning process which covers all modes of transport, parking policy, pedestrian, cycling as well as safety (Master Plan Transport; Comprehensive Plans, etc.)
- The introduction of parking space management represents a priority measure of Viennese transport policy and is very successful in reducing the volume of motorised individual traffic, reducing average parking duration, facilitating the parking situation for local residents, improving access to commercial zones for "unavoidable" car journeys, enhancing the attractiveness of public transport, opening additional public space for pedestrian and cyclists. The revenues from short-term parking charges are used for the construction of garages (large-scale residential garages, park & ride facilities)
- Linking of land use and transport planning (e.g. Seestadt Aspern, Vienna main train station, Nordbahnhof station etc.)
- Investments in cycling: upgrading of the cycle network, cycle parking facilities, public bike rental system (in the budget 2015 6 million Euros are foreseen for the expanding of the cycle network and the Citybike service)

2.1.2 Perspectives for future urban development in Vienna

According to population prognosis the ongoing growth of population in Vienna and its urban hinterland will continue over the next few decades. The population of the city of Vienna will grow from currently 1,765,600 people to 2,137,300 people until 2050 (population projection Vienna 2012 – 2050, main scenario).

The expected population growth will raise the demand for flats and intensifies housing pressure. Future demand for new housing units will not depend solely on the quantitative development of the resident population, but also on changing expectations regarding the quality of housing. This refers to trends like the wish for more living space per inhabitant, higher quality of the infrastructure and furnishings in flats and houses as well as higher demands on the quality of the environment (private and public green spaces, spaces for communication and social encounters, leisure-time facilities, social infrastructure). Some expected demographic trends will increase the demand for flats additionally:

- The number of single persons, single parents and patchwork families will rise
- The number of one-person households will increase
- The wish of the older generation to lead self-determined lives

Multi-generational housing and more flexible forms of living that may be adapted to specific needs in different stages of life will be a way to meet these demands.

Therefore, even if the population were to stagnate, there would be constant demand for new housing. Changes to structures and to the uses of buildings are further major factors of influence driving demand for housing; for example, the demolition of mostly older buildings and the combining of small flats to form larger ones (mainly in districts with buildings from the Gründerzeit, built in the period 1850 to 1914). Estimates put the annual demand for homes from this source alone at 2,500 to 3,000.

Assuming an average of 2.2 persons living in each housing unit and based on the population growth projections up to the year 2050, the number of new housing units required will be 169,000 in all, or 4,500 per year. This adds up to a total approx 7,000 housing units to be constructed in the City of Vienna annually.

In the light of the expected growth of population in the city of Vienna itself, but also in its urban hinterland, the increasing commuter traffic from the urban hinterland of Vienna into the city is expected to remain a major challenge over the coming years.

Barriers to promote sustainable lifestyles are the following: Whereas in the inner districts of Vienna car ownership and car trips are declining, the outskirts of the city and the suburban areas are still characterised by growing motorised private transport. This is due to several factors: no parking restrictions; because of the ongoing urban sprawl in the outskirts of Vienna many people are dependent on transport by car; public transport is attractive and competitive only on the main corridors; lack of tangential public transport lines; lack of park & ride facilities; economic or fiscal considerations (e.g. private use of company cars, housing subsidies, tax benefits for commuters).

In coming years the city of Vienna is planning to increase the number of park & ride facilities at the urban periphery. In addition a co-operation with the Federal Province of Lower Austria will lead to the construction of additional park & ride facilities near regional train stations in municipalities adjoining Vienna.

The further expansion and improvement of the public transport network will be continued. The new Vienna main train station will link four mayor railway lines which meet Vienna from four directions and will offer significantly improved connectivity of Vienna concerning long-distance as well as regional transport. Shorter timetable intervals on rapid transit rail, the extension of Vienna's underground network and new rolling stock are further measures to meet the goal of shifting transport from private car traffic to public transport.

2.1.3 Green and open spaces in Vienna

A relatively large share of Vienna's urban area is unsealed. About 20,000 hectares – 48% of Vienna's city area – are classified as open space and recreational areas (15,700 hectares of green landscape, 2,200 hectares of municipal and federal gardens, 2,000 hectares of waters). In addition, there are green spaces that are part of residential units as well as large private gardens.

The maintenance and further development of the landscapes and the green and open spaces is part of the Development Scheme – "Green Areas in the Urban Region" in the "Urban Development Plan Vienna 2005" (STEP 05). Green and open spaces are seen as an integral component of economic local development and a basis of the long-term preservation of the quality of life in Vienna. The "Urban Development Plan Vienna 2005" describes the wide variety of functions that green and open spaces fulfil: recreation, social, cultural, ecological, climatic and orientation functions.

Green spaces in Vienna are not equally distributed throughout the city: There are large green areas in the so-called cottage districts, i.e., residential zones with low building density and a high share of green space that belong to the individually-owned plots of land. In contrast, larger parks are lacking in the comparatively densely built-up urban areas.

Nearly half of the Viennese population lives in urban areas at least 500 meters away from the landscapes of the urban region and the large green areas of the built-up urban area, as Augarten, Belvedere, Schönbrunn, etc. Therefore the "Urban Development Plan Vienna 2005" calls for the provision of sufficient green spaces, especially in densely built-up areas. Following this objective and the example of other metropolis, some innovative and alternative concepts of Urban Farming were developed in recent years in Vienna, such as Community Gardening, self-harvest and the greening of small areas around roadside trees – so-called "Baumscheiben".

Figure 3: Green and open spaces in the urban area according to the Development Scheme – Green Areas in the Urban Region

Source: Urban Development Plan Vienna 2005

In Vienna, consultants, organic farmers and green-minded consumers have developed the concept of urban organic farming, called "self-harvest". Organic farmers prepare a plot of arable land and sow or plant a variety of plant species. The plots are divided into subplots (40 to 80m^2) that are rented to so-called self-harvesters. Self-harvest plots are provided by the Municipality of Vienna as well as by private providers, e.g. www.selbsternte.at. The first self-harvest plot was established in 1987, the company Selbsternte was founded in 1998 and since 2002 the Municipal Department for Gardens and Parks and teachers and students of the technical school for gardening in Vienna have been supporting the management of some plots.

Since 2010 the Municipality of Vienna supports the idea of Community Gardening, called "Nachbarschaftsgärten". The Municipal Department for Gardens and Parks offers organizational and technical assistance as well as financial support for Community Gardens. In 2014 there exist more than 40 Community Gardens in almost all 23 districts of Vienna. The greening of small areas around roadside trees – so-called "Baumscheiben" is also supported by the Municipality of Vienna.

2.2 Characteristics of the district Liesing, Vienna

2.2.1 Development goals and challenges

The Urban Development Plan Vienna 2005 (STEP 05)[11] defined target areas of urban development, which represent certain areas of the city with an increased demand of attention, due to their special situation or expected changes in the future. These are areas with particular problems or outstanding development potentials. Development programmes for each of the target areas were drafted together with relevant stakeholders of different levels of administration (city and district), representatives of institutions, social partners and the public. According to the STEP 05, the realization of projects within the target areas should be done in the course of participatory planning procedures, following the principles of sustainable development and promoting diversity and gender mainstreaming.

One of Vienna's target areas of urban development is "Liesing-Mitte" in the southern district of Liesing. The area is accessible by high-level public transport lines (railway and metro) in two South-North directed corridors and offers huge reserves for settlement activity (see Figure 4). In proximity to these two corridors, greenfield development of housing in the area "In der Wiesen", as well as the reconstruction of the existing industrial areas "Industriegebiet Liesing" and "Atzgersdorf" is promoted by STEP 05.

The district of Liesing accommodates about 95,000 inhabitants (2012), which is about 5.5% of Vienna's population. The main urban development areas "Atzgersdorf" and "In der Wiesen" (approximately the light red area shown below) represent a population of about 30,500 inhabitants and have a potential to accommodate up to 35,000 inhabitants more by 2025, mainly within the areas marked in dark red (see Figure 4).

Figure 4: **Map of Vienna's areas of main future housing development** (left) **and zoomed into "Liesing Mitte"** (right)

Source: MA21 (2014): Perspektive Liesing. Ein Entwicklungskonzept für einen Stadtteil im Wachsen. Projektzeitung No. 1, August 2014

The widely undeveloped area of "In der Wiesen" shows good accessibility by public transport (metro line U6). The high-level road network of the district is characterized by high traffic loads,

[11] City of Vienna, Municipal Department 18 – Urban Development and Planning (2005): Urban Development Plan Vienna 2005 (STEP 05), Vienna 2005.

mainly due to incoming commuter traffic from the southern hinterland. In the course of urban development in the area, congestion needs to be better distributed and needs to be reduced by better offerings in public transport.

The availability of properties for development in the area is a problem, as a big part is in private ownership and land is to a large degree used for commercial gardening. The development of housing in the area requires the establishment of appropriate social infrastructure, which is currently lacking.

2.2.2 Mobility patterns

The district of Liesing, as an area on the urban fringe, is characterized by the alignment of its transport infrastructure to the city centre. Both the high-level public transport and road network are oriented from South to North, to connect hinterland and centre. That is why Liesing is the district with the highest volume of transit traffic originating from the southern suburbs of Vienna. Also, Liesing displays the highest motorization compared to the rest of Vienna (about 500 cars per 1000 inhabitants compared to 390 in Vienna) and more trips are done by individual transport than in the city average. This leads to high loads in the road network and congestion.

Accessibility by public transport is only considered positive along two corridors directed to the city centre. The connection of local centres within the district from East to West and between the corridors is unsatisfactory. Also the network of cycle paths and footpaths is fragmentary and of low quality, which leads to low modal split of walking and cycling. The consultation of residents in the course of the "Perspektive Liesing" process showed the need of a comprehensive mobility concept for Liesing and its urban development areas.

The ideas to improve the situation of public transport within the district range from the establishment of an additional stop of the urban railway line and intensification of service, to the introduction of metro bus lines or trams to connect important local centres within the district to each other and the high-level public transport. Also restrictions in car traffic are requested by the resident population.

2.2.3 Green space, open space and Urban Gardening

The district of Liesing is characterized by a patchwork of different areas of housing, industry, green spaces and transport infrastructure. The stream "Liesingbach" crosses the district from East to West and serves as "green backbone" with adjacent walking and bicycle paths and alluvial area. In the West, the foothills of the "Wienerwald", which is a huge forestal area embracing the whole western periphery of Vienna, are located. South of the urban development areas "Atzgersdorf" and "In der Wiesen" lies the extensive industrial area "Industriegebiet Liesing", which is characterized by a high degree of sealed soil, warehouses, concrete areas and lack of green spaces. In the future, additional high-quality green spaces are needed in the development areas as well as the connection of green spaces with each other and their accessibility needs to be improved. Introduction of urban gardening into housing developments can serve as additional positive input to "greening" the area. Corridors of open spaces should be kept free from other uses in order to improve the quality of stay, but also of walking and cycling.

2.3 Quantitative analysis for the district of Liesing, Vienna

2.3.1 The data

The aim of the quantitative analysis was to conduct a representative stated preferences survey among the inhabitants of the district of Liesing in order to determine a) the housing situation, with special regards to housing form and green space availability, b) orientations and opinions with regard to leisure and travel infrastructure c) resident's leisure behaviour concerning visit of certain leisure infrastructures and d) their mobility patterns (primarily mode choice) for leisure activities.

A total of 424 respondents were interviewed by phone, covering a representative distribution of Liesing's inhabitants in terms of age, gender and housing type. The questionnaire consisted of six parts (see annex for details):

- Current housing situation and availability of green areas
- Assessment of infrastructure facilities in the immediate residential environment
  - Item list concerning mobility orientations (transport infrastructure)
  - Item list concerning leisure orientations (leisure infrastructure)
- Self-assessment of mobility behaviour (work/training and shopping for daily needs)
- Self-assessment of leisure behaviour
  - Leisure infrastructure predominantly frequented, its location, frequency of visit and preferred means of transport to the location
- Availability of transport modes, alternatives to car use for leisure activities, conditions for mode shift
- Personal and household characteristics

The evaluation of the interviews aimed at identifying links between housing form (type of apartment or house incl. availability of private and public green/open spaces), personal characteristics (age, degree of education and status of employment), life-style (mobility orientation, leisure orientation and predominant choice of leisure activity) and mobility patterns (predominant choice of transport mode).

2.3.2 Personal and household characteristics

One quarter of the sample live in single-person-households and almost half of the interviewees in two-person-households. Another 15% have household sizes of 3, 8% live in households of 4 persons, and 6% in households with 5 persons and more. In terms of age, the youngest age group of 15-24 years, which due to monetary constraints is dependent to a higher degree on public transport and unmotorized transport, is only represented with 9%. The highest share (40%) represents the age group of 25-54 years, which in terms of income is the group with the most freedom of choice related to mobility. The "late economically active" age group 55-64 is represented with 22% in the sample. People aged over 65 years (to large degree pensioners) are

represented with 29%. Both sexes are evenly represented in the survey. 12% of the respondents have children below 10 years of age in their household.

Concerning education, 7% of the interviewees only finished compulsory school, 26% compulsory school with vocational training, 32% a Secondary school (higher school certificate) and 21% have a university or similar degree. One third of the respondents work full time (more than 36hrs), 10% part time and 50% have no or other occupation (unemployed, pensioners).

5% of the sample have a net household income below 950 Euros, 22% earn between 951 and 1,800 Euros, 30% up to 3,000 Euros and 19% more than 3,000 Euros.

Table 3: Personal and household characteristics of the sample

	N	%		N	%
Female	213	50	Occupation		
Male	211	50	full time	147	35
Age			part time	42	10
15-24 years	40	9	marginally employed	4	1
25-54 years	167	39	other	216	51
55-64 years	93	22	Household size		
65+ years	122	29	1 person	105	25
Net household income			2 persons	195	46
below 950 Euros	23	5	3 persons	61	14
951-1,800 Euros	94	22	4 persons	34	8
1,801-3,000 Euros	128	30	5+ persons	27	6
over 3,000 Euros	82	19	Children < 10 years		
no response	97	23	1	24	6
Educational attainment			2	20	5
compulsory school	30	7	3+	6	1
apprenticeship	112	26	Children < 18 years		
technical college	48	11	1	33	8
secondary school	134	32	2+	16	4
university	88	21			

Source: Survey OIR, n=424, 2014

2.3.3 Housing form and availability of private open spaces and green areas

The majority of interviewees live in multi-storey buildings with up to 6 storeys (53%) or more than 6 storeys (14%). One quarter live in single family homes and less than 10% in townhouses. 8% live in an apartment or house with up to 50m^2, 20% have up to 70m^2, 25% have up to 90m^2, 16% have up to 110m^2 and 15% have up to 130m^2. Another 16% of the sample has housing space of up to 131m^2 or more.

The availability of private open spaces and green areas is very high in the sample. More than half of the respondents own a loggia, a balcony or a terrace and another 40% have access to a private garden. The availability of semi-private and public green spaces is less distributed, with 18% of the respondents having access to common green spaces within the building complex and 26% having access to public green spaces. Here, multiple responses were possible; meaning also a combination of private and public spaces may be available per individual.

Table 4: Housing form and availability of private open spaces and green areas in the sample

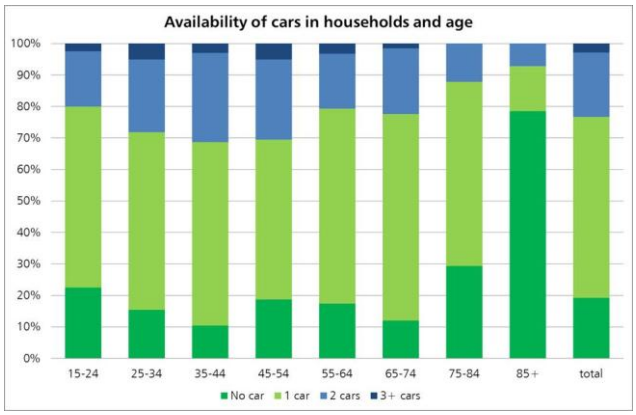
	N	%
Housing form		
Single-family home	104	25
Townhouse	34	8
Multi-storey -6	223	53
Multi-storey 6+	58	14
Loggia, Balcony, Terrace	230	54
Apartment Size		
< 50m²	32	8
51m² – 70m²	86	20
71m² – 90m²	106	25
91m² – 110m²	66	16
111m² – 130m²	65	15
> 131m²	69	16
Availability of green & open space		
Loggia, balcony, terrace	230	54
Private garden	170	40
Common green	77	18

Source: Survey OIR, n=424, 2014

2.3.4 Ownership of transport vehicles and usage of public transport

The survey sample covers 424 interviewees living in households comprising overall 971 persons. For these households, 450 cars are either in ownership or leased for personal usage (e.g. company car for personal use), which yields a motorization of about 463 cars per 1000 inhabitants in the sample. This is below the motorization measure of the Liesing district (500 cars per 1000 inhabitants), but still well above the motorization of the city of Vienna (390 cars per 1000 inhabitants). Also, the share of people with driving licenses is very high at 87%. Motorization is very high in all age classes and declines with age. In the age group of 85 and older, almost 80% have no car at their disposal.

Figure 5: Availability of cars in households and age



Source: Survey OIR, n=424, 2014

The fares policy of Vienna's public transport operator that favours frequent users of public transport (annual ticket for 365 Euros) also makes an impact on public transport ticket ownership in the sample. More than 40% of the interviewees use the annual ticket, which also indicates frequent public transport use. Another 40% only use daily and single tickets, indicating occasional public transport use.

Table 5: Ownership of transport vehicles and usage of public transport in the sample

	N	%
Car ownership		
No car	81	19
1 car	242	57
2 cars	86	20
3+ cars	12	3
Driving license		
Driving license car	361	85
no Driving license	55	13
Usage of public transport		
Public transport annual ticket	174	41
monthly ticket	29	7
weekly ticket	4	1
Daily/single ticket	175	41

Source: Survey OIR, n=424, 2014

2.3.5 The construct of "lifestyle"

The construct of "lifestyle" was built from the elements mobility orientations, leisure orientations and leisure behaviour, representing customary leisure activities.

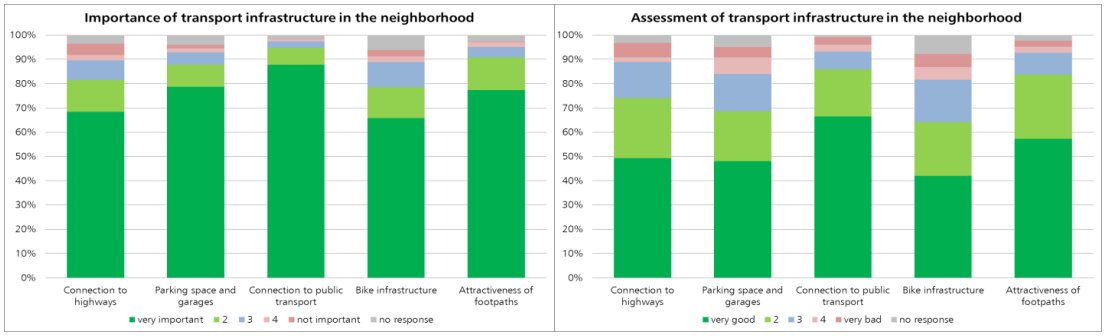
2.3.5.1 Mobility orientations

Mobility orientations were operationalised by an item list on importance and assessment of certain transport infrastructures, which indicate orientations towards car, public transport, bicycles, walking and multi-modality.

Interestingly, the connection to public transport is considered most important in the sample, followed by parking spaces and garages as well as attractiveness of footpaths. Also the satisfaction with public transport is highest compared to all other modes – almost 70% deem public transport infrastructure as "very good", followed by attractiveness of footpaths with almost 60%. Public transport supply and attractiveness of bike- and footpaths are main discussion points in the ongoing civic participation discourse in Liesing. The importance rating of connection to highways and high-level roads is significantly lower. Here, the comparably high modal split of car within the district would suggest higher ratings, which indicates that the population is less car oriented and the actual mobility behaviour is rather a result of infrastructural, accessibility and other constraints. This assumption can be strengthened by the statements on requirements for a change in mobility behaviour from car orientation to other modes. The survey results show that improvement of public transport, increase in opportunities for shopping in the

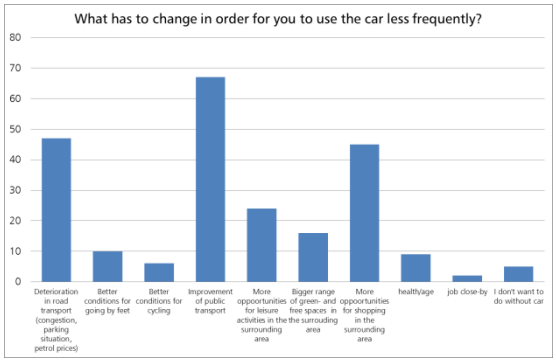
neighbourhood and restrictions in road transport are most important aspects for the inhabitants of Liesing to induce modal shift from car. Improvements in footpaths or bicycle tracks were less stated claims. The strict rejection of all other modes than car is also highly underrepresented.

Figure 6: Importance and assessment of transport infrastructure in the neighbourhood



Source: Survey OIR, n=424, 2014

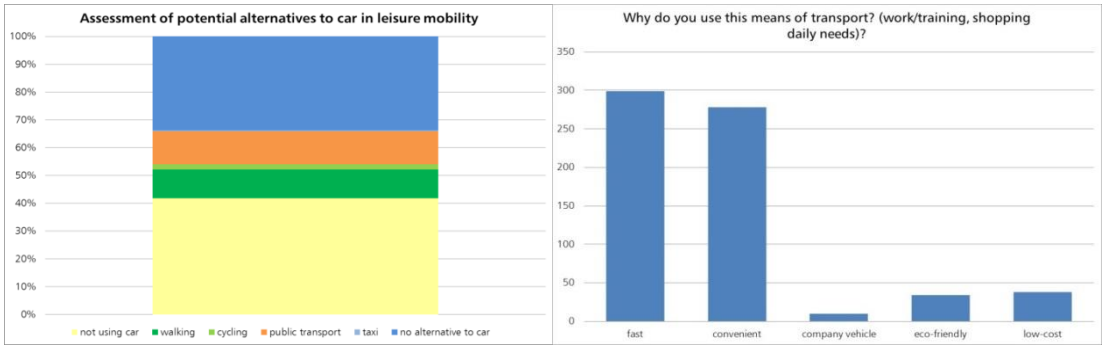
Figure 7: Necessary changes for using the car less frequently



Source: Survey OIR, n=424, 2014

The importance of and satisfaction with bike infrastructure generally is lower compared to the other means of travel, again representing the low bike orientation and modal split of the whole district, which is accompanied by a mobility culture and policy of non-consideration of the bicycle as a serious means of transport.

Figure 8: Assessment of potential alternatives to car in leisure mobility. Reasons for using different means of transport



Source: Survey OIR, n=424, 2014

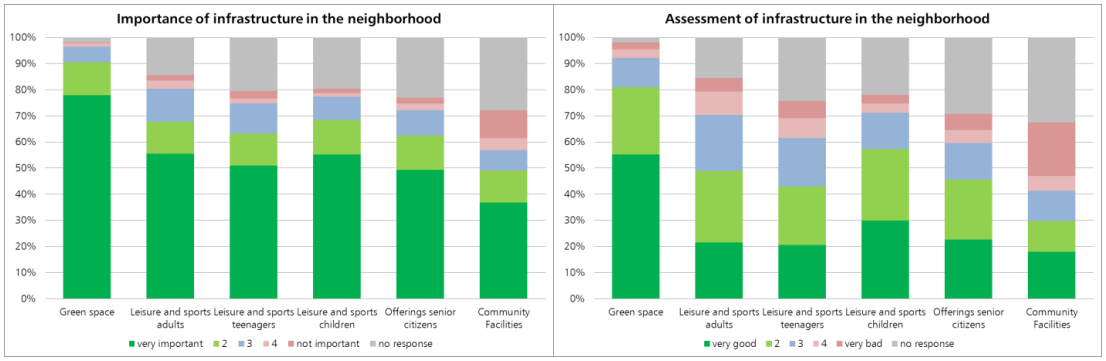
Also the car-related infrastructure represented by supply of parking and connectivity to highways shows lower ratings among the interviewees. This again may reflect the negative image of individual motorized traffic in the district, emerging from traffic congestion due to high volumes of commuter inflow and transit traffic as well as shortage of parking space.

The assessment of potential alternatives to the car for leisure trips as well as the question on the reason for choosing a means of transport for trips to work/training or shopping for daily needs were surveyed as open questions without pre-defined categories. Within the sample, 42% of the respondents are not using a car at all for mobility related to leisure, 34% see no alternative to using the car in their leisure time. Of the rest of the interviewees using the car for their leisure trips, 12% also see public transport as a potential alternative, 10% walking and only 2% would use the bicycle. Regarding trips to work or training or trips related to shopping for daily needs, the most important reasons for mode choice are travel time and convenience of the means of transport.

2.3.5.2 Leisure orientations

Leisure orientations were operationalised by an item list on importance and assessment of certain leisure infrastructures, which indicate orientations towards green spaces, sports facilities, community facilities and infrastructure for children or the elderly.

Figure 9: Importance and assessment of infrastructure in the neighbourhood



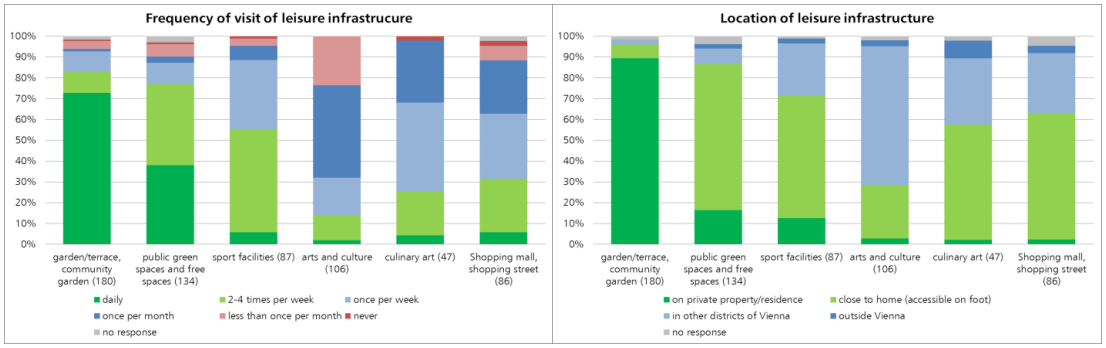
Source: Survey OIR, n=424, 2014

A clear preference towards green spaces is visible within the sample. Both the importance-rating and the satisfaction with the green spaces provided in the neighbourhood are significantly higher than for the other leisure infrastructures inquired. Assessment of leisure infrastructure is rather mediocre for sports as well as offerings for senior citizens and community facilities.

2.3.5.3 Leisure behaviour

Leisure behaviour was inquired referring to the predominantly frequented leisure infrastructure according to predefined groups "private garden, terrace or community garden", "public green spaces and free spaces (e.g. parks, woods)", "sport facilities (e.g. fitness centre, soccer field, tennis court)", "arts and culture (e.g. theatre, cinema, concerts, exhibitions)" and "culinary art (e.g. cafes, restaurants, clubs)" or "Shopping mall, shopping street".

Figure 10: Frequency of visit and location of leisure infrastructure



Source: Survey OIR, n=424, 2014

Parallel to the high orientation and positive opinion towards green spaces within the sample, also the leisure behaviour (i.e. stated frequency of visit) shows a clear trend towards private and public green spaces. Private garden, terrace or community garden is the most frequented group of infrastructure among the interviewees, followed by public green spaces and free spaces, sports facilities, shopping opportunities, offerings related to culinary art and lastly arts and culture.

Multiple responses were possible in this question block. More than 300 responses were related to private and public green spaces, while less than 100 responses each were given for the other proposed leisure destinations. This also emphasizes the high orientation of respondents towards green spaces in the district of Liesing.

By housing form, private and community gardens on average are visited more frequently by single family home and townhouse owners than from persons living in multi-storey buildings, reflecting the ownership and availability of private green spaces. Concerning the frequency of visit of public green and free spaces, this trend is reversed. Generally, the frequency of visit of green spaces is very high in the sample, with more than 80% visiting any type of green and free spaces at least 2-4 times per week.

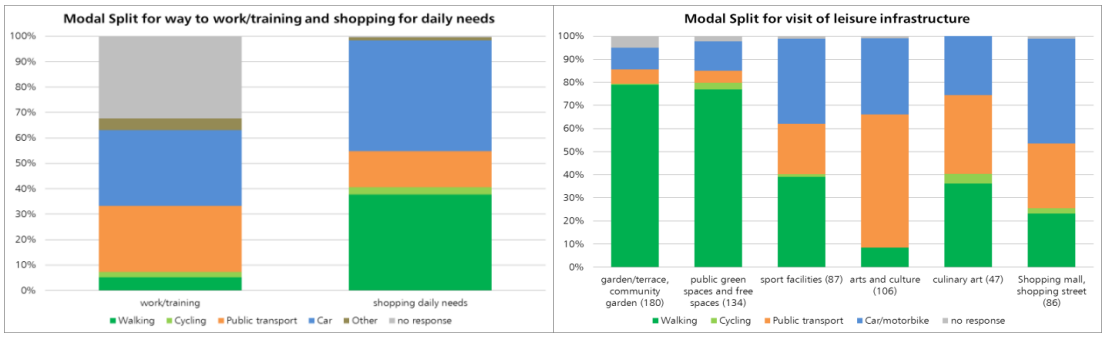
2.3.6 Mobility behaviour and modal split

Measuring mobility behaviour to work/training and shopping for daily needs as well as to leisure infrastructure was operationalized as stated preference on the means of transport predominantly used for trips undertaken for the respective purpose.

One third of the sample are pensioners and have no trip to work or training. Of all persons with trips to work and training, the modal split is characterized by high shares of car (45%) and public transport (39%) and very low shares of bicycle (3%) and walking (8%). For trips related to shopping for daily needs the modal split displays a different distribution. However, the modal split of car remains the same with 44% and seems to be a constant, which could be explained by the combination of trips to mobility chains (e.g. shopping for daily needs on the way to or from work, using car). The accessibility by car of supermarkets is good in Liesing, as well as there are no parking restrictions. The modal split for walking lies at 38% while only 14% use public transport for their trips to the supermarket. This trade-off between public transport and walking for the two different trip purposes to a large degree can be explained by short distances between the residential areas and respective offerings for those with no way to work or training

(pensioners), who are not represented in the statistic dealing with the way to work/training (no such trip). Also the organization of trips in mobility chains may show some effect here, with public transport being the main means of transport to work and training for 38% of the sample and walking being the stated mode of transport for shopping for daily needs on the way to or from work. The modal split of bicycle is only 3%.

Figure 11: Modal split for way to work/training, shopping for daily needs and visit of leisure infrastructure



Source: Survey OIR, n=424, 2014

Regarding leisure trips, the modal split in all of the leisure groups significantly correlates with the location[12] of the infrastructures headed for. Walking is the transport mode predominantly used for destinations close to home, public transport is more frequently used for trips to other districts of Vienna and car is the preferred mode for trips to locations outside Vienna (see also correlation analysis in Chapter 2.3.10). Private garden, terrace or community garden is the group of infrastructure with the highest modal split of walking (83%) among the interviewees, followed by public green spaces and free spaces with 79%, sports facilities with 40%, offerings related to culinary art with 36%, shopping opportunities with 24% and lastly arts culture with 9% displays the lowest modal split of walking.

The modal split of car is highest among trips to shopping opportunities (46%), sports facilities (37%) and arts and culture (33%). Interestingly, except opportunities related to arts and culture, these leisure infrastructures were characterized by a significant share of the interviewees as being close to home and accessible by foot. This leads to the conclusion, that for the activities sports and shopping, the type of activity and related convenience of means of transport as well as location factors[13] additionally have an influence on the mode choice.

The modal split of public transport is highest among trips to arts and culture (58%), culinary art (34%) and shopping opportunities (28%). These opportunities are mostly located in other districts of Vienna or in the centre, which are better accessible by public transport and generally have restrictions regarding car traffic (being it parking restrictions or traffic overload). Also the supply of opportunities related to arts and culture, culinary art and shopping is higher in the more centrally located districts, which leads to the organization of trips out of the residential district into these areas.

12 This also implies that distance, accessibility and travel times have an influence, see Chapter 2.3.10
13 E.g. opportunities to combine activities at one location

2.3.7 Constructing "lifestyle types"

In order to test the hypothesis of lifestyle having an influence on mobility patterns for leisure activities, the first step of the empirical analysis deals with the grouping of individuals to identify social groups or "lifestyle types", based on orientations and attitudes towards transport and leisure infrastructure as well as the frequency of visit of leisure infrastructures. To construct these lifestyle types, the items on mobility orientation, leisure orientation and leisure behaviour were selected from the questionnaire, followed by factor analysis, and, finally cluster analysis.

With help of factor analysis, the main factors (independent variables), which explain the correlation of the selected set of variables, were established. For factor analysis, the Principal component analysis (PCA) method combined with VARIMAX rotation with Kaiser Criteria was used (see Backhaus et al., 2006, for methodological issues[14]). PCA is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. Three separate factor analyses were conducted for mobility orientations, leisure orientations and leisure behaviour, leading to the extraction of a total of 9 factors. The 3 factors for mobility orientations explain 71.3% of the variance of the original 9 items, the 3 factors for leisure orientations explain 61.3% of the variance of the original 22 items, and the factors for leisure behaviour explain 62.2% of the variance of the original 6 items (see table).

Variables with high factor loadings describe the characteristic of the common factor; negative factor loadings indicate reverse correlation of the particular variable with the other variables loading on the factor. The interpretation of factor loadings reveals the following components for mobility orientations, leisure orientations and leisure behaviour:

- Factor 1: Importance and Assessment of bicycle and walking infrastructure
- Factor 2: Importance and Assessment of Car infrastructure
- Factor 3: Assessment of multi modal infrastructure (car, public transport, walking)
- Factor 4: Importance and assessment of infrastructure related to leisure/sports all ages; services seniors; community facilities
- Factor 5: Importance and assessment of infrastructure related to children education; daily shopping; services; green spaces and contacts with neighbours
- Factor 6: Assessment of infrastructure for children education, daily shopping, services and green spaces
- Factor 7: Frequency of visit of arts, culinary or shopping facilities
- Factor 8: Frequency of visit of private or public green spaces
- Factor 9: Frequency of visit of sports facilities

[14] Backhaus, K., B. Erichson and W. Plinke (2006) Multivariate Analysemethoden: Eine anwendungsorientierte Analysemethode, Springer, Berlin.

Table 6: Nine extracted factors/components for mobility and leisure orientations and leisure behaviour

Mobility orientations	F1	F2	F3
Importance connection to highways	0.23	**0.88**	0.07
Assessment connection to highways	0.21	**0.63**	**0.46**
Importance provision of parking space and garages	0.11	**0.83**	0.16
Assessment provision of parking space and garages	0.08	0.43	**0.65**
Importance connection to public transport	0.16	0.09	**0.82**
Importance provision of bike infrastructure	**0.82**	0.35	-0.10
Assessment provision of bike infrastructure	**0.80**	0.06	0.18
Importance attractiveness of footpaths	**0.76**	0.25	0.15
Assessment attractiveness of footpaths	**0.70**	-0.03	**0.50**

Question: How important is the provision of the following infrastructures and how do you assess the current situation? Scale from 1-5; (1) very important/very good, (5) not important/very bad. N=424.

Leisure orientations	F4	F5	F6
Importance provision of kindergardens	0.25	**0.79**	0.17
Assessment provision of kindergardens	0.13	**0.49**	**0.63**
Importance provision of schools	0.24	**0.81**	0.19
Assessment provision of schools	0.10	**0.50**	**0.63**
Importance shopping opportunities for daily needs	0.09	**0.70**	0.30
Assessment shopping opportunities for daily needs	0.09	0.20	**0.68**
Importance provision of services	0.03	**0.69**	0.30
Assessment provision of services	0.05	0.16	**0.76**
Importance green spaces	0.09	**0.68**	0.28
Assessment green spaces	0.15	0.24	**0.61**
Importance leisure and sports facilities for adults	**0.70**	0.45	-0.11
Assessment leisure and sports facilities for adults	**0.74**	0.11	0.20
Importance leisure and sports facilities for teenagers	**0.78**	0.41	-0.13
Assessment leisure and sports facilities for teenagers	**0.79**	0.05	0.23
Importance leisure and sports facilities for children	**0.79**	0.42	-0.12
Assessment leisure and sports facilities for children	**0.83**	0.15	0.16
Importance special offerings aimed at senior citizens	**0.72**	0.24	0.00
Assessment special offerings aimed at senior citizens	**0.69**	-0.11	0.37
Importance community facilities in the condominium	**0.65**	0.15	0.09
Assessment community facilities in the condominium	**0.61**	-0.19	0.40
Importance contact to neighbours	0.43	**0.49**	0.08
Assessment contact to neighbours	0.43	**0.49**	0.08

Question: How important is the provision of the following infrastructures and how do you assess the current situation? Scale from 1-5; (1) very important/very good, (5) not important/very bad. N=424

Leisure behaviour	F7	F8	F9
Frequency of visit private or community garden, terrace	0.19	**0.78**	-0.32
Frequency of visit public green spaces and free spaces	0.26	**-0.70**	-0.38
Frequency of visit sports facilities	0.13	-0.04	**0.89**
Frequency of visit arts and culture	**0.68**	0.15	0.01
Frequency of visit culinary art	**0.71**	-0.04	0.23
Frequency of visit Shopping mall, shopping street	**0.65**	-0.12	-0.07

Question: How often do you visit recreational facilities? (1) daily, (2) several times a week, (3) once a week, (4) once a month, (5) less than once a month, (6) never. N=424.

Rotated component matrix, factor loadings above +/- .40 printed in **bold type**

A cluster analysis was conducted on the basis of the 9 factor-variables, in order to define "lifestyle types" for further analysis. The task of a cluster analysis is to generate clusters (groups of cases) that are relatively homogeneous within and heterogeneous in relation to other clusters (see Backhaus et al., 2006, for methodological issues). The K-means algorithm was used, which constructs groups without an aggregation process (as opposed to hierarchical-agglomerative cluster analysis, e.g. Ward-method) using the Euclidean metric as global measure for heterogeneity within groups, with the number of groups being pre-defined. The K-means algorithm does not identify groups with particularly compact clusters at the expense of high heterogeneity within other groups, but rather creates clusters with "medium" homogeneity.[15]

Table 7: Cluster centres of lifestyle types

N	SUB URB 102	CITY TOUR 69	x 12	HOME 60	ECO 181
Factors of mobility orientations					
F1: Bicycle and walking infrastructure	0.13	**-1.24**	*-2.76*	**0.32**	**0.48**
F2: Car infrastructure	**0.49**	-0.28	*-1.69*	0.20	-0.13
F3: Multi modal infrastructure	**-1.00**	**0.46**	*-1.28*	0.22	**0.40**
Factors of leisure orientations					
F4: Leisure/sports all ages; services seniors; community facilities	0.10	**-0.72**	*-0.42*	**0.51**	0.08
F5: Children education; daily shopping; services; green spaces …	**0.63**	**-0.57**	*-3.80*	0.05	0.10
F6: Assessment children education, daily shopping, services …	**-0.90**	0.18	*-1.74*	0.13	**0.51**
Factors of leisure behaviour					
F7: Arts, culinary or shopping facilities	0.26	**0.30**	*0.37*	**-1.96**	**0.36**
F8: Private or public green spaces	**0.38**	0.19	*0.43*	-0.02	**-0.31**
F9: Sports facilities	-0.07	-0.04	*0.02*	-0.15	0.10

Bold type: High deviations of factor mean from cluster centre. *Note*: Lifestyle types SUBURB="Suburbanites"; CITY-TOUR="City tourists"; HOME="HOMIES"; ECO="ECOs", see following chapter for description

This orientation-based clustering has led to the identification of 5 groups, which allowed the interpretation of 4 "lifestyle types"[16]. The decision for four groups was made after comparing with various other cluster solutions and being judged the best solution to allow plentiful scope for interpretation. They were differentiated by characteristics on the basis of statistically significant deviations from the mean of all cases (cluster centres, table above). In order to clarify their cluster-specific differentiation in terms of their mobility and leisure orientation and leisure behaviour, we labelled the clusters with characteristic names: "The Suburbanites", "The City Tourists", "The Homies" and "The Ecos". Several relationships between personal and household characteristics, housing situation, availability of green areas and private open spaces and availability of transport modes and the lifestyle types become apparent.

[15] Cf. Wiedenbeck, M. and Züll, C. (2001), Klassifikation mit Clusteranalyse: Grundlegende Techniken hierarchischer und K-Means-Verfahren. ZUMA How-to-Reihe, Nr. 10. Mannheim

[16] One Cluster with n=12 was removed from the analysis

Table 8: Lifestyle types by personal and household characteristics, housing situation, availability of green areas and private open spaces and availability of transport modes in %

		SUBURB	CITY TOUR	HOMIES	ECOs	Total
	N	102	69	60	181	424
Personal and household characteristics						
Female	213	**56**	**57**	50	44	50
Age						
15-24 years	40	10	6	5	**13**	9
25-54 years	167	41	41	40	38	39
55-64 years	93	18	17	**27**	**24**	22
65+ years	122	31	**36**	27	25	29
Net household income						
below 950 Euros	23	3	**7**	2	**7**	5
951-1,800 Euros	94	23	25	23	22	22
1,801-3,000 Euros	128	24	26	30	**36**	30
over 3,000 Euros	82	**30**	19	13	17	19
no response	97	21	23	32	18	23
Educational attainment						
compulsory school	30	8	3	**12**	7	7
apprenticeship	112	25	33	27	24	26
technical college	48	11	10	12	12	11
secondary school	134	25	33	30	37	32
university	88	**29**	16	18	19	21
Occupation						
full time	147	35	28	27	40	35
part time	42	10	6	**17**	9	10
marginally employed	4	0	1	3	1	1
other	216	52	**61**	48	48	51
3 and more persons in household	123	**41**	20	23	28	29
Child under 18 years in household	88	**30**	14	15	20	21
Housing Situation						
Single-family home	104	21	19	23	**29**	25
Townhouse	34	10	7	7	8	8
Multi-storey -6	223	57	**61**	52	49	53
Multi-storey 6+	58	12	13	**18**	14	14
Availability of green areas and private open spaces						
Loggia, Balcony, Terrace	230	52	46	**68**	56	54
Private garden	170	**45**	**29**	38	42	40
Common green	77	15	17	**25**	19	18
Availability of transport modes						
No car	81	20	19	15	20	19
1 car	242	52	54	**72**	56	57
2 cars	86	24	23	7	23	20
3+ cars	12	4	4	5	1	3
Public transport annual ticket	174	43	**33**	45	43	41
Driving license car	361	87	87	90	84	85
no Driving license	55	13	13	**7**	14	13

Bold type: High/Low share compared to other clusters. *Note*: SUBURB="Suburbanites"; CITYTOUR="City tourists"; HOMIES; ECOs. Reading example: 18% of "HOMIES" live in multi-storey buildings with more than 6 storeys

2.3.7.1 Cluster 1: "Suburbanites"

Cluster 1 (N=102) represents respondents who on the one hand state an above average importance of car-related infrastructure in their neighbourhood. On the other hand, their assessment of public transport, walking or bike-related infrastructure is very negative, compared to the mean of the sample. Therefore, they can be labelled as car affine. In terms of other infrastructure in the neighbourhood, this cluster stands out due to high stated importance of infrastructure related to children education, daily shopping, and services as well as high importance of green spaces in the neighbourhood. In contrast to this stands the highly negative assessment of provided infrastructure in the neighbourhood. Contacts with neighbours are very important for members of this cluster, who also show a high frequency of visit of private or public green spaces. Compared to the average, representatives of the "Suburbanites" are more frequently women (56%) and a relatively large share compared to the average live in households with 3 and more persons (41%) and children under 18 years in the household (30%). Their age distribution is average. Furthermore, the "Suburbanites" occur more in high-income household groups (over 3,000 Euros, 30%) and are educated well above average (29% with university degree). 45% of this type own a private garden and 52% a loggia, balcony or terrace. 80% of the "Suburbanites" possess at least one car, but at the same time the share of people with a public transport annual ticket is very high (43%).

2.3.7.2 Cluster 2: "City tourists"

Cluster 2 (N=69) represents respondents who give a positive assessment for infrastructure of all modes in their neighbourhood. However, they attribute very low importance to bicycle and walking infrastructure and below average importance to car-related infrastructure. Therefore, they can be labelled as public transport affine. In terms of other infrastructure in the neighbourhood, this cluster ascribes low importance to leisure/sports facilities for all ages, services for seniors and community facilities as well as infrastructure related to children education, daily shopping, services and green spaces in the neighbourhood. Contacts with neighbours are not important for interviewees of this cluster, who also show a high frequency of visit of arts, culinary or shopping facilities. Compared to the average, representatives of the "City tourists" are more frequently women (57%) and 65+ years old (36%). Their household size (20% with 3 and more persons in household) and share of households with children under 18 years (14%) is well below average. The income distribution of "City tourists" shows above-average shares of households in the lowest and second lowest income group (below 950 Euros, 7%, 951-1,800 Euros, 25%). Only 35% of this type are at least marginally employed, which means that there is a high share of people either unemployed or retired (61%). Representatives of this group more frequently live in multistorey buildings (74%) and to a significantly less degree own a private garden (29%). Also the availability of a loggia, balcony or terrace is below the average of the sample, but still high compared to urban standards (46%). 81% of the "City tourists" possess at least one car and the share of people with a public transport annual ticket is below average (33%).

2.3.7.3 Cluster 3: "Homies"

Cluster 3 (N=60) represents interviewees who are bicycle and walking affine but also show a positive assessment and orientation towards car and public transport infrastructure. Therefore,

they can be labelled as multi-modal. In terms of other infrastructure in the neighbourhood, this cluster ascribes high importance to leisure/sports facilities for all ages, services for seniors and community facilities. The frequency of visit of private or public green spaces and sports facilities is average, and the frequency of visit of arts, culinary or shopping facilities is highly below average. Representatives of the "Homies" show an even distribution of men and women, are more likely in the middle spectrum of the age pyramid (25-64 years, 67%) and less in the younger age group 15-24 (5%) or older age group 65+ (27%). Their household size (23% with 3 and more persons in household) and share of households with children under 18 years (15%) is well below average. The income of "Homies" lies in the middle of the distribution, with the lowest share of members with net household income less than 950 Euros (only 2%) but also the lowest share in the highest income group (over 3,000 Euros, 13%). Compared to the average, representatives of the "Homies" are more frequently of minor education (compulsory school, 12%) and employed part time (17%). They more frequently live in multi-storey buildings (70%) and to a significantly higher degree own a loggia, balcony or terrace (68%) or have access to common green (25%). This type more likely owns a car (85%) and has the lowest share of members without a driving license (7%). The ownership of a public transport annual ticket is also high (45%).

2.3.7.4 Cluster 4: "Ecos"

Cluster 4 (N=181) represents respondents who attribute high importance and a positive assessment to bicycle and walking infrastructure as well as to public transport. Their orientation towards car is below-average. Therefore, this cluster can be labelled as multi-modal but also car emancipated. In terms of other infrastructure in the neighbourhood this cluster is characterized by an average orientation but very positive assessment of infrastructure related to children education, daily shopping, services and green spaces. The leisure behaviour shows a high frequency of visit of arts, culinary or shopping facilities and above average orientation towards sports facilities. Conversely, the orientation towards private or public green spaces is low. Compared to the average, representatives of the "Ecos" are more frequently men (56%) and younger (15-24 years, 13%). The share of households with 3 and more persons (28%) and children under 18 years in the household (20%) is average. The income distribution shows an above average share of net household income below 950 Euros (7%), but also an above average share in the upper middle section (1,801-3,000 Euros, 36%). The "Ecos" are more frequently employed full time (40%) and their educational attainment corresponds to the average distribution. They more frequently live in single-family homes (29%) and to a higher degree own a loggia, balcony or terrace (56%) or have access to common green (19%). This type to 80% owns a car, but has the highest share of members without a driving license (14%) within the sample. The ownership of a public transport annual ticket is also high (43%).

2.3.8 Lifestyle types and mode choice in leisure time

In this section, the previously established lifestyle types are examined for their mode choice for leisure. A total of 170 respondents have stated their mode of transport predominantly used for visiting the private garden, terrace or community garden, 128 is the sample size for trips to public green spaces and free spaces, n=86 for trips to sport facilities, n=104 for trips to arts

and culture, n=46 for trips to culinary art and n=82 for trips to a shopping mall or shopping street. For some leisure trips, the sample sizes are very small, and therefore the results are only indicative. The mode choices of the established lifestyle types are compared to the mobility patterns differentiated by housing form, in order to show relationships and to draw conclusions for the added value of the concept of lifestyle for analysing mobility patterns.

Table 9: Lifestyle and housing types by mode of transport to leisure activities in %

		SUBURB	CITY TOUR	HOMIES	ECOs	Total %	S-F-H	Town-house	M-S-B <6	M-S-B >6	Total %
Mode of transport to Private or community garden/Terrace											
	N	22	18	35	95	170	66	26	66	22	180
Walking	142	**91**	83	83	81	83	83	**91**	79	86	83
Bicycle	1	0	0	0	1	1	2	0	0	0	1
PT	11	5	**11**	**9**	5	6	6	5	8	5	6
Car	17	5	6	9	**13**	10	9	5	**13**	9	10
Mode of transport to public green spaces and free spaces (e.g. parks, woods,..)											
	N	40	17	31	40	128	20	*9*	82	16	127
Walking	103	**88**	**88**	77	70	79	74	*100*	80	78	79
Bicycle	4	0	**12**	0	5	3	**11**	*0*	1	0	3
PT	7	0	0	**13**	5	5	0	*0*	6	6	5
Car	17	13	0	10	**20**	13	**16**	*0*	13	**17**	13
Mode of transport to sport facilities (e.g. fitness centre, soccer field, tennis court)											
	N	26	10	23	27	86	16	*1*	47	22	86
Walking	34	31	40	35	**52**	40	13	*100*	32	**73**	40
Bicycle	1	0	0	4	0	1	6	*0*	0	0	1
PT	19	19	**30**	**35**	11	22	6	*0*	**30**	18	22
Car	32	**50**	30	26	37	37	**75**	*0*	38	9	37
Mode of transport to arts and culture (e.g. theatre, cinema, concerts, exhibitions)											
	N	25	13	39	27	104	26	10	57	12	105
Walking	9	4	8	**15**	4	9	4	0	5	**42**	9
Bicycle	0	0	0	0	0	0	0	0	0	0	0
PT	61	48	54	**62**	**67**	58	50	**70**	65	33	58
Car	35	**48**	38	23	30	33	**46**	30	30	25	33
Mode of transport to culinary art (e.g. cafés, restaurants, clubs,..)											
	N	*5*	*4*	33	*4*	46	11	*3*	24	*8*	46
Walking	17	*40*	*25*	**39**	*25*	36	18	*67*	**42**	*38*	36
Bicycle	2	*0*	*0*	3	*0*	4	9	*0*	0	*0*	4
PT	16	*40*	*25*	**36**	*25*	34	36	*33*	33	*38*	34
Car	12	*20*	*50*	21	*50*	26	**36**	*0*	25	*25*	26
Mode of transport to Shopping mall, shopping street											
	N	*8*	12	42	20	82	20	*5*	44	16	85
Walking	20	*13*	8	**26**	20	24	20	*20*	23	**31**	24
Bicycle	2	*0*	0	5	0	2	0	*0*	5	0	2
PT	24	*25*	8	**36**	30	28	25	*20*	27	**38**	28
Car	39	*63*	**83**	33	50	46	**55**	*60*	45	31	46

Bold type: High/Low share compared to other clusters. *italic subscript:* Sample size below n=10. *Note*: SUBURB="Suburbanites"; CITYTOUR="City tourists"; HOMIES; ECOs; S-F-H=Single-Family Home; M-S-B <6=Multi-Storey-Building below 6 storeys; M-S-B >6=Multi-Storey-Building 6+ storeys.

The modal split to the private garden or community garden is due to its close proximity to the apartment or house naturally characterized by a high share of walking (above 80% in all clus-

ters). However, small differentiations are visible between the lifestyle clusters. Interestingly, the car oriented cluster 1 ("Suburbanites") shows the highest share of people predominantly walking to private green spaces. Conversely, the highest share of car use is to be observed in the car emancipated cluster 4 ("Ecos"), which also has the highest number of responses on this trip purpose. Here, the stated preference of orientation towards transport infrastructure to a degree contradicts the stated preference of means of transport for this particular leisure purpose. The highest use of public transport is within cluster 2 ("City Tourists"), which again corresponds with the mobility orientation. By housing type, the same small differentiations are visible, with residents of townhouses showing slightly higher shares of walking and residents of multi-storey buildings showing slightly higher shares of car use.

To public green and free spaces, the share of walking is still very high in all four lifestyle clusters (above 70%). "City tourists" display the highest share of biking (12%) in the sample. "Homies" have the highest share of public transport use (13%) for this purpose. The "Ecos" interestingly show the highest modal split of car within the sample, with 20%. Here again, the stated preference of orientation towards transport infrastructure to a degree contradicts the stated preference of means of transport for this particular leisure purpose. By housing type, the differentiations are smaller, with the share of car being evenly distributed between residents of single family homes and multi storey buildings and public transport only being chosen by residents of multi-storey buildings. Single family home owners also display the highest share of bicycle to public green and free spaces with 11%.

For leisure activities related to sports facilities, the number of responses decreased to a total of 86. Within the clusters, the mobility orientation shows higher similarities to the mobility behaviour than in the previous leisure destinations. The "Suburbanites" show the highest modal split car (50%), "Homies" have the highest modal split public transport (35%) and the "Ecos" display the highest share of walking in the sample (52%). By housing form it is very clear regarding car (75% share for single family home residents); public transport (30%) but also walking (73%, for multi-storey buildings >6 storeys) has significant shares on mobility of residents of multi-storey buildings to sports facilities.

The modal split to arts and culture destinations is in all clusters and housing forms characterised by high shares of public transport (50%+, except multi-storey buildings >6 storeys), but also significant shares of car (30%+, except "Homies" and multi-storey buildings >6 storeys). "Suburbanites" have the highest share of car mobility (almost 50%) and the lowest of public transport in the sample (also almost 50%). In all other clusters, the modal split of public transport lies above 50% or even above 60% (Multi-modal clusters 3 and 4). By housing form, residents of single-family homes display the highest share of car mobility (46%), opposed to townhouse and multi-storey building residents having high shares of public transport (70%). Residents of multi-storey buildings with more than 6 storeys also have a very high walking share (42%) to arts and culture destinations.

For cafes, restaurants and clubs, the sample size is relatively small (46 responses). Modal split in the sample is almost evenly split between walking, public transport and car. "Homies" display a modal split of 39% walking, 36% public transport and 21% car. By housing form, the modal split of single family home owners is evenly divided between public transport and car (36%) and residents of multi-storey buildings show a higher share of walking (42%).

The modal split to shopping malls and shopping streets in the sample is characterized by a high modal split of car (46%) and significant shares of public transport (28%) and walking (24%). Again, the phenomenon of contradicting statements regarding mobility orientations and predominantly chosen means of transport becomes apparent with the "City tourists" showing the highest share of car use (83%), but also "Ecos" to 50% using the car predominantly for these trips. The "Homies" again show the highest shares of walking (26%) and public transport 36%) of all lifestyle types. Analysed by housing form, the modal split car tends to be higher in trips to shopping opportunities from residents of single family homes or townhouses (more than 55%) than of multi-storey building residents.

2.3.9 Lifestyle types and mode choice for work/training/daily shopping

The modal split to work and training differs significantly between the lifestyle-clusters: The highest shares of car use can be found among the "Suburbanites" (51%), the "City Tourists" (47%) and "Ecos" (44%). The highest shares of public transport to work/training are among "Homies" (53%) and "City Tourists" (45%). The share of walking is highest among "Homies" with 12% and below 10% in all other clusters. For the trips to shopping for daily needs, significant shares of car are observable among "Suburbanites" (51%) and "City Tourists" (46%), followed by "Ecos" (43%). Only the "Homies" display lower shares of car (33%) and higher shares of walking (47%). Public transport is very evenly distributed among the lifestyle clusters with shares ranging from 13%-17%.

Table 10: Lifestyle and housing types by mode of transport to work/training and daily shopping in %

		SUBURB	CITY TOUR	HOMIES	ECOs	Total %	S-F-H	Town-house	M-S-B <6	M-S-B >6	Total %
Mode of transport to work or training											
	N	61	53	34	129	277	66	19	159	38	282
Walking	19	7	0	**12**	9	7	6	0	7	**16**	8
Bicycle	8	**5**	2	0	3	3	5	5	3	0	3
PT	108	38	45	**53**	33	39	29	**47**	43	32	38
Car	124	**51**	**47**	32	44	45	**52**	32	43	45	44
Other	18	0	6	3	11	6	9	16	4	8	7
Mode of transport for shopping for daily needs											
	N	102	69	60	181	424	104	34	223	58	424
Walking	160	31	35	**47**	40	38	22	38	41	**53**	38
Bicycle	12	3	3	3	3	3	5	3	3	0	3
PT	60	14	13	**17**	14	14	14	12	15	9	14
Car	185	**51**	**46**	33	43	44	**57**	47	40	36	44
Other	5	0	3	0	1	1	1	0	1	2	1

Bold type: High/Low share compared to other clusters. *Note*: SUBURB="Suburbanites"; CITYTOUR="City tourists"; HOMIES; ECOs; S-F-H=Single-Family Home; M-S-B <6=Multi-Storey-Building below 6 storeys; M-S-B >6=Multi-Storey-Building 6+ storeys.

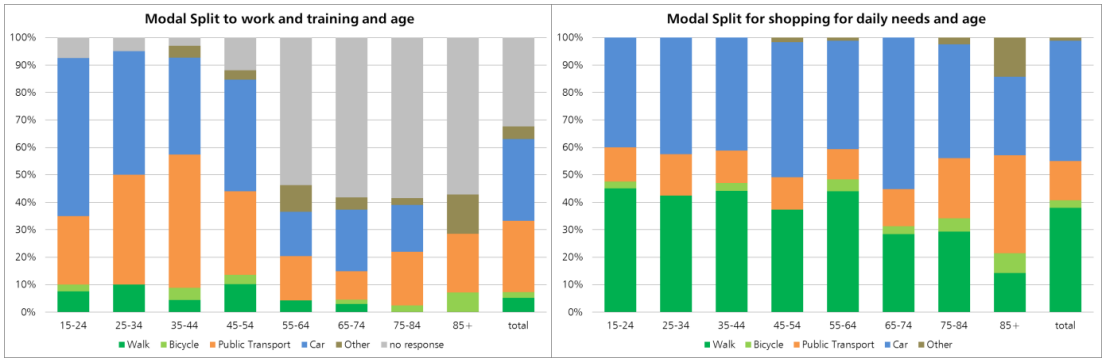
By housing form, the modal split to work/training of car shows nearly no differentiation between single family homes (52%) and Multi-storey buildings (45%). The share of public transport is higher in Townhouses (47%) and Multi-storey buildings (43%), but lower and on the same level with single family homes in buildings with more than 6 storeys (32%).

For the purpose of shopping for daily needs, almost 60% of the residents of single family homes use car, this share declines with building density (lowest in multi-storey buildings with more than 6 storeys: 36%). The share of walking shows the reversed pattern. The share of public transport is only slightly higher in Multi-storey buildings (15%), but lowest in buildings with more than 6 storeys (9%).

The share of people with trips to work and training declines with age, only less than 50% of people over 55 years within the sample leave home for this purpose. The modal split car is highest in the youngest age group of 15-24 (58%), followed by the age group 25-34 (45%) and 45-54 (41%). The modal split public transport is highest in the age group 35-44 (49%), followed by 25-34 (40%) and 45-54 (31%). The modal split of walking is highest in the age groups 25-34 and 45-54 with 10%.

For the trips to shopping for daily needs, the highest car use is visible in the middle-aged age groups 65-74 (55%) and 45-54 (49%). The highest share of public transport can be found among the older age groups 75-84 (36%) and 85+ (22%) – in all other age groups the share of public transport is comparably low (below 15%). The age groups below 64 years display similarly high shares of walking for trips related to daily shopping (45%).

Figure 12: Modal Split to work, training and age and for shopping for daily needs and age



Source: Survey OIR, n=424, 2014

2.3.10 Correlation of mode choice in leisure time, frequency and "location"

The different elements of mobility patterns – mode choice, frequency and distance – tend to be connected to each other. Also, there is a tendency of connecting trips to different activities in mobility chains, which necessarily leads to correlations and interferences between the trips undertaken by persons (e.g. mode of transport chosen). Within this study, mode choice was defined as the means of transport predominantly used for a certain leisure activity. Frequency of trips to certain leisure activities was inquired on an ordinal scale (1=daily…6=never). Distance of trips is difficult to operationalize in stated preference surveys, as on the one hand the estimation by the test person may not be correct, but on the other hand the inquiry of the target location and subsequent calculation of distance may also be incorrect due to different routing possibilities. In the survey at hand, the location of leisure infrastructure visited was inquired on an ordinal scale (1=own property…4=outside Vienna). Ranking of Variables is possible with this kind of scale, but no metric measurement of distance can be given. Within the scope of this analysis, the variable "location" has to be always interpreted as a factor entailing various dimen-

sions such as distance, accessibility, travel time or location factors[17] which all have an influence of the other elements of mobility patterns.

In order to detect bivariate relationships between the variables of mobility patterns, the non-parametric Kendall-Tau-b was used, which is a measure of correlation between two ordinal-level variables. The following correlation matrix shows different relationships between the variables of mobility patterns. Firstly, mode and location of leisure trips correlate with mode and location of other leisure trips (see correlation factors with red outline). This correlation points to the combination of trips within mobility chains, e.g. trips for shopping with trips to the fitness centre, the cinema or restaurant. Here, shopping centres which combine all these four elements may have an influence. Secondly, in all of the six types of leisure trips inquired (except trips to private garden, terrace or community garden), the mode of transport correlates with the location, i.e. trips to destinations close to the neighbourhood have a higher chance of being done walking, while trips to destinations outside Vienna are rather done by car (see correlation factors with yellow outline). Indirectly, this shows the range of different modes of transport (walking for short distances and motorized transport for long distances). As mentioned before, e.g. when it comes to differentiating car transport with public transport, the multi-dimensionality of the "location" variable makes it difficult to explain the choice for either of the two just by looking at the quantitative analysis.

Figure 13: Correlations (Kendall-Tau-b): Frequency – Mode – Location of leisure activities

	frequency PRIV	mode PRIV	location PRIV	frequency PUB	mode PUB	location PUB	frequency SPORT	mode SPORT	location SPORT	frequency CULT	mode CULT	location CULT	frequency CULIN	mode CULIN	location CULIN	frequency SHOP	mode SHOP	location SHOP
frequency PRIV	.	_	,151	_	_	_	,387	_	_	_	_	_	_	_	_	_	_	_
mode PRIV	.	.	_	,588	,908	_	_	_	_	_	_	_	_	,373	,505	_	_	_
location PRIV	.	.	.	_	,407	_	_	_	_	_	_	_	_	_	_	_	_	,383
frequency PUB	.	.	.	.	,418	_	_	_	_	_	_	_	_	_	_	_	_	_
mode PUB	.	.	.	.	.	,322	_	,421	_	_	_	_	_	_	_	_	_	_
location PUB	.	.	.	.	.	.	_	_	_	_	_	_	_	_	,425	_	_	_
frequency SPORT	.	.	.	.	.	.	.	_	_	_	_	_	_	_	_	,465	_	_
mode SPORT	.	.	.	.	.	.	.	.	,373	_	_	,421	_	_	_	_	,656	_
location SPORT	.	.	.	.	.	.	.	.	.	_	_	,406		,489	_	,463	_	_
frequency CULT	.	.	.	.	.	.	.	.	.	.	_	,204	_	_	_	,342	,333	_
mode CULT	.	.	.	.	.	.	.	.	.	.	.	,372	_	,370	_	_	,492	,375
location CULT	.	.	.	.	.	.	.	.	.	.	.	.	_	_	,514	,403	,446	,470
frequency CULIN	.	.	.	.	.	.	.	.	.	.	.	.	.	_	_	_	_	_
mode CULIN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	,573	,394	,534	,350
location CULIN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	_	_	,405
frequency SHOP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	,319	_
mode SHOP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	,355
location SHOP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Only correlations which are significant at the 0.05 level (2-tailed) are shown. Source: Survey OIR, n=424, 2014. *Note*: PRIV="private garden, terrace or community garden"; PUB="public green spaces and free spaces (e.g. parks, woods)"; SPORT="sport facilities (e.g. fitness centre, soccer field, tennis court)", CULT="arts and culture (e.g. theatre, cinema, concerts, exhibitions)"; CULIN="culinary art (e.g. cafes, restaurants, clubs)"; SHOP="Shopping mall, shopping street"

[17] Each of these dimensions of "location" can have an influence on e.g. mode choice. For example, travel time is one element, which itself can be influenced by distance or by accessibility constraints/privileges of a certain type of mode. But also location factors, such as opportunities to combine activities at one location, are elements of this variable.

2.4 Qualitative analysis for the district of Liesing, Vienna: Communal probes

ÖIR Communal Probes are a creative approach to capture citizens' perceptions and opinions about Liesing's mobility. The tool was designed and used with 20 citizens in spring 2015. The study's aim was to involve citizens in creative self-reporting activities to collect insights about citizens' perceptions of Liesing's mobility system, and to identify particular problem areas and suggestions for improvements. For this purpose, the tool incorporates a number of (open) questions that participants' are expected to answer creatively using the Probes Package.

Figure 14: ÖIR Communal Probes package

Source: Create, 2015

2.4.1 Communal Probes' central elements

- Three postcards that ask participants to describe three wishes they have for Liesing's mobility system.
- Three A3 Liesing city maps that show the district area in an abstract format. Each plan addresses a particular task/question:
  - show your typical everyday mobility, indicating your everyday places and journeys
  - show how you wish your everyday mobility took place
  - introduce your district highlights (things, places, events, etc. that you like and appreciate about your district, including such that go beyond mobility).
- One card that asks participants to highlight and depict one particular everyday journey, e.g. the one from home to work
- Seven mobility cards, each of which asks the respondents to reflect on the following seven means of transport, in particular: bus, tram, metro, local train (Schnellbahn), car, walking, bike.

2.4.2 Conduction and analysis

Participants were introduced to the Probes packages individually in short sessions lasting about 10 to 15 minutes. For two weeks they could work with the package – the respondents confirmed later, that it took them 30 minutes up to 3 hours to fill in the entire package. Some did it all in one go, others in stages coming back to some questions later on. Returning the completed Probes, participants were debriefed in a 10 to 15 minutes interview.

We received 18 out of 20 completed Probe packages. Of these 18 participants, 5 are men and 13 are women. Four children/teens took part in the study, the 14 participating adults are between 40 and 60 years old. 5 people live in single family homes or townhouses, the other 13 in apartments in multi-storey buildings. All participants use a car at times and all but three have annual tickets (including school season tickets) for the public transport system.

The participants were asked to classify themselves according to the lifestyle groups identified in the quantitative survey. Five persons declared themselves as City-tourists, 5 as Homies, 3 as Ecos and 5 did not find any of the groups fitting.

The completed Probes were analysed using qualitative/quantitative content analysis

- The completed city maps that showed everyday movement patterns were scrutinized. For each city map, we identified core messages, problem spaces and areas of improvement. We analysed participants' wishes relating to everyday mobility and grouped them into clusters of similar comments. This led to overarching trends of citizens' perception and potential improvements of Liesing's mobility system.
- Text based comments on mobility cards were grouped into clusters. We counted numbers of entries in each emerging cluster. This led to an analysis of participants' perception of individual means of transport in Liesing.
- We analysed district highlights and wishes that hinted at citizens' overall perception of Liesing. We clustered similar comments and entries. This resulted in overall tendencies highlighting aspects that respondents appreciate about Liesing as a district.

The following examples illustrate the participants' work:

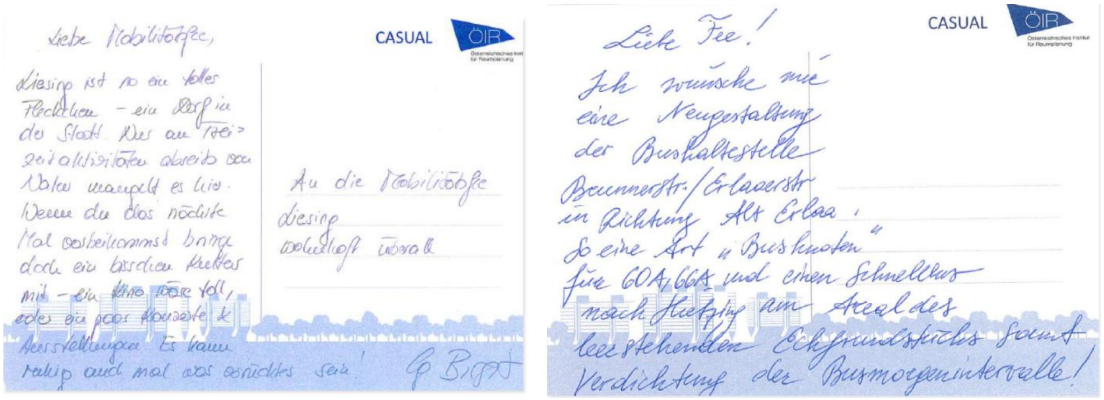
Figure 15: Participants depict their highlights in Liesing

Source: Communal Probes OIR/Create, 2015

Figure 16: Participants describing their trips on a usual day and on mobility chain they wish for

Source: Communal Probes OIR/Create, 2015

Figure 17: Wishes for Liesing's mobility system



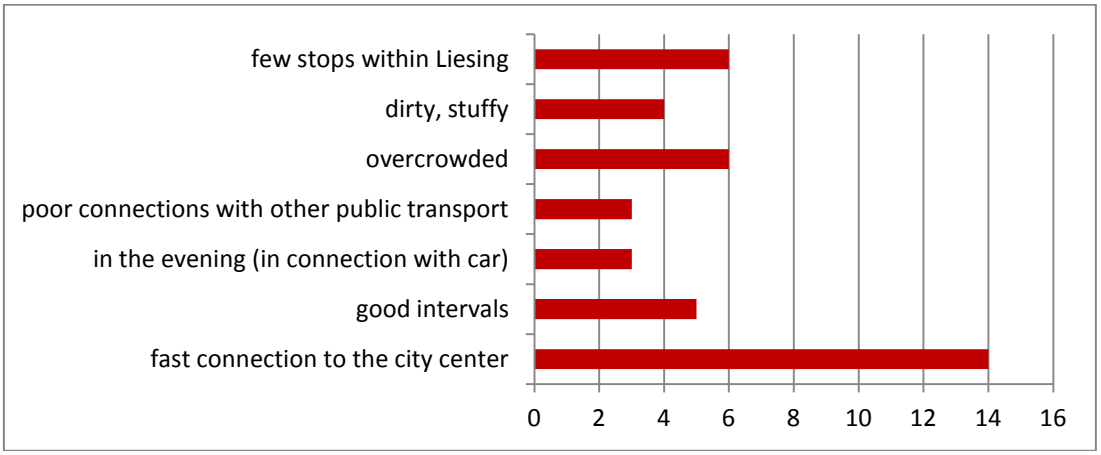
Source: Communal Probes OIR/Create, 2015

2.4.3 Main findings and tendencies

The Communal Probes were used as a method to gather insights into why and how people in Liesing use a certain means of transport. The focus was on the participants' every day trips but also accommodated information of their leisure related mobility. The main findings and tendencies can be found below.

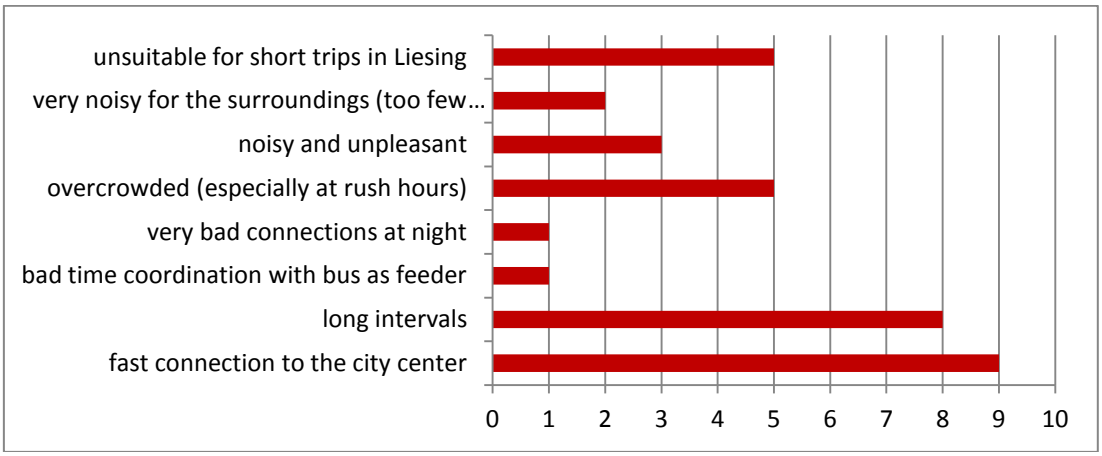
Metro and local trains (Schnellbahn) are perceived as effective and good connections to Vienna's city centre (and to the south). However, participants experience local trains as rather crowded and running infrequently, even during rush hours. In contrast, the metro's high intervals are appreciated, also because they are maintained until late evening.

Figure 18: Reflections of participants on the metro line (U6) in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

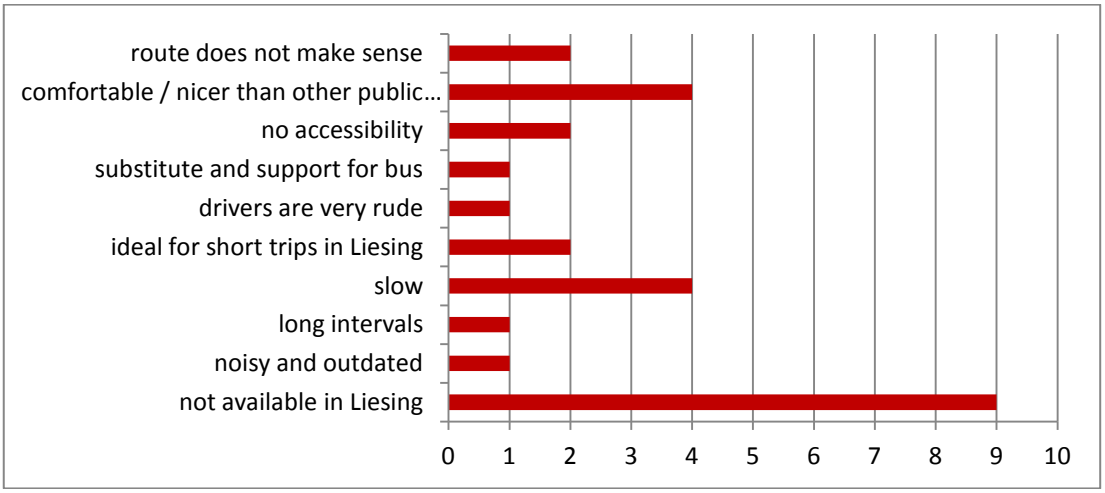
Figure 19: Reflections of participants on local trains (Schnellbahn) in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

A weakness was identified in **missing vertical transport connections** within Liesing. Participants criticise slow or missing connections between east and west, e.g. from Liesing station to Siebenhirten metro, or to the north-west, e.g. from Liesing to Hietzing. The current bus system is appreciated but experienced ineffectively in this respect. The tram does not play a big role for a large share in Liesing. The only tram route is located along the western boarder of Vienna and is not part of their usual mobility chain.

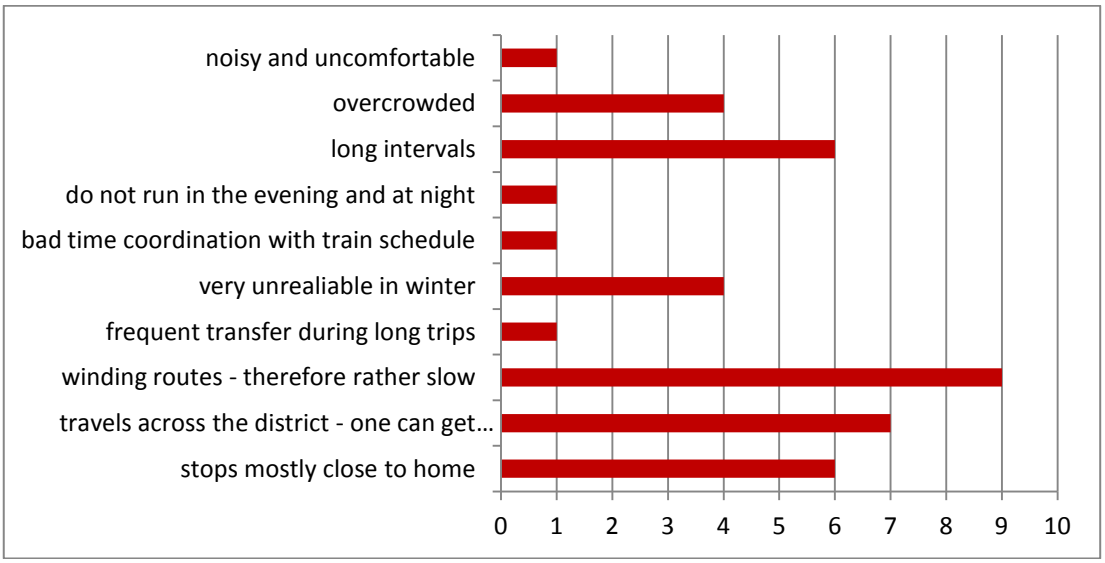
Figure 20: Reflections of participants on the tram (60) in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

The availability of **busses** is highlighted positively. However, participants also criticised busses for being crowded and rather slow, due to many stops. This makes busses appear as a less direct and a rather slow means of transport in Liesing.

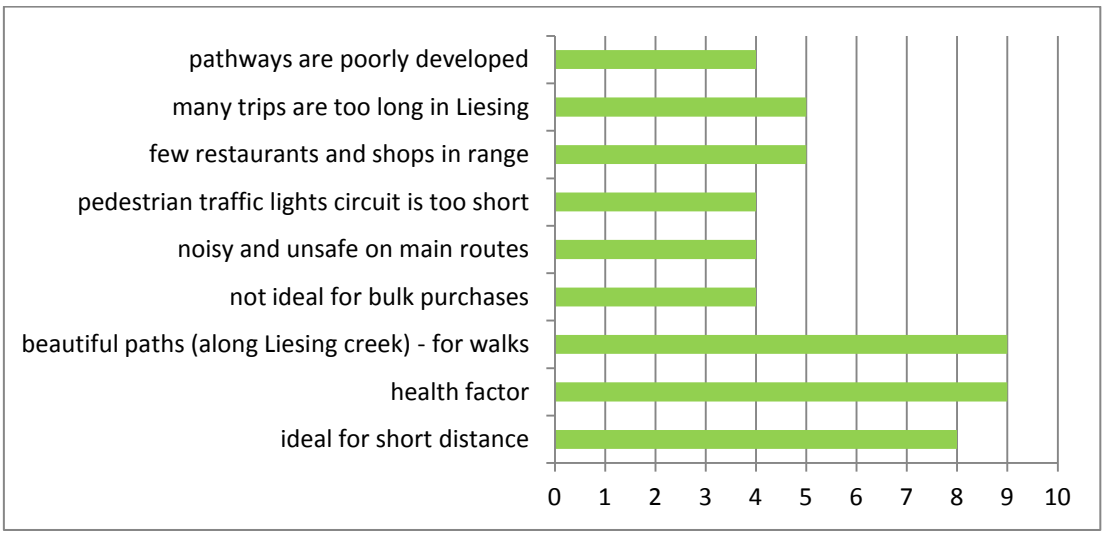
Figure 21: Reflections of participants on busses in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

Many respondents foreground Liesing to be a **green district** that offers a variety of sport and leisure activities. They highlight the possibility to walk their local area. In this respect however, participants appreciate a direct – but also wish for a better – access to these areas by foot or bike. For example, a save and direct access to the Liesingbach-area.

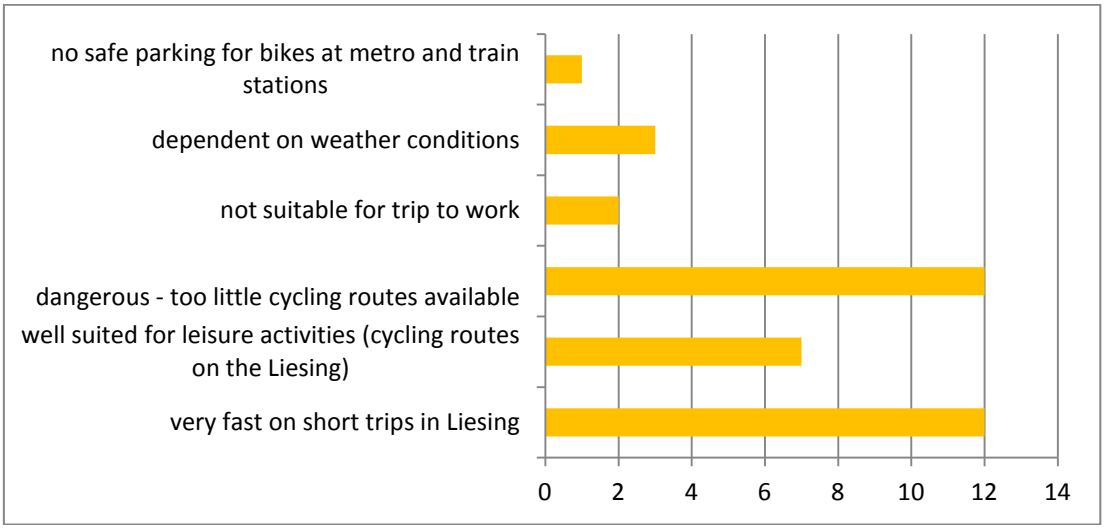
Figure 22: Reflections of participants on walking by feet in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

The study shows that participants would like to bike more, but identify a number of limitations in the current bike track system in Liesing. **Improving aspects around bike travel** was the main wish for Liesing's mobility. Participants mainly criticise interrupted bike tracks, (partly) poor bike track surfaces and often an inexistent or insufficient separation from heavy car traffic. Furthermore, participants experience a lack of adequate possibilities to lock and store bikes at metro and train stations.

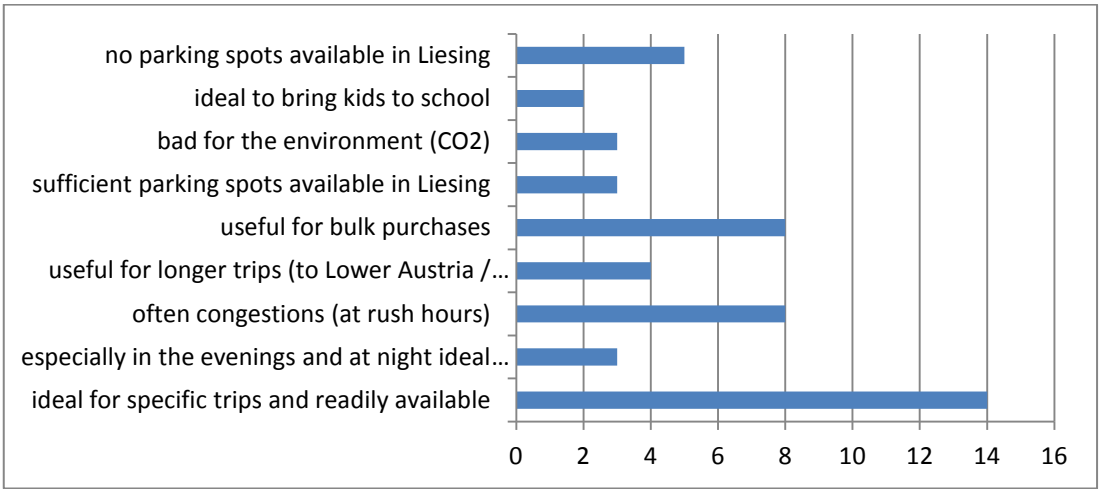
Figure 23: Reflections of participants on biking in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

Car travel in Liesing is experienced in a two-fold way. Participants associate cars with traffic jams in the district. Participants wish that car traffic was regulated more, e.g. by introducing 30 km/h zones. At the same time cars offer an effective, highly available and direct way of transportation. Participants experience their cars as an optimal way to get into or out of town, but also for shopping activities, e.g. to do the weekly shopping.

Figure 24: Reflections of participants on the car in Liesing



Source: Communal Probes OIR/Create, n=18, 2015

One of the main findings was the **affinity of Liesing's population to green spaces**. The pathway along the Liesing creek is considered the most important local recreational area used for all kinds of activities. The Vienna Wood to the west of the district as well as parks and spacious playgrounds in Liesing are also considered a highlight for many. This in-between situation of Liesing – being close to the city center but at the same time at its edge in proximity to green spaces – seems to be a motive to live in that area.

2.4.4 Four implications arising from the study

Bike travel: Liesing's mobility could benefit from an improved bike-track system. This concerns the quality of the tracks itself, in particular track surfaces and their shielding-off from heavy traffic. Bike travel could especially benefit from direct and save connections to a) Liesingbach and other park areas and b) to main metro and local train stations. A direct improvement suggested by study participants is the installation of infrastructure that allows storing bikes securely at metro and local train stations.

Connections across Liesing between east and west; connections to the north-west: Liesing's mobility can benefit from improved "horizontal" connections within the district. This concerns connections from local train stations, e.g. Liesing station, to metro stations, e.g. Siebenhirten. Participants mentioned that current bus lines are too slow to maintain these east-west connections well enough. At the same time the district's mobility could benefit from a better connection to the north-west towards Hietzing, and other western districts. For example, a participant suggested a good connection to local train line S45, which crosses Vienna's western districts.

Local Train connections to town: Participants in this study appreciate local trains to central Vienna (and to the south), which for many people is their daily route to work. However, participants wish this connections to run more frequently and reliably. Liesing's mobility could benefit from shorter Schnellbahn intervals during rush hours.

Reducing Car travel. This implication is less salient, compared to the before mentioned ones. Nevertheless, participants wish for a reduced and better-controlled car traffic within the district, but especially in and around housing areas, e.g. by introducing 30 km/h zones.

2.5 Conclusions of the empirical analyses

In the study at hand, a two-fold approach was chosen to allow for an in-depth analysis of mobility patterns, orientations and lifestyles in Liesing, Vienna. First, a quantitative survey was conducted among 424 inhabitants of Liesing, covering a representative distribution of Liesing's inhabitants in terms of age, gender and housing type. Second, the qualitative method of Communal Probes was used with 20 inhabitants of Liesing. This creative approach to capture citizens' perceptions and opinions was designed to support the interpretation of the quantitative hard facts by providing a phenomenological perspective. This chapter highlights the main conclusions of the empirical analyses.

Mobility orientations and mobility behaviour: Desired mobility versus infrastructural constraints

The district of Liesing is characterized by a very high volume of motorized transit traffic on main routes, the highest motorization compared to the rest of Vienna (about 500 cars per 1000 inhabitants compared to 390 in Vienna), the highest share of car trips on modal split and high loads in the road network and congestion. At the same time, accessibility by public transport is only considered positive along two corridors directed to the city centre, while the connection of local centres within the district between East and West and between the corridors is unsatisfactory. Also the network of cycle paths and footpaths is fragmentary and of low quality, which contributes to the low modal split of walking and cycling.

The empirical analysis shows that the general mobility orientations[18] of residents in the district of Liesing to some degree contradict the reality of their daily transportation, depicted in the transport measures above. The connection to public transport is considered most important by the respondents, as well as the existing supply is evaluated positively. The rating of importance of connection to highways and high-level roads is significantly lower. Additionally, satisfaction with the supply of parking and highways is comparably low among residents. This reflects the negative image of individual motorized traffic in the district, emerging from traffic congestion due to high volumes of commuter inflow and transit traffic as well as shortage of parking space in some areas.

The mobility orientation of the respondents indicates that the desire towards individual car mobility is weaker than the high modal split and motorization of the district population would suggest and that there is potential for modal shift, provided that infrastructure for public transport, walking and cycling is improved. The Communal Probes maps depicting the usual trips on weekdays and the mobility chain they wish for, strengthens this hypothesis. The quantitative analysis shows that of the interviewees using the car for their leisure trips, 12% also see public transport as a potential alternative, 10% walking and 2% would use the bicycle[19]. 41% of the interviewees own an annual ticket for public transport compared to 36% in Vienna (650,000), which shows the principal willingness to use public transport in Liesing.

[18] Operationalised by an item list on importance and assessment of transport infrastructures which indicate orientations towards car, public transport, bicycles, walking and multi-modality.

[19] Within the sample, 42% of the respondents are not using a car at all for mobility related to leisure, 34% see no alternative to using the car in their leisure time.

The need of improvement in public transport supply and attractiveness of bike- and footpaths are main discussion points in the ongoing civic participation discourse in Liesing. This is also reflected in the quantitative survey, by low ratings of satisfaction with bike infrastructure and footpaths. The share of cycling on all modes is extremely small in the district of Liesing and also the orientation of respondents towards this mode is very low. This can to a large degree be blamed on the bad infrastructure, leading to cycling not being considered as serious means of transport and also ascribing an overall low importance to this mode. The Communal Probes identified a number of limitations of biking infrastructure in the district, namely interrupted bike tracks on crucial points (e.g. train stations forecourt), poor road surfaces and inadequate possibilities to lock and store bikes at metro and train stations. The most important factor however seems to be safety; the expansion of the bike line network with physical barriers that separate the cyclists from heavy traffic has the potential to induce a shift of modal split.

Complex relationships between lifestyle, social factors, location and mobility

In order to test the hypothesis of lifestyle having an influence on mobility patterns for leisure activities, social groups or lifestyle types were identified based on orientations and attitudes towards transport and leisure infrastructure as well as the frequency of visit of leisure infrastructures. Lifestyle therefore was operationalized as a construct characterized to a large degree by free time activities and orientations, but also general views on transport infrastructure.

The cluster analysis showed that several relationships between personal and household characteristics, housing location, availability of green areas and private open spaces, availability of transport modes and the chosen lifestyle exist. Educational attainment, occupation and income, but also factors related to the stage of life of the individual, such as family formation (children) or retirement (age), influence the decision on the place of residence and the possibility and desire to own certain private goods, such as cars, single-family houses or private gardens.[20] The ownership of these goods again influences mobility patterns. The decision on the place of residence, housing form, density and location within the city on the other hand determines the availability and accessibility of public goods and infrastructure, such as public transport infrastructure, services, supermarkets, offerings of leisure, etc., and therefore influences freedom of choice of transport mode. The three elements – lifestyle, social factors and location – are interconnected and interact.

Modal choice for daily trips: The influence of lifestyle on mobility patterns subordinates to the factor "location" if accessibility constraints are high[21]

The study shows that a mixture of lifestyle, social factors and location factors has an influence on the choice of transport modes. Depending on the trip purpose (daily trip or leisure trip) and related destination and accessibility constraints, one of the factors emerges as the deciding one. In terms of mobility orientations, the quantitative survey shows a clear picture of multi-modality of the residents of Liesing. One cluster of "Suburbanites" (24%) can be described as car ori-

[20] E.g. in case of the car-affine "Suburbanites", the income distribution shows a significantly above average share of people in the highest income group (30%), with three or more people (41%) and children (30%) in the household.

[21] Location in this case is a complex construct which consists of the elements distance, accessibility, travel time or location factors

ented, while the three other clusters (76%) deem all means of transport as important, show no preference of car, or even prefer other means of transport.

For trips to work and training as well as for shopping for daily needs, the modal split shows a different picture opposed to the identified lifestyles and mobility orientations: Of all persons with trips to work and training, mobility patterns are characterized by high shares of car (45%) and public transport (39%) and very low shares of bicycle (3%) and walking (8%), with very little differentiation between lifestyle groups. By housing type, single family home residents show a significantly higher share of car use to work and training (52%) as well as for shopping for daily needs (57%) than residents of the other housing types. The Communal Probes support the assumption of the quantitative findings that in the case of trips to work and training the factors location, accessibility and travel time have more influence on mode choice than the factor lifestyle or mobility orientation. This is due to the fact that trips to work and training are to a very high degree bound to a certain destination, and freedom of choice of destinations taking into consideration travel times and accessibility is restricted[22]. An improvement in accessibility and travel times of other means of transport would increase equality between modes and would consequently lead to higher significance of lifestyle and mobility orientation as a factor for mode choice for daily trips.

Analysed by housing type, 16%[23] of the residents of Multi-Storey-Buildings with more than 6 storeys reach their place of work or training by foot and 53%[24] do their daily shopping trips by walking. The differentiation of mode choice for daily shopping trips between lifestyle groups is not as distinct as it is between housing types, showing the higher influence of "location", population density and related density and quantity of offerings compared to lifestyle and mobility orientations.

There is a tendency for the combination of trips and the choice of principal mode influences additional trips

For trips related to shopping for daily needs the modal split of car remains the highest with 44% and shows the same shares in all the lifestyle clusters as for trips to work and training. This constancy of car usage for different trip purposes can be explained by the combination of trips to mobility chains (e.g. shopping for daily needs on the way to or from work, using the car for the whole mobility chain). Another reinforcing element is the positive accessibility of supermarkets by car in Liesing, as well as the lack of parking restrictions. Therefore, as the choice of the principal mode of transport influences the mode choice for additional trips, it is important to increase the accessibility of daily destinations e.g. by public transport, in order to induce modal shift from car to other modes.

The modal split of walking lies at 38% while only 14% use public transport for their trips for daily shopping. This trade-off between public transport and walking for the two different trip purposes to a large degree can be explained by short distances between the residential areas and respective offerings for those with no way to work or training (pensioners). Also the organi-

[22] The job location is assumed to be a subordinated criterion for choice of job; the same applies to choice of education.
[23] The average modal split of walking for trips to work or training is 8%
[24] The average modal split of walking for daily shopping trips is 38%

zation of trips in mobility chains may show some effect here, with public transport being the main means of transport to work and training for 39% of the sample and walking being the stated mode of transport for shopping for daily needs on the way to or from work. The modal split of bicycle is only 3%.

Modal choice in leisure time: The type of leisure activity, its location, the distribution of opportunities in space and life style have an influence

The mobility patterns in leisure time show a similar interaction of lifestyle and locational factors and alternating influence on the choice of transport modes as the mode choice for trips to work and training and daily shopping. However, the modal split for leisure trips better represents the multi-modal mobility orientations found among the respondents: The share of trips done by car is lower than for daily trips and other modes are well represented.[25] This confirms the hypothesis that people are freer to decide where to go and what transport mode to use when it comes to leisure activities.

Regarding leisure trips, the modal split in all of the leisure activity groups significantly correlates with the location[26] of the infrastructures headed for. Amongst the respondents, the highly frequented public and private green spaces are also related to short travel distances and the ones with the highest share of sustainable transport (mostly walking). The other leisure destinations are less frequented but show higher travel distances and a higher share of car and public transport. The share of public transport is higher for trips to leisure activities which are rather located in other districts of Vienna or in the centre (arts and culture, culinary art and shopping), which are better accessible by public transport and generally have restrictions regarding car traffic (being it parking restrictions or traffic overload).

The influence of lifestyle, mobility orientation and housing form on mode choice subordinates to locational factors in the case of trips to leisure destinations which usually are very close to home and accessible by foot (public and private green spaces). This becomes evident in the contradicting statements on mobility orientations and mobility behaviour related to these trips[27]. Also by housing form the mode choice for trips to private and public green spaces contradicts the mode choices observed for trips to work and training and daily shopping[28]. This relates to the availability of these places in close proximity to the residence.

For leisure trips to destinations which predominantly are in greater distance to the residence (sports facilities, arts and culture and culinary art), the correlation of lifestyle and housing form with mode choice becomes more important and overlays and stratifies the influence of locational factors. This becomes evident in the clear patterns in mode choice of lifestyle groups and housing types, with "Suburbanites" and residents of Single-Family Homes traditionally having the highest shares of car use, "City Tourists", "Homies" and residents of Multi-Storey Buildings

[25] Shopping as a leisure activity is one exception, with 46% share of trips done by car

[26] This also implies that distance, accessibility and travel times have an influence, see Chapter 2.3.10

[27] E.g. "Suburbanites" contradict their car orientation by showing the highest share of walking and lowest share of car to private and community gardens and to public green spaces opposed to "Ecos", who display exactly the opposite behaviour, but still with a very high share of walking.

[28] Residents of Multi-Storey Buildings display the highest share of car use to private and public green spaces (13% and 17%), while residents of Single-Family Homes have below average car shares to private green spaces (9%) and average shares to public green spaces (16%).

having the highest shares of public transport use and "Ecos" and residents of Multi-Storey Buildings having the highest shares of walking. Leisure trips for the purpose of shopping constitute an exception with a generally high share of car-use and "City Tourists" displaying high car shares in particular. In this case, the type of activity and related convenience of means of transport as well as location factors[29] additionally have an influence on the mode choice.

The tendency to combine trips for different purposes to mobility chains also comes apparent in leisure time. The frequency, mode and location of certain leisure trips correlate with the frequency, mode and location of other leisure trips. For example, trips for sports, culture and shopping display strong ties. Here, shopping centres or locations which combine offerings for all these purposes may have an influence on selection and combination of trips and mode choice.

Leisure orientations and behaviour show high importance of green spaces in Liesing

A clear preference towards green spaces is visible within both samples of the study: The Communal Probes reveal green spaces as dominant highlight in Liesing. Within the quantitative survey both the importance-rating and the satisfaction with the green spaces provided in the neighbourhood are significantly higher than for the other leisure infrastructures inquired. Also, green spaces are mostly accessible by foot and in close proximity to residential areas. One has to assume that in many cases a pre-existing orientation towards green spaces led to the decision on the place of residence in Liesing and this predisposition was increased by positive feedback (adequate infrastructure) in the neighbourhood. This high value of high-quality and well accessible green spaces in Liesing is important to keep in mind when developing new residential areas in the district.

Parallel to the high orientation and positive opinion towards green spaces within the sample, also the leisure behaviour (i.e. stated frequency of visit) shows a clear trend towards private and public green spaces. Private garden, terrace or community garden is the most frequented group of infrastructure among the interviewees, followed by public green spaces and free spaces, sports facilities, shopping opportunities, offerings related to culinary art and lastly arts and culture. More than 300 responses were related to private and public green spaces, while less than 100 responses each were given for the other proposed leisure destinations. This also emphasizes the high orientation of respondents towards green spaces in the district of Liesing.

By housing form, private and community gardens on average are visited more frequently by single family home and townhouse owners than from persons living in multi-storey buildings, reflecting the ownership and availability of private green spaces. Concerning the frequency of visit of public green and free spaces, this trend is reversed. Generally, the frequency of visit of all kinds of green spaces is very high in the sample, with more than 80% visiting any type of green and free spaces at least 2-4 times per week.

[29] E.g. opportunities to combine activities at one location

3 Summary and conclusions

The aim of the study at hand is to understand the linkages between housing form, mobility patterns and lifestyle with focus on leisure activities using the example of Vienna/Liesing. By means of a broad literature review we identified the main factors that influence travel behaviour, with a focus on lifestyles, leisure behaviour and mobility types. We showed general trends in urban mobility and analysed the importance of urban green spaces for residents. During the empirical part we investigated if there is empirical evidence for differing mobility behaviour depending on lifestyle. Furthermore, we analysed how mobility behaviour of leisure activities is linked to the availability of local recreational facilities in the Viennese district of Liesing and if the availability of private and semi-private green space affects mobility behaviour.

A two-fold approach was chosen to allow for an in-depth analysis of mobility patterns, orientations and lifestyles in Liesing, Vienna. First, a quantitative survey was conducted among 424 inhabitants of Liesing, covering a representative distribution of Liesing's inhabitants in terms of age, gender and housing type. Second, the qualitative method of Communal Probes was used with 20 inhabitants of Liesing.

The literature review shows that travel behaviour is a very complex phenomenon which is influenced by a variety of different factors, such as lifestyles and preferred leisure activities, mobility orientations and attitudes towards different modes of transport, socio-demographic characteristics, the built environment and supply with infrastructure. These factors are partly interlinked and different combinations of factors emerge as the deciding ones for the choice of transport mode, depending on the assessment of the situation by the individual and his or her preferences and routines.

Research question 1: Is there a linkage between life-style issues and mobility patterns for leisure activities?

In order to test the hypothesis of lifestyle having an influence on mobility patterns for leisure activities, social groups or lifestyle types were identified based on orientations and attitudes towards transport and leisure infrastructure as well as the frequency of visit of leisure infrastructures. Lifestyle therefore was operationalized as a construct characterized to a large degree by free time activities and orientations, but also by general views on transport infrastructure.

The study shows that depending on the trip purpose (daily trip or leisure trip) and related destination and accessibility constraints, either location factors or lifestyle emerge as the deciding factors for mode choice. Trips to work and training are to a very high degree bound to a certain destination, and freedom of choice of destinations taking into consideration travel times and accessibility is restricted. In this case, the factors location, accessibility and travel time have more influence on mode choice than the factors lifestyle or mobility orientation.

The modal split for leisure trips better represents the multi-modal mobility orientations found among the respondents: The share of trips done by car is lower than for daily trips and other modes are well represented. This confirms the hypothesis that people are freer to decide where to go and what transport mode to use when it comes to leisure activities. For leisure trips to destinations which predominantly are in greater distance to the residence (sports facilities, arts

and culture and culinary art), the correlation of lifestyle with mode choice becomes more important and overlays and stratifies the influence of locational factors. This becomes evident in the clear patterns in mode choice of lifestyle groups and housing types, with "Suburbanites" and residents of Single-Family Homes traditionally having the highest shares of car use, "City Tourists", "Homies" and residents of Multi-Storey Buildings having the highest shares of public transport use and "Ecos" and residents of Multi-Storey Buildings having the highest shares of walking.

Research question 2: Can sustainable mobility patterns be promoted by providing certain leisure infrastructure in Liesing? If so: What is needed in respect to local lifestyles?

Regarding leisure trips, the modal split in all of the leisure activity groups significantly correlates with the location[30] of the infrastructures headed for. Amongst the respondents, the highly frequented public and private green spaces are also related to short travel distances and the ones with the highest share of sustainable transport (mostly walking). The other leisure destinations are less frequented but show higher travel distances and a higher share of car and public transport. The share of public transport is higher for trips to leisure activities which are rather located in other districts of Vienna or in the centre (arts and culture, culinary art and shopping), which are better accessible by public transport and generally have restrictions regarding car traffic (being it parking restrictions or traffic overload).

The influence of lifestyle, mobility orientation and housing form on mode choice subordinates to locational factors in the case of trips to leisure destinations which usually are very close to home and accessible by foot. The provision of attractive public and private green spaces in close proximity to housing areas proves to be very effective in Liesing, holds citizens in their neighbourhood, decreases travel distance of leisure trips and promotes walking.

Research question 3: Can the provision of private, semi-private and public green spaces in the residential environment influence mobility patterns?

A clear preference towards green spaces is visible within both samples of the study: The Communal Probes reveal green spaces as dominant highlight in Liesing. Within the quantitative survey both the importance-rating and the satisfaction with the green spaces provided in the neighbourhood are significantly higher than for the other leisure infrastructures inquired. Also, green spaces are mostly accessible by foot and in close proximity to residential areas. One has to assume that in many cases a pre-existing orientation towards green spaces led to the decision on the place of residence in Liesing and this predisposition was increased by positive feedback (adequate infrastructure) in the neighbourhood. This high value of high-quality and well accessible green spaces in Liesing is important to keep in mind when developing new residential areas in the district.

[30] This also implies that distance, accessibility and travel times have an influence, see Chapter 2.3.10

To what extent do the results of this working paper no. 7 clash or comply with the findings of working paper no. 3?

Working paper no. 3 critically reviews urban policy documents in Europe concerning their dealing with the concepts of a sustainable city and lifestyle. Sustainable built environments are in this context seen as being shaped by the mutual coexistence of supply and demand side measures[31]; consumption practices on the other hand are considered to be shaped both by the lifestyle choices of individuals and the system of provisions that make these practices possible. In this respect, the analysis of working paper no. 3 intends to illustrate how the production and consumption side in cities (or city-regions) are addressed in different policy documents.

Working paper no. 3 concludes, that change of behaviour is mostly thought through in terms of improving the sustainable city through eco-efficiency of technological infrastructures at the strategic policy levels. Although there are signs of awareness amongst policy makers about the need to understand the context in which unsustainable behaviour arises, urban infrastructures and their cultural context are still largely segregated in sustainable urban policy documents on the city wide level. Some strategies are more willing to relate urban infrastructures to everyday life through engaging language and rhetoric, and the provision of a greater degree of choice and flexibility in relation to different lifestyles. This is coherent with the findings of the analysis of the study at hand, which indicates that a certain level of infrastructure provision (in this case transport infrastructure) is a prerequisite for freedom of choice of transport modes and further, the performance and development of mobility lifestyles.

All policy documents screened in Working paper no. 3 include the principles compact development, public transport accessibility, mixed-use development and social green. Especially mixed-use development is seen as a pre-requisite to create an attractive, "vibrant" city. Social green shall facilitate "social cohesion", be it of people of different ages (young and old) or different social backgrounds. According to the results of the survey in Liesing, these elements of a sustainable city are also main areas of interest of citizens and "consumers" of the built environment and have an influence on their mobility patterns.

Lessons learned: What are the barriers/opportunities to promote the "sustainable city" (production of the built environment) and "sustainable lifestyles" (consumption of the built environment) in general, in Vienna and in particular in Liesing?

The study shows that lifestyle and the decision on place of residence and urban environment often are mutually dependent. In Liesing, the choice to live in an environment with lower settlement density, remote to the city centre and close to green spaces, represents a certain lifestyle. This lifestyle deliberately accepts constraints related to accessibility, supply with public infrastructure and freedom of choice of transport modes, because other values are more important. However, the results of the analysis show that even representatives of this particular lifestyle are not a priori car oriented or have a desire for long-distance trips. The mobility orientations of residents in Liesing indicate that the desire towards individual car mobility is weaker than the high modal split and motorization of the district population would suggest and that

[31] cf. Davoudi S. et al. (2009).

there is potential for a shift to sustainable transport modes, provided that infrastructure for public transport, walking and cycling is improved.

Modal shift from car seems to be easier to manage for leisure trips than for trips to work and training, where the freedom of choice of destinations is restricted. Regarding leisure trips, measures like the enhancement of attractiveness of footpaths, the closing of gaps in cycling infrastructure or the improvement of local public transport could already do the trick. Barriers in this case are on the one hand the trend to combine trips to mobility chains, which leads to a higher importance of mode choice for daily trips (to work/education) and more complex trip routes and destinations. On the other hand, economic constraints often hinder the expansion of public transport in less densely populated areas.

Trips to work and training are often directed towards the city centre and naturally people living in remote districts like Liesing are disadvantaged in terms of accessibility and distances to cover. This disadvantage cannot be completely eradicated, but modal shift from car can be encouraged by increasing freedom of choice for different modes of transport with incentive (e.g. better local feeder connections to high-level public transport lines) and restricting (e.g. parking restrictions or speed limits) planning measures. The study shows the importance of mobility chains and resulting high share of car use for daily trips (e.g. shopping for daily needs on the way to or from work, using the car for the whole mobility chain). A reinforcing element for motorized trips is the positive accessibility of supermarkets by car in Liesing, as well as the lack of parking restrictions. Therefore, as the choice of the principal mode of transport influences the mode choice for additional trips – especially when using the private car – it is important to increase the accessibility of daily destinations e.g. by public transport, in order to induce modal shift from car to other modes.

Lifestyles as a main concept of the study must be considered as dynamic rather than as static and given. Social attitudes about mobility do change; sometimes quite quickly. Transitions in family composition and major changes due to the stage of life (i.e. employment status, marital status, children, etc.) often lead to changes in travel behaviour. Also, the range of lifestyles is wide and will become wider. The dominance of a small number of socially accepted lifestyles will diminish, and heterodoxy in lifestyle will be accompanied by a wider range of different travel arrangements. Initiatives to change mobility behaviour need to be tailor-made for different target groups and therefore a classification of lifestyles will be helpful for drawing up successful approaches and strategies. In this respect, a further sharpening of the construct of "lifestyle" is needed, probably also including factors such as occupation, job location etc., as the daily trips proved to be rather independent from the chosen definition of lifestyle in this study.

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