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1. Foreword

USEmobility aims to find out about the reasons for behavioural change in the personal mobility of European citizens and to forecast future potential.

Work Package 2 identifies factors which have an impact on the choice of means of transport. Objectively measurable “hard factors” such as structural and technological factors and also subjective “soft factors” like socialisation, amenity values of transport and environmental awareness will be examined. Furthermore, trends and best practices towards multimodal and environmentally friendly mobility in different European countries will be identified. Within work package 2, also the ten regions, which will be examined in detail, will be selected.

A sustainable and eco-friendly multimodal mobility can only be achieved when acquiring a deep understanding of the specific motivation and factors of decision processes regarding the choice of the means of transport as well as relevant criteria for changes in mobility behaviour.

Report D2.1 aims to explore factors influencing multimodal mobility behaviour, especially social behaviour for eco-friendly multimodal mobility. This knowledge will build an important input for the questionnaire and the setting-up of the scenarios. On the basis of this knowledge, suitable and target-group specific recommendations and measures can be developed, which support an eco-friendly multimodal mobility and a green transport policy in Europe.

2. Summary

In report 2.1 a state-of-the-art assessment about theoretical concepts and the results of previous national and European studies concerning mobility behaviour is conducted.

The objective is to identify all relevant factors influencing behavioural change, especially social behaviour, towards eco-friendly multimodal mobility.

In the first part of the report, different theoretical models will be examined, which explain aspects of mobility behaviour and serve as scientific background information. First, systems theory creates a broad picture and helps to understand complex relations within the transportation system. Afterwards, social behaviour models lead to an understanding of decision processes in consideration of social factors. Finally, consumer behaviour models show a good example of the successful application of theory into practice. All concepts are directly referred to USEmobility.

In the second part, the reasons of passenger behaviour, according to the current knowledge in the five countries Austria, Belgium, Croatia, Germany and Hungary, will be collected and analysed. For this purpose, the methodology and results of existing national and European studies on eco-friendly multimodal mobility will be summarised and compared. In a last step, the results are interpreted with the approach of the USEmobility project and a further need for research is derived. Additionally, possibilites of influencing mobility behaviour will be shown.
3. Theoretical background

3.1 Introduction

In the following chapter, three different theoretical approaches will be described.

First, systems theory shall provide a framework to understand the dynamics of the traffic system and the correlation with the environment. It also helps to realize where system interventions take place and how they will affect users.

In addition, the second approach of social models focuses on the factors influencing the internal mobility decision. Several theories are described, which identify different motivational factors of the choice of transport mode, ranging from a pure rational view to extended models, considering attitudes and social influence.

Finally, consumer behaviour models focus on the ‘purchase’ of a product or service. Hereby, an aggregated view on the mobility decision unifies different motivational factors to explain the purchase decision.

![Figure 1: Overview of theoretical models.](image)

3.2 System-theoretical models

3.2.1 General Systems Theory

According to the general systems theory by Bertalanffy[^1], systems consist of elements (subsystems), which show a correlation (dynamics). A system is divided from its environment

by system borders (difference). A distinction is made between open and closed systems. In contrast to closed systems, open systems are interacting with their environment, exchanging material, energy and information. These relations are shown in figure 2.

Figure 2: System-theoretical model, modified according to Bertalanffy, L., General Systems Theory, New York, 1968.

The general systems theory can be used to gain a better understanding of real systems, effects on systems and system interventions.

A system intervention is described as a change of complex systems in terms of one or more objectives. By linking the general systems concept (theory) and the research object (empiricism), a gain in knowledge (synthesis), e.g. in the form of actions or recommendations, can be achieved. Complex systems are often beyond a linear cause-effect scheme. Accordingly, the control of a system becomes the more sophisticated, the more complex a system is.

The system-theoretical approach can be applied as follows on USEmobility:

The transport system is an artificial (man-made), complex, dynamic, real and open system. It can be distinguished from a political, social, legal, economic, environmental peripheral system, but is strongly correlated with it.

The objective of USEmobility includes the derivation of recommendations for policy, transport operators, civil societies, such as passengers’ associations and other decision makers. These system interventions will affect the mobility behaviour of European citizens.

It has to be kept in mind that in many cases linear cause-effect relations do not exist. Additionally, the actions must be considered in the light of the various peripheral systems of the individual countries.

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3.2.2 Transportation system model by Manheim

The transportation system model by Manheim considers the entire transport and traffic system of a region and regards it as a complete multimodal system. The transport system is thus not independent of the social, environmental and political system of a region.

"We must understand transportation as a technology, a system of physical elements managed by human organizations to move people and goods. We must therefore understand transportation as a subsystem of the complex of social, economic, political, and other forces we so tersely summarize as ‘the activity system.”

In the model three basic variables can be found, which are also shown in figure 3:
1. Transportation system (T)
2. Social and economic activity system (A)
3. Structure of flows in the system (F), which is formed by the sources, destinations, routes, and the amount of goods and people moving within the system.


The traffic and system activity are both affecting the structure of flows in the system (1). The transportation system and the socio-economic system of a region are closely linked and dependent on each other. Over time, the current flows change over two feedback loops to

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4 Cf. ibid.
balance the system.\textsuperscript{5}

As a first step, the organization of the transportation system continuously influences the activity system, which determines the structure of the flows. A short-term balance in the transportation market is created, where the offer equals the demand and the corresponding flows are established.

The transportation system is also affected by itself via the offered service in the transportation system and the required resources (3), when entrepreneurs or politics modify existing transport services or develop new transport services, in response to the current or expected flows.

Additionally, the activity system is changed by the service level in the transport system (2) if, for example, businesses or households choose new locations, in dependence of the transportation offer. This second relationship influences the current structure of the flows and the long-term activity system.\textsuperscript{6}

According to Manheim\textsuperscript{7}, different options for politics and transportation companies to influence the system exist. Thus, changes to the technology, networks, the link characteristics (interfaces), the vehicles, the system operating policies, the organizational policies and the travel or other activity options can be executed. The changes in the service model, resource model, demand model, equilibrium model and activity-shift model, result in design options affecting the users, operators and politics, which is demonstrated in the following figure.

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\textsuperscript{6} Cf. ibid.

\textsuperscript{7} Cf. ibid.
basic components:

- The **service model** is used to determine the service level for different traffic volumes with all specific possibilities.
- The **resource model** is used to determine the required resources of land, capital and other costs, pollution (air, noise, etc.) as well as the aesthetic and social effects.
- The **demand model** is used to determine the transportation demand and its composition at different service levels.
- The **equilibrium model** is used to predict the transportation volume, which actually flows through the transportation system at a certain level of service and demand.
- The **activity-shift model** is used to predict the long-term changes in the regional distribution and structure of the activity system as a consequence of the short-term balance of the flows.

The transportation system by Manheim can serve as a good theoretical basis for the planned system modifications in the course of USEmobility:

The design of the transportation system (service level) directly affects both, the short- and long-term equilibrium between supply and demand in the transportation market.

The approach also reveals the way the planned measures of USEmobility show its effects: Politics and entrepreneurs can modify the existing transportation facilities or add other factors (information, communication), which means that the currently inadequate multi-modal transportation system will affect itself and will finally motivate to increasingly use multimodal transport chains.

It also becomes evident in which areas interference, developed by USEmobility may take place: In technology, networks, link characteristics, vehicles, system operating policies, organizational policies or travel and other activity options.

The model also stresses again the direct integration of the transportation system in the social, environmental, economic and political regional peripheral system, which is very important to consider, due to large differences in the selected regions in Hungary, Croatia, Belgium, Austria, the Netherlands and Germany.

The following figure gives an impression about the way how system interventions of USEmobility will have an impact. The questions decision-makers need to address are on the one hand how they can get non-users of multimodal transport modes into the system, on the other hand how to keep existent users and satisfy them, intensifying their use.

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3.3 Models of social sciences

3.3.1 Preface

In social and behavioural sciences, various action models with a different focus exist, in which the interaction of different influencing factors on the choice of the means of transport is shown.

In economics and sociology, mainly rational choice models can be found, that consider mobility behaviour as a result of an individual utility maximization of objective factors (especially money and time). In contrast, socio-psychological action models (theory of planned behaviour, norm-activation model, etc.) describe mobility behaviour as an inner psychological evaluation process, which also considers attitudes, values and behavioural standards as relevant.\(^9\)

Below, the theoretical action models are presented in detail.

3.3.2 Rational-Choice Model

Basis of the rational-choice model is the economic theory of individual utility maximization (cost–benefit ratio). The choice of the mode of transport is therefore determined by objective parameters such as cost and the time spent. Attitudes and values are considered as irrelevant.\(^10\)

Studies confirmed the rational-choice approach, showing that travel time and/or costs are crucial for the decision.

A study of the choice of means of transport by commuters revealed that “the four modal


\(^10\) Cf. ibid.
attributes fare, total travel time, additional walk and convenience of the means of transport are sufficient, to describe both, the psychological decision-making process and the actual traffic behaviour in an adequate way.”

Equally, in a survey by Brüderl and Preisendörfer\(^\text{12}\), examining the way to the workplace, the factors time and convenience had the strongest effect on the choice of transport mode. However, in this study no significant effect could be detected for monetary costs and environmental awareness.

The two studies show, that regular purpose-related ways, which are relatively well known, in terms of behaviour alternatives and behaviour costs, are rather selected according to rational criteria (time spent or cost). However, decisions for irregular spontaneously planned ways of leisure activities, are often based on individual, emotional factors (e.g. quality of experience).\(^\text{13}\)

Also the objective and perceived costs can be different. One kilometer costs only 14 cents in average for public transport in Germany, for a car kilometer it is 20,4 cents (or 81,5 cents total cost).\(^\text{14}\) However, public transport is sometimes perceived as expensive, especially when only considering the ticket fare, when possessing a car, and when not taking into consideration the cost for insurance, depreciation etc.

These aspects are no longer compatible with the objective rationality demand of the strict rational-choice approach and requires other explanations. USEmobility will help to find out more about the importance of different factors, which might be the perception of costs and travel time for the mode decision.

3.3.3 Low-Cost Thesis

The low-cost thesis states that attitudes and moral beliefs are especially relevant when behaviour costs are low, e.g. when a well-developed local public transport system exists.\(^\text{15}\)

For a verification of the low-cost thesis, examinations were performed. Diekmann and Preisendörfer\(^\text{16}\) transferred the low-cost theory to environmental behaviour. The higher the costs of environmental actions and behaviour, the lower is the influence of environmental awareness, which is shown in figure 6. A low-cost situation takes place, when for many people the costs of the environmentally conscious behaviour (e.g. the use of public transport) are only slightly higher than the cost of the less environmentally friendly alternative (e.g. use of the car).

\(^{16}\) Preisendörfer, P. et al., Umweltbewusstsein und Verkehrsmittelwahl, 1999, p.3.
A multivariate analysis showed a general relation between environmental awareness and the choice of the mode of transport (except for "local shopping"). The strongest connection occurs for the "way to work" and "shopping in the inner city". Consequently, significant effects on behaviour can be achieved by environmental awareness. However, the transport sector is to be regarded as a high-cost area, which results in a lower strength of behavioural effects, compared to other environmental relevant areas of behaviour.\textsuperscript{17}

However, another study by Preisendörfer\textsuperscript{18}, focused on transportation-related environmental awareness, showed that the low-cost logic is confirmed for purpose-related ways (e.g. the way to work) but is not applicable for leisure-related ways. For frequent ways, large behaviour cost would have to be accepted, while for irregular recreational ways, the benefit-cost ratio plays a minor role, which means that the perceived costs are less important.

A contrary result is shown by a secondary analysis of the population survey "Environmental awareness in Germany."\textsuperscript{19} In this study, environmental awareness proved to be insignificant on the way to work and when performing household purchases. In contrast, a significant influence was proven for the choice of the means of transport for weekend getaways and leisure travel.

It is therefore not clearly demonstrated, whether environmental awareness influences rather leisure mobility or purpose-related mobility. This shows that there is a further need for research, which can be covered by USEmobility. The ex-post survey with a large sample aims to show if differences between leisure mobility and purpose-related mobility decisions with regards to environmental awareness can be discovered and eventually identify other factors which differ

\textsuperscript{17} Cf. Preisendörfer, P. et al., Umweltbewusstsein und Verkehrsmittelwahl, 1999, p.3.
\textsuperscript{18} Cf. ibid.
\textsuperscript{19} Cf. Preisendörfer, P., Umwelteinfluss und Umweltverhalten in Deutschland, 1999.

\begin{figure}
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\includegraphics[width=\textwidth]{figure6.png}
\caption{Influence of environmental awareness according to the low-cost thesis, Preisendörfer, P. et al., Umweltbewusstsein und Verkehrsmittelwahl, 1999.}
\end{figure}
dependent on the purpose of the journey.

### 3.3.4 Theory of Planned Behaviour

According to the Theory of Planned Behaviour\(^{20}\) (TPB), a psychological assessment process takes place, when choosing a mode of transport, in which attitudes, values and behaviour standards are relevant. The behaviour is influenced by individual internal and external factors.

According to the model\(^{21}\), the intention to use a certain mode of transport is dependent on three attitude-based influencing factors:

- subjective evaluation of behaviour (such as attitudes towards the mode of transport)
- perceived normative expectations of important other persons (e.g. norms related to car use)
- perceived „behavioural control“ (perceived difficulty) to perform this behaviour.

In the TPB, the subjectively perceived characteristics of the situation and the normative claims of the social situation are regarded as relevant factors, influencing behaviour. The inner psychological evaluation processes gain a significant influence on the actual mobility behaviour, especially in situations, that are not characterized by complete transparency of information and thus require a decision in uncertainty. Moral beliefs and habits are, however, not considered. The applicability of the TPB to the transportation system could be successfully proved in several studies.\(^{22}\)

USEmobility will especially consider social behaviour, such as attitudes and the social influence with impact on the mode choice and will try to name the importance of the different influences. Furthermore, adequate measures and recommendations, directly based on those results will be developed.

### 3.3.5 Norm-Activation Model

The Norm-Activation Model includes normative expectations in decision-making processes. The mobility behaviour is determined by individual internal and external factors. The individual internal factors include problem awareness, subjective norm, perceived behavioural control (perceived difficulty) and normative pressure of expectations. The individual external factors include the objective characteristics of transportation systems.

Empirical studies by Hunecke et al. show a significant impact of environmental norms on the choice of the mode of transport, which is shown in figure 7.\(^{23}\)

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\(^{21}\) Cf. ibid.


In a study of trips into the city of Bochum, a direct effect of the personal norm on the modal choice could be detected. In addition, the individual external factor "ticket fare" proved as a further direct behaviour predictor. However, no interaction effects between "personal norm" and "ticket fare" could be found.

**USEmobility** will concentrate on subjective characterics, such as social influence, problem awareness and standards that are described in the norm-activation model. Objective characteristics will be considered but are not in the focus of the survey, since they are already examined very well and are often fixed parameters, which cannot be changed when trying to influence people towards eco-friendly mobility.

### 3.4 Consumer Behaviour Models

Consumer behaviour describes the behaviour of people at the purchase and consumption of economic goods. The purchase decision can be made individually or collectively in groups (e.g. households).

The traditional consumer behaviour research is based on economic theories and assumes complete information, unlimited problem-solving capacity and the rationality of a "homo oeconomicus". In recent investigations, behavioural approaches of consumer behaviour research are dominant.

The traditional behaviourism analyzes parameters, that are intermediately observable. Those...
are stimuli, that affect an individual and the reactions triggered by them. In the stimulus-response (SR) models the individual is perceived as a black box, so that the processes which lead to an observable behaviour, cannot be explained.

In contrast, the neo-behaviourism also includes the non-observable, intervening variables of structured processes within the organism, which leads to the so-called „SOR model“, as shown in figure 8.\(^{27}\)

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**Figure 8:** Neo-behaviouristic SOR-Model of Consumer Behaviour, Foscht, T./Swoboda, B., Käuferverhalten – Grundlagen, Perspektiven, Anwendungen, 2007, p. 30.

The basis of any scientific explanation of consumer behaviour are the determinants of individual consumer behaviour. The diversity of views can be collected in a shell model (see figure 9), that enables a separation between psychological, personal, social and cultural determinants.\(^{28}\)

-Psychological determinants, divided into activating processes and conditions (activation, emotions, motivations, attitudes) and cognitive processes and states (cognition, information retrieval, perception, information acquisition, information storage - learning and memory, decision making)


- Personal determinants (personality, involvement, lifestyle)
- Social determinants (primary and secondary groups, families)
- Cultural determinants (social class, culture and subculture)

Purchasing decisions can be systematized according to the degree of cognitive control.

A distinction is made between decisions with a greater cognitive control (extensive and limited) and decisions with low cognitive control (habitual and impulsive).  

Determinants for the occurrence of individual types of purchase decisions are the type of selected product, the purchase situation or other determinants, such as predispositions of the decision maker, e.g. the risk attitude or the involvement.

The models of consumer behaviour can be transferred to the mobility decision. Within USEmobility the decision to use a certain mode of transport can be seen as a purchase decision. The public transport sector could learn a lot from other industries, where the model is already examined very well and where specific target customers are determined. Additionally, the shell model makes clear that there are many factors that need to be considered when trying to understand social mobility behaviour.

4 Factors of the choice of transport mode

4.1 Introduction

In the following chapter, the main aspects of various studies from the five selected countries Hungary, Austria, Belgium, Germany and Croatia are presented.

In a first step, there will be an overview of all analyzed studies and a comparison of their methodology. This will show similarities and differences between the studies and will implicate the knowledge basis on which USEmobility is going to build on. It will also be shown how USEmobility can extend the existing research.

In a next step, the main reasons found in the examined studies, sorted by studies, will be shown to understand the current knowledge, the methods, and to get an idea about which reasons are seen as the striking ones when choosing a certain mode of transport.

In a last step, the reasons will be analyzed more deeply and results from the studies will be used to get background information, extending the pure naming of the reasons. This in-depth analysis will focus on the influencing factors to achieve a better understanding for being able to give detailed input about specific behavioural reasons for the creation of the questionnaire and later on for the development of concrete measures, corresponding those factors.

4.2 Overview

The following table gives an overview of the analyzed studies. Besides the title and the author of the study, it shows a short summary of the contents as well as the used methodology to gather or represent information about mobility behaviour. This overview will serve as a basis for the comparison of the studies.
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<td><strong>Link, the european forum of intermodal passenger travel, recommendations and strategies for passen- ger intermodality in Europe</strong>&lt;br&gt;European Commission, Directorate-General for Mobility and Transport (DG MOVE) within the 6th Framework Pro- gramm 2007-2010&lt;br&gt;Europe</td>
<td>The LINK project, funded by the European Commission, created a European Forum on Intermodal Passenger Travel. The specific focus of LINK is on long-distance and cross-border travelling. The LINK working groups provided a unique opportunity to bring together more than 100 experts from different scientific disciplines and institutional backgrounds such as public authorities, operators, lobbyists, user groups, academia, politics, business and industry. They had the task to develop recommendations for one of the most complex and multi-faceted topics in long-distance transport. The participating experts agreed that there is an urgent need for the further integration of transport modes to increase the efficiency of the overall transport system, tackle environmental challenges and improve the service quality for the long-distance traveller. The LINK recommendations present a rich pool of concrete ideas on what should be done to enhance passenger Intermodality in Europe. The strategic objectives of the LINK Forum are to support a more favourable environment for intermodal passenger travel across Europe, to foster the integration of intermodality policies for pas- senger travel; to facilitate co-operation in implementing intermodal solutions and to help overcoming the fragmentation of the current transport market. The 19 recommendations generated by the working groups have been detailed and summarised in a report by the working leaders in close co-operation with external experts. The target groups are regulators and facilitators (e.g. European Commission, national governments) and implementers (e.g. operators, interchange managers, transport authorities)</td>
<td>The project has three different methods: 1. Exchange: build up a European network for intermodal passenger transport to exchange experiences and work on better (trans-national) solutions. 2. Transfer: set up a knowledge centre for intermodal passenger transport which structures research, defines research questions, formulates policy recommendations and disseminates information (see: <a href="http://www.inkforum.eu">www.inkforum.eu</a>). 3. Promotion: mobilise political support, activate stakeholders and eventually develop a long-term perspective for the Forum as an active organi- sation. The project provides a communication mode between authorities, associ- ations, operators and user groups at different levels. A wide range of stakeholders, with a diversity of backgrounds and stakes in Passenger Intermodality, has been involved in the LINK Forum activities. The core of the Forum activities has been the Passenger Intermodality Network activities which included conferences, national workshops and five Working Groups (each with a different intermodal focus). The Working Group (WG) activities were the basis for the elabora- tion of strategic recommendations and brought together a wide range of European stakeholders for exchange and discussion. Based on results of WG meetings and supported by external experts, 19 recommendations have been developed. Selected recommendations were subject to an online consultation among the LINK community and were fine-tuned according to the feedback from this exercise. Three online expert consultations were carried out in co-operation with the LINK National Focal Points. The aim was to obtain a broad feedback on selected recommendations (in short version) that had been developed at the second and third working group meeting in Copenhagen and Madrid.</td>
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<td><strong>Move together, Rais- ing citizens aware- ness and appreciation of EU research on sustainable transport in the urban environ- ment</strong>&lt;br&gt;European Commission, FP7 - Specific pro- grammme 'Cooperation' - Research theme: Transport 2009&lt;br&gt;Europe</td>
<td>The MOVE TOGETHER project focused on raising citizens' awareness and appreciation of EU research on sustainable transport in the urban environment. A key expectation is that better people awareness of the results of EU research on urban sustainable mobility may lead to more responsible choices - letting people to move away from the use of their cars or mopeds as the preferred option in any circumstance, even when time and space resources are severely limited as in today urban environments</td>
<td>The project includes three main activities: 1. Developing a citizens’ appreciation of EU research on sustainable urban transport at the European Union level: this is done with the help of a transnational focus group of citizens coming from different cities in the 27 EU member States. They will participate to two workshops and an European citizens and stakeholders conference. 2. Raising the awareness and appreciation of EU funded research for sustainable mobility in the city of Rome: randomly selected panel of 25 local citizens, living in the different districts of the city and in the surround- ing municipalities. They participated in a local conference process in Rome, including two citizens’ workshops and a final conference, in the period September - November 2008. 3. Wide communication of the citizens’ appreciation of EU research on urban transport, as produced at the EU level and at local level for the emblematic case of Rome (media events, a travelling exhibition, town exhibitions and other standard dissemination activities e.g. newsletter)In a recent Green Paper entitled Towards a New Culture for Urban Mobility, the European Commission (2007) reports on the results of a series of consultations with local authorities, citizens and other relevant stakehold- ers with respect to the future of urban transport and the role of EU policy. The paper notes the key problems of urban transport in Europe today, namely chronic congestion, environmental pollution, road traffic accidents and points to the necessity to invest more in collective transport and the organization of ‘co-modality’ between different modes of collective transport.</td>
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<td><strong>Mobilität in Deutsch- land 2008, Ergebnis- bericht, Struktur, Aufkommen, Emissio- nen, Trends</strong>&lt;br&gt;Infra, DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung 2008/2009&lt;br&gt;Germany</td>
<td>The study Mobility in Germany 2008 (MID 2008) examines the mobility behaviour of different population groups in different regions of Germany. In addition, it allows a closer in urgent need for the further integration of transport modes to increase the efficiency of the overall transport system, tackle environmental challenges and improve the service quality for the long-distance traveller. The LINK recommendations present a rich pool of concrete ideas on what should be done to enhance passenger Intermodality in Europe. The strategic objectives of the LINK Forum are to support a more favourable environment for intermodal passenger travel across Europe, to foster the integration of intermodality policies for pas- senger travel; to facilitate co-operation in implementing intermodal solutions and to help overcoming the fragmentation of the current transport market. The 19 recommendations generated by the working groups have been detailed and summarised in a report by the working leaders in close co-operation with external experts. The target groups are regulators and facilitators (e.g. European Commission, national governments) and implementers (e.g. operators, interchange managers, transport authorities)</td>
<td>The project has the following focus: 1. Exchange: build up a European network for intermodal passenger transport to exchange experiences and work on better (trans-national) solutions. 2. Transfer: set up a knowledge centre for intermodal passenger transport which structures research, defines research questions, formulates policy recommendations and disseminates information (see: <a href="http://www.inkforum.eu">www.inkforum.eu</a>). 3. Promotion: mobilise political support, activate stakeholders and eventually develop a long-term perspective for the Forum as an active organi- sation. The project provides a communication mode between authorities, associ- ations, operators and user groups at different levels. A wide range of stakeholders, with a diversity of backgrounds and stakes in Passenger Intermodality, has been involved in the LINK Forum activities. The core of the Forum activities has been the Passenger Intermodality Network activities which included conferences, national workshops and five Working Groups (each with a different intermodal focus). The Working Group (WG) activities were the basis for the elabora- tion of strategic recommendations and brought together a wide range of European stakeholders for exchange and discussion. Based on results of WG meetings and supported by external experts, 19 recommendations have been developed. Selected recommendations were subject to an online consultation among the LINK community and were fine-tuned according to the feedback from this exercise. Three online expert consultations were carried out in co-operation with the LINK National Focal Points. The aim was to obtain a broad feedback on selected recommendations (in short version) that had been developed at the second and third working group meeting in Copenhagen and Madrid.</td>
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The project includes three main activities: 1. Developing a citizens’ appreciation of EU research on sustainable urban transport at the European Union level: this is done with the help of a transnational focus group of citizens coming from different cities in the 27 EU member States. They will participate to two workshops and an European citizens and stakeholders conference. 2. Raising the awareness and appreciation of EU funded research for sustainable mobility in the city of Rome: randomly selected panel of 25 local citizens, living in the different districts of the city and in the surrounding municipalities. They participated in a local conference process in Rome, including two citizens’ workshops and a final conference, in the period September - November 2008. 3. Wide communication of the citizens’ appreciation of EU research on urban transport, as produced at the EU level and at local level for the emblematic case of Rome (media events, a travelling exhibition, town exhibitions and other standard dissemination activities e.g. newsletter)In a recent Green Paper entitled Towards a New Culture for Urban Mobility, the European Commission (2007) reports on the results of a series of consultations with local authorities, citizens and other relevant stakeholders with respect to the future of urban transport and the role of EU policy. The paper notes the key problems of urban transport in Europe today, namely chronic congestion, environmental pollution, road traffic accidents and points to the necessity to invest more in collective transport and the organization of ‘co-modality’ between different modes of collective transport.
The preliminary study serves as background for the scenario study "Environmentally Sustainable Transport (EST)", which is conducted by the Organization for Economic Cooperation and Development (OECD). For this purpose, the "Umweltbundesamt" has announced a research project to ensure sustainable transport development. There are proposals for the implementation and possible strategies developed to influence policy-making, in particular, but also to influence individual behaviour and attitude changes. Communication strategies are developed to enhance the attractiveness and persuasiveness of alternatives to car-based mobility.

1st Part:
- Common theories and knowledge regarding the importance of psychological and social factors that influence the mobility behaviour.

2nd Part:
- Survey about car-free households in Germany and Switzerland represented, both in terms of their socio-economic characterization as well as their motives and their satisfaction with the car-free life.

The study analyses the state of knowledge concerning the significance of psychological and social influence on mobility behaviour. Current theories are presented, e.g., the Rational Choice Theory, Low Cost Theory, Theory of Planned Behaviour and the Norm Activation Model. The influence of cost-benefit considerations and the influence of attitudes and values on mobility behaviour are discussed. Several approaches identifying target groups are presented.

Car-free households are portrayed concerning socio-economic characteristics as well as motives and satisfaction with a car-free life. The study shows surveys of car-free places and other studies and expert interviews, describing organization and benefits for inhabitants. In the first part, the current state of knowledge of social scientific investigation is presented. In the second part, 11 case studies have been analysed and factors identified which can hamper or foster success.

The results of these two parts lead to the first concrete recommendations for future research perspectives and strategies, which are reproduced in Part 3. Key findings of this report as well as the political science part of the preliminary study were in a one-day workshop presented at the Federal Environmental Office. The experts from the Political and Social Science was specifically addressing the objective to identify and discuss specific research ideas and areas for further work by the Federal Environmental Agency.

The first part of the survey under the topic "Customer satisfaction in public transport" includes part of the overall satisfaction of the detailed profiled as well as the profiles of specific modes of transport. The present study unites two instruments of market research. On the one hand, the number of the barometer, usually used by TNS, measures customer satisfaction. The second instrument was one of the reprints of the survey "public transport in the evaluation of the population", that VDV carried out regularly between 1978 to 2002. The survey asks about the assessment of transport (public transport and car traffic) and about the motivation of transport changes or attitudes. It especially considers environmental protection. A web-based interview framework of a market research institute with online access panels was performed. The participating people were a representative sample of the population. The sample size of online interviews is 1011 persons aged 16 years, collected from 09.06.2009 to 24.06.2009. Also a telephone survey took place from 15.06.2009 to 18.06.2009. The sample, based on a telephone random drawing, includes interviews with 2004 people aged over 16 years. In this representive telephone survey, some questions from the online questionnaire were placed parallel to this information to weight the use of the online sample. In addition to the questions for socio-demographics (age, gender, profession, education, size of city, region) were especially traffic-related information (frequency of use of public transport, car availability, number of cars in the household, accessibility of goals) and personal information (global satisfaction, recommendation, reselection, technical affinity, environmental interest).

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The study examined the assessment of transport (public transport and car traffic as well as the satisfaction with public transport) as well as the profiles of specific modes of transport.

The German Mobility Panel (MOP) asks yearly since 1994, members of nearly 1,000 households to record the mobility of a week in a diary. A part of households with cars in the sample are also asked to record in a diary for eight weeks, the driving performance and fuel increase.

1,062 households were asked to record the mobility of a week in a diary. A part of households with cars in the sample was also asked to write down in a diary their driving performance and fuel increase for eight weeks.

The mobility panel is executed every year under similar external conditions as regards with regard to the collection period in autumn, in order to compare results over the years. The survey does not take place during school holidays in each state, so that actually the everyday mobility is shown. In 2008, the collection of all-mobility data was done from 14.09.2008 to 24.11.2008. After the plausibility analysis, 1062 households with 1783 reporting persons remained as a basis, used for the analysis of everyday mobility in 2008. Secondary data sources on household and individual level, e.g. the census, the current economy, and the income and consumption survey (EVIS) in 2008 from the Federal Statistical Office are included.

The environmental policy plays a significant and growing role in the future. Environmental problems, global warming, resource scarcity and price increases are central strategic challenges to the political system as a whole. The study examines the importance of environmental and climate change for the citizens, the potential for environmental protection measures of individual actors and the areas of responsibility in environmental protection.

The biennial survey sample includes the German population aged over 18 years. The data was collected in the period from 22 March to 23 April 2010. Interviews with 2008 people (1,602 from West and 406 from East Germany) were surveyed. The holistic model of society and the target group is constituted by the social situation, value orientations and life styles of people. The Sinus milieus are used, which cannot replace sociodemographic scheme differentiation characteristics (gender, age, education, income, region, etc.), but complement and refine them. As a baseline study, the investigation includes both a body of repeated questions with
The study examines the mobility behaviour of citizens in everyday life, with a special importance of climate protection. It asks about the perceived costs of mobility, the expectations of users and the importance of climate protection and a change in mobility behaviour.

The results are based on a representative survey of Infas Institute for applied social research in September 2008 on behalf of the German Transport Forum. Target group of the study was the German-speaking population over the age of 18 living in households with landline telephone connection. A total of 2019 persons from randomly selected households in Germany were interviewed. A random selection of the interviewee took place after the "last birthday" principle. The survey was implemented between the 6th and 30 November 2008 by the infas call center. The interview length was 15 minutes on average.

TÜV Rheinland has performed in early September 2010 a nationwide survey in Germany with 500 participants, which examines the aspects of mobility behaviour for a representative population by age, gender and region in detail.

The purpose of this study is to examine the user's evaluation of the bus service within urban public transport. The main objective of this paper is to find out how the expectation and perception of the bus service quality contributes to consumers' satisfaction. Previous studies provide the methodological assistance to estimate the interrelated dependency of the variables. Specifically multivariate techniques, factor analysis and regression analysis were used to reveal the relationship between the services attributes. The study explores the relation between the bus service quality attributes and the consumer satisfaction based on passengers' perception. Based on a sample of 160 respondents, an empirical study was carried out. At the beginning of 2008, the survey was conducted at different hours of the day. The research is divided into three parts.

The researches generally apply the expectation – disconfirmation paradigm in the case of attributes oriented satisfaction. The consumer compares the experienced performance with his/her expectations in the disconfirmation model. A battery of 12 items, selected through literature review, was developed. For evaluating the satisfaction with the bus service at a global level a five-point scale was used. The satisfaction level ranged from "very poor" to "very good", and the expectations level from "not at all important" to "extremely important". The passengers were asked to give their satisfaction level regarding their perception of the existing service conditions. Besides, the SERVPERF method for the evaluation of the importance and the satisfaction of the service attributes were applied. The target population was public transport passengers in a city of the western part of Hungary. The sample survey was addressed to the bus passengers considering the urban routes that are very important for the citizens of the city. Based on the quota criteria, four groups of the sample were divided: ticket users, passengers with monthly tickets, passengers with student tickets and passengers with senior tickets. They were asked about their socioeconomic characteristics considering their origin, the purpose of their trips and about the overall satisfaction. The places of the personal interview were three final bus stops of the routes and one bus stop next to the town hall.

Institute staff surveyed 1560 foreign tourists visiting Budapest by using standard questionnaires by personal interviews. The respondents were asked to answer 10 questions about public transport in the city. The examination took place between the 29th of September 29 and 12th of October 1999. The sample composed tourists from Western Europe with a share of 62.8 percent, 12.5 percent of arrivals from the United States, 15.3 percent from Eastern Europeans, and 9.7 percent from other non-European countries.
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<td>Multimodale Mobilität als Chance</td>
<td>The study shows an overview on the modal split in Austria and reasons for transport mode choice. It especially deals with essential building blocks of a variety of advantages and opportunities of multimodality. It develops recommendations and measures, such as how the interfaces between different transport modes should be designed to make public transport more attractive.</td>
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<td>Ergebnisse der landesweiten Mobilität betrachtung, 2006</td>
<td>The survey in Lower Austria 2008 examined both, the weekday as well as the Sunday mobility. It examined mobility behaviour, mobility costs and regional differences. In a separate survey, young people were asked about their motivations and attitudes towards means of transport. 4,041 households participated, 9,300 persons completed the written survey part and information about 25,000 ways was specified. As a survey form, a combination of writing (by mail) and oral (by phone) survey was chosen. The unit of selection interviews of this type of survey is the household. At a certain date, all persons (over the age of 6) within the household were asked about their daily trips. The survey asked about a specific day (Tuesday, Thursday, Sunday). A weighting of the data was performed after socio-demographic characteristics on the level of households and persons. There were the following weighting steps applied: Weekday, Household size, Socio-demographics (age and sex), Season and non-response weighting In addition, the mobility of young people is examined in detail according to their attitudes.</td>
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<td>Soziale Aspekte von Mobilität, VCO-Schriftenreihe 1/2009 „Mobilität mit Zukunft“</td>
<td>Access to mobility is a prerequisite for participation in public and social life. Equal access to mobility in the society is often not given. Groups like children and young people, low income or elderly persons, which do not use a car, rely on a public transport system. A transport system in the sense of sustainability alongside the economic efficiency and environmental compatibility is socially just and must also be affordable for everyone.</td>
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<td>De sociale effecten van basismobilitéit in niet-stedelijke gebieden</td>
<td>The study focuses on social aspects of public transport, between 2001 and 2006, the Flemish government researches to optimize the provision of public transport in Flanders. One year after the completion of the introduction of basic mobility, this knowledge should be extended with social benefits of basic mobility. For a picture of how the public transport in general and the supply base in terms of mobility in particular plays an effective role in the travel behaviour of the Flemish population, a number of people was visited in their homes. During our visit the respondents answered questions about their travel patterns, their mobility needs and transport modes used for these different trips. Depending on the research framework initially a number of areas was selected. The region Waasmunster Komrij was chosen where the standards for basic mobility have only recently been converted in various mobility services. Furthermore a Flemish area with a very scarce offer of public transport where no basic mobility measures were introduced was selected.</td>
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<td>Onderzoek in opdracht van het vlaams ministerie van mobiliteit en openbare werken department mobiliteit en openbare werken afdeling beleid mobilitéit en verkeersveiligheid</td>
<td>The analysis of the Flemish OVG Travel Survey aims to get an idea about the choice of travelers and their resulting travel behaviour regarding the use of car or public transport. The Flemish OVG Travel Survey contains most observations that have been surveyed in an identical manner of ± 10,000 households. Analyses were done with ‘weighted’ factors. The sample has been given a weight so the total sample is representative of the Flemish Brabant population. For the study, the same weights as in earlier analysis of OVG are used.</td>
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<td>Telefonska anketna Stavovi stanovnika Hrvatske o Hrvatskim željeznim Prosinac Neovisna (istraživačko-analitička agencija</td>
<td>The survey is an analysis of media appearances and the image of public transport. It explores the attitudes, awareness and evaluation of Croatian population on the main characteristics and quality of rail transport. The purpose of this study is to find out if the institution matches the picture, that the public receives about public transport in the newspaper. Since January 2006, Croatian Railways systematically monitored and analyzed the image that the media provides to the public. A telephone survey was conducted from 8th to 11th December 2006. Target group was the Croatian population aged 18-74 years. It was implemented as a random selection of telephone numbers in target areas The survey was based on a questionnaire with open 1 and 16 closed questions and demographic indicators. The respondents were interviewed by 10 trained staff - students. The sample comprised: • 527 persons from 267 sites in Croatia • 275 (52%) and 252 women (48%), men</td>
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### Razvoj novih usluga u prijevozu putnika željeznicom

Ivica Skrtic, Željeznice 21, HŽ Putnički prijevoz d.o.o.

2009 Croatia

The study seeks to improve the quality of transport services and find out about the development of new services HŽ passenger transport d.o.o. should conduct. It tries to determine passenger satisfaction with the existing situation offered by passenger rail service. It aims to determine the need for the introduction of new, additional services offered by passenger rail and offer concrete suggestions for improvement of passenger rail services in the Republic of Croatia.

A descriptive study was conducted in May 2009. This is a study on a sample basis and methods of testing. The period has been selected for the survey to be sure to cover a broad part of population and before the designated time before the summer holidays of workers. The respondents were interviewed in fast trains and IC-trains while traveling on the routes: GK Zagreb - Osijek, Zagreb GK, GK Zagreb Vinkovci - Zagreb GK, GK Zagreb - Rijeka - Zagreb GK, GK Zagreb - Split-Zagreb GK.

The data collection method was interviewing. The questionnaires were distributed to passengers on each train, and they independently completed those questionnaires. 250 passengers were interviewed. The survey aimed to explore attitudes of users of transportation in selected fast trains to find about attitudes towards new services. The questionnaire consists of 67 questions that were divided into four separate units. The first unit had the title 'Basic opinion' and consisted of three general multiple-choice questions about rail transport service. The second part, named 'Evaluation of existing services' consisted of 29 statements that included the existing services, each associated with a Likert scale with five levels offered to the attitudes of respondents (1 - very dissatisfied, 2 - dissatisfied, 3 - neither satisfied nor dissatisfied, 4 - satisfied, 5 - very satisfied). In the third part, opinions about new services were examined. These opinions are also associated with Likert scale with five levels of attitudes explanation is (1 - completely irrelevant, unimportant 2-, 3 - neither important nor unimportant, 4 - important, 5 - very important). In the fourth general part, titled 'General data', information on the subject was asked through six multiple-choice questions with the data obtained on sex, age, workplace status, monthly income and place of residence of respondents.
The overview shows that many studies, examining mobility behaviour in general, already exist in all five countries and on European level. The selected studies, which are analyzed in detail, are result of a research of an analysis of more than 70 studies. The selected studies show the highest relevance in reference to the research objective of USEmobility.

Especially in Austria, Belgium and Germany, studies have been conducted about social behaviour, while in Hungary and Croatia the studies are mainly focused on satisfaction surveys or mobility behaviour in general. Nevertheless, the report includes results of all five countries to avoid a separate national view on the research field. Social behaviour has not been examined yet in-depth with a high sample size on international level. This gap will be filled by USEmobility.

Regarding the methodology, the analysis showed that a big part of the studies have summarized important aspects of the research topic by using secondary data or by conducting classic surveys. It becomes obvious that European studies mostly used alternate research methods such as discussion forums and knowledge databases whereas national studies focus on classic surveys which can be seen in the following figure. However, most of the surveys, especially in Hungary, Belgium and Croatia, are conducted with relatively low sample sizes. USEmobility will on the one hand conduct desk research, as it is done within work package 2, and on the other hand extend those results with a survey, interviewing a large sample of 10,000 persons.

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**Figure 10: Methodic comparison of research method and sample size.**

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为主题词进行分组：

- **Large Sample Size**
  - UBA Umweltbewusstsein, Germany
  - TÜV Rheinland, Germany
  - MID, Germany

- **No Sample**
  - Move Together, Europe
  - Librik, Europe

- **Small Sample Size**
  - UBA Soziale Faktoren, Germany
  - ____
  - TÜV Rheinland, Germany

- **Desk Research**
  - UBA Soziale Faktoren, Germany
  - TÜV Rheinland, Germany
  - MID, Germany

- **Other Research Method**
  - UBA Soziale Faktoren, Germany
  - TÜV Rheinland, Germany
  - MID, Germany

- **Classic Survey**
  - UBA Soziale Faktoren, Germany
  - TÜV Rheinland, Germany
  - MID, Germany

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**State-of-the-art assessment**

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It is also evident, that most of the studies have a national focus; they examine aspects of mobility behaviour in one country with its specific characteristics. Two of the studies extend this view and examine mobility behaviour on European level. The topic multimodality is often not in the focus of the studies, but the modal split in general and specific aspects such as climate protection or customer satisfaction. This focus can be seen in figure 11. USEmobility will examine multimodality and its potential in depth on international level in the six selected countries. Not only the desk research will analyse studies from the different countries but also the survey will be conducted in ten regions of six countries, which will lead to a very multifaceted view on multimodality behaviour.

Figure 11: Methodic comparison of (inter)national focus and multimodality reference.

The analyzed studies differ in most cases among groups, often by sociodemographic criteria such as age and gender. However, most of them focus on objective factors (costs, travel time) or offer-related factors (infrastructure, timetable). Often they also consider subjective factors (satisfaction) but the analysis remains superficial. Only one study focuses on subjective factors in detail (attitudes, emotions, theoretical background) which can be seen in figure 12. USEmobility seeks to find out about eco-friendly mobility behaviour beyond obvious facts such as costs and time. It will not exclude those objective factors but will extend them by motivations for the mode choice, which are less subtle and transparent (social status, privacy, perception of complexity, attitudes). It will differ between groups by criteria which lead to a significant difference between groups. This can be sociodemographic criteria but also attitudes or
personality types.

**Group differentiation**

![Group differentiation diagram]

*Figure 12: Methodic comparison of group differentiation and factor type.*

### 4.3 Results of the studies

The first part shall give an impression about the way how mobility behaviour is examined in the studies. It is going to provide an insight into the main reasons, why certain modes of transports are selected or rejected. The analyzed studies usually conduct a brief scanning of main reasons, after examining specific factors, according to the research objective, in detail. Those overviews are presented in the following text, serving as a first approach to find the standard set, displayed in the studies.
VDV- survey about the assessment of public transport and mobility behaviour change

The VDV asked about the reasons for the use of public transport. The main reasons named were parking problems, a fast alternative in inner cities, a stress-free travel, environmental protection and no car availability. Also low costs are a motivational factor, but are not considered as the main driver of the use of public transport. A more detailed overview can be found in the following figure:

![Figure 13: Reasons for selecting public transport, VDV/TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.](image)

When asked about the one main reason of the change to public transport, no parking problems were mentioned by 29%, 17% have no car available, 12% of the respondents mentioned comfortable journey and less stressful, 11% think that in inner cities public transport is a reasonable alternative to the car and 5% use it out of environmental reasons and because they can quickly reach their target, only 3% named the cost.

The reasons for not using public transport or a non-change to public transport are in particular poor connections and transfers, high fares, unattractiveness of the offer, car availability, high cost, no customer-friendly tariffs and overcrowded vehicles. A more detailed breakdown can be found in the following illustration.

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As the most important reason, preventing the respondents from using public transport, 28% indicate poor connections or necessary changes, 18% high fares, 14% car-availability, 12% poor transport services, and 7% a long travel time.

To find out about more about the different profiles, the VDV also asked about the characteristics of public transport and cars. The respondents named the perceived strengths and weaknesses.\(^{31}\)

While public transport has its strengths in safety, a low rate of accidents, relief of traffic, environmental friendliness, climate protection, sustainability and energy efficiency, it shows weaknesses in the timeliness, convenience, cost, speed, sympathy, inequivalent way of life and lack of innovation.

The car, however, has its strengths in the perceived safety, punctuality, comfort, speed, emotional appeal, reliability, innovation and lifestyle assessment, and weaknesses in the number of accidents, relief of traffic, costs, energy efficiency and environmental protection.

These answers show that the choice of transport mode is very subjective, because it is evident that the perceived safety of car transport and the perceived high costs of public transport do not match reality.

The VDV investigated the change of transport. It was examined how many of the people who had a car available planned a change and in which cases the change actually took place. In the last years, a positive trend could be observed, as in 2009 57% thought about a change, compared to only 37% in 2002. In fact, in 2009, 68% of the respondents who have planned a change, actually switched and so did 69% in 2002.

\(^{31}\) Cf. VDV/TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.
The survey asked persons who had a car available about the purpose of the trip, in which the transition took place. The respondents especially mentioned shopping trips into the city, trips to authorities / office / bank / doctor and to go out / for meals / into the city. A change at the trip to work was made in 30% of the cases, which is lower than for the purposes mentioned before. The following illustration shows in detail the purposes when a change was executed.

![Trips by purpose for which a change has occurred](image)

Figure 15: Conducted changes sorted by trip purpose, VDV/TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.

When asked about the possible improvements of attractiveness, certain offers were considered particularly important. Thus, the respondents named cheap fares and a greater trip frequency, the reduction of complexity, improvements in comfort and better information.

The survey asks about the assessment of transport (public transport and car traffic) and about the motivation of transport changers or attitudes. It especially considers environmental protection.

**Infas: Mobility in Germany – Study about developments in mobility behaviour**

The study „Mobility in Germany“ cites a survey, when infas, on behalf of the Munich Transport and Tariff Association (MVV), examined in 2007 groups of „public transport potential“ and the „public transport occasional“ customers, to find out how public transport can target its potential passengers in a better way. The results show that an objectively good public transport offer (sufficient number of connections, good infrastructure etc.) are conditions for a positive

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subjective assessment of a local good public transport service.

For both groups of users, the following are the crucial factors: Subjective safety, reliability, information in case of delay, information about targets / network / time, environmental reasons, no need to find a parking space and costs.

The study distinguishes different user segments. It says, that for „car captives“, a lack of efficient connections is responsible for the fact that they always use their car. For „potential public transport users“, other reasons are quality aspects or subjective preferences for the car. The user who renounce of a car, are not only motivated by economic reasons, but also by a conscious decision against the car out of reasons such as health and age, but also for environmental reasons or good local public transport service.

As a conclusion, it can be said that the study examines mobility behavior statically for 2007. It shows that different groups (car captives and potential public transport users) exist and are motivated by different factors. This means for USEmobility that a target-group oriented approach is important.

The study „Mobilität in Deutschland 2008“ also examines the modal split, comparing the years 2008 and 2002, but is not mentioned here, due to the fact that it is not focusing on influencing factors.

Deutsches Verkehrsforum – Study about climate protection, mobility costs and behavioural changes

The DVF-study surveyed different groups of users about their expectations regarding means of transportation. Across all income- and age-groups, reliability (97% of respondents) and punctuality (94%) are the most important traits. On third place is the environmental friendliness (93%), which is particularly important to cyclists (71% very important, 98% important or very important), and less important to car drivers and young adults (53%/44% very important, 92%/89% important or very important and important).

Flexibility is important for 91% of the respondents, which is for car users and cyclists more important than for public transport users, pedestrians and retirees. The availability was cited by 91%, which is particularly important for full-time professionals and less important for retirees. The costs were mentioned by 91% of respondents, but higher travel costs are accepted as long as the performance is adequate. The costs plays a role for 84% and are especially important for captives with low incomes. Comfort was named by 61% as important, however, only 20% of respondents see this aspect as very important. Speed is important for 58% and particularly important for trainees, city residents, car-free persons and young adults. The survey shows that in public transport punctuality and flexibility play a less important role than for the car, while the environmental friendliness is less important when choosing the car.

As a conclusion, it can be emphasized that the study examines statically for 2009 different aspects of quality of the mobility offer, with a focus on mobility costs, which can be found in

detail in chapter 4.4.1. Hereby it distinguishes groups by different characteristics, such as sociodemographic, modal choice characteristics and attitudes (e.g. age, cyclists in terms of environmental attitude). It focuses on environmental awareness and the influence of mobility costs, which are described in chapter 4.4. For USEmobility it shows which quality attributes are seen as especially important and which need to be improved for multimodal mobility offer.

**VCÖ – Study about different aspects of multimodal mobility**

The Austrian study "Multi-modal mobility as a chance" presents the following factors, especially influencing the choice of transport mode:

*Car ownership, travel time, existing infrastructure, cost-benefit assessment, environmental awareness, communication behaviour, status, relaxation, and sportiness. Also habits, convenience, good or bad experiences with a transport system, lack of knowledge about alternatives, values and opinions of reference persons are mentioned.*

Therefore, it shows for the recommendations of USEmobility that it is important to take into consideration the fares, the factor of time savings and the regularity, reliability and predictability of the transport timetable, clearly arranged rates and guaranteed connections and settled reasonable ticket prices.

**Medianet – Survey about the attitudes of Croatian population towards public transport**

The Croatian study „Telefonska anketa Stavovi stanovnika Hrvatske o Hrvatskim željeznicama Prosinac“ is a telephone survey, examining the attitudes of Croatian population towards Croatian Railways.

The main reasons for the choice of the train, named by the respondents are *convenience/comfort (86%), security (8%), low costs (2%), speed (3%) and habits (3%).* In comparison to the train, the main reasons for the preference of the bus are *habits of respondents (17%), speed of the bus (6%), convenience/comfort (20%), proximity to bus stop (6%), security (41%) and better punctuality (2%).*

As main characteristics of public transport, the study identifies ecological acceptability, safety, comfort, costs, accessibility, modernity, speed and accuracy.

According to the study, *customer courtesy/friendliness* of railway staff is also an important factor. The average staff friendliness of Croatian Railways is rated very high with 4,12 out of 5 (2010). In fact, the respondents travel less frequently to worse evaluate staff. The best evaluation of the staff was given by passengers who travel every day.

For USEmobility, the survey shows that the perception of friendliness and security as well as habits play an important role for the satisfaction and hereby for the mode choice.

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34 Cf. VCÖ, Multimodale Mobilität als Chance, 2009.
Széchenyi István University – Study about the satisfaction with local urban transport

The Hungarian study “Consumer evaluation in the transit industry” examined how much specific quality attributes contribute to the level of satisfaction. The components of the satisfaction of local urban transport can be divided into basic components and high-level components.

Basic components are reliability, accessibility, expertise, frequency of the services, regional and temporal accessibility, number of buses, safety, appearance, comfort and condition of public transport.

High-level components are sensibility, courtesy of employees, communication, confidence, knowledge, satisfaction of consumer needs and behaviours.

As quality attributes of the bus service, the study cites the following ones:

1. Frequency of the local bus service
2. Speed
3. Correctness (Reliability, Punctuality)
4. Distance between bus stops
5. Connection
6. Modernity of the buses
7. Travel safety
8. Travel comfort
9. Attitude of the employees
10. Information
11. Purchase opportunity of the tickets
12. Price

For evaluating the satisfaction with public transport at a global level, a five-point scale was used. The passengers were asked to give their satisfaction level regarding their perception of the existing service condition and to rate the importance and the satisfaction.

Factor analysis was conducted with the 12 service attributes, which resulted in three factors. Factor 1 appeared to reflect the travel time. Factor 2 is representing the travel comfortableness. Finally, factor 3 is labelled as consumer relationship.

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36 Cf. Széchenyi István University, Department of Marketing and Management, Ida Ercsey: Consumer evaluation in the transit industry, 2008.
### Table 1: Results of the factor analysis of variables, Széchenyi István University, 2008.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Variables</th>
<th>Explained variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel time</td>
<td>Frequency</td>
<td>42.60%</td>
</tr>
<tr>
<td></td>
<td>Number of bus stops</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Punctuality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connection</td>
<td></td>
</tr>
<tr>
<td>Travel comfort</td>
<td>Buses are reliable</td>
<td>15.40%</td>
</tr>
<tr>
<td></td>
<td>Travel safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comfort</td>
<td></td>
</tr>
<tr>
<td>Consumer Relationship</td>
<td>Behaviour of personnel</td>
<td>7.30%</td>
</tr>
<tr>
<td></td>
<td>Price</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selling of the ticket</td>
<td></td>
</tr>
</tbody>
</table>

The decision to include a variable in a factor was based on factor loadings ($\geq 0.45$), and its meaning within the factor. The factorial analysis on 12 variables yielded three-factor solution accounts for 65.3 percent of the explained variance.

**Travel time** accounts for 42.6 percent of variance and is constituted of five variables related to the frequency, number of bus stops, punctuality, speed, and connection. Thus, the empirical results confirm the crucial role of the frequency, the speed, and the punctuality in the consumers' evaluation towards urban public transport.

**Travel comfort**, explains 15.4 percent of variance and consists of three variables, representing the reliable of buses, the travel safety, and comfort. The travel comfortableness constitute the second most important element in the perception of the satisfaction.

Finally, **consumer relationship**, accounts for 7.3 percent of variance and is composed of four variables expressing the behaviours of staff, information, the selling of tickets and the price. Concerning consumer relationship, users consider it as a third-order factor in their perception of the passengers' satisfaction with lower values of regression coefficient.

The results reveal that the influence of those three factors on the satisfaction is statistically significant. The coefficient of determinant value describes that three factors contribution to explain the overall satisfaction of 57%.

For **USEmobility** this means that the measures should include improvements in travel time, travel comfort and consumer relationship.
Monitor - Survey about motivational factors for using public transport in Budapest

The Hungarian study “A külföldi turisták véleménye a budapesti tömegközlekedésről” examined public transport in Budapest.

It showed the motivational factors of the selection of public transportation: 20% of the respondents each named speed, cheapness and necessity (no other option), followed by 14% habits and 13% safety. Environmental considerations played a minor role in the extent of the choice of means of public transport.

Here it is shown that often there is just no other option for a mode choice, which needs to be kept in mind in the survey of USEmobility. The study is also a good example showing that often only classic factors such as speed, costs and safety are examined, which can only explain a part of mobility behaviour.

TÜV-Rheinland – Study about mobility behaviour and possible changes

In the German study „Umfrage zum Mobilitätsverhalten” about one third of respondents would make more use of public transport, if public transport was improved.

The improvement of quantity (denser network, better availability, shorter cycle times, etc.) is given more importance than the improvement of quality (punctuality, cleanliness, comfort, safety, etc.).

Depending on the trip purpose, significant differences in the proportion of quantitative and qualitative factors can be detected. For routes to and from work, quantity is three times as frequently named as quality. For purchasing, and personal business and recreation quantity is almost twice as often mentioned as quality. For holiday trips, quality is almost as often mentioned as quantity. The importance of quality rises with the character of leisure travel. With regular trips to work or training, however, the quantity of public transport supply is weighted much higher.

This means for USEmobility that mobility behaviour needs to be regarded differently according to the trip purpose and that quantitative as well as qualitative factors play an important role for the mode choice.

Skrtic, Ivica – Study about attitudes of users and new services in public transport in Croatia

The Croatian Study „Razvoj novih usluga u prijevozu putnika željeznicom” about public transports seeks to find out more about attitudes of users towards the rail passenger transport services and the need to introduce new services. The study asks about passenger satisfaction.

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37 Cf. MONITOR Társadalomkutatásh és Módszertani Központ: A külföldi turisták véleménye a budapesti tömegközlekedésről.
with the existing situation and offers of passenger rail service and determine the need for the introduction of new, additional services.

As especially important, the study identifies the kindness, courtesy, professionalism and speed of the personnel, service sales of transport tickets in the stations, information service for passengers in the station and first-class service on the train. Additionally, the accessibility, information, attractive offer and comfort are named as important factors.

NÖ (Lower Austria) – Study about mobility behaviour, the influence of mobility costs and attitudes

The study asked about a change of mobility behaviour in the last five years.

![Figure 16: Reasons for a change in mobility behaviour, NÖ, 2009.](image)

In the course of the study, adolescents were asked to evaluate various statements, relating to specific modes of transport. Most frequent are statements that relate to emotions and experience, freedom and flexibility when using a car. Young people agree less responsive to statements that refer to prestige or their social environment. These attitudes will be analyzed more detailed in the following subchapter when discussing attitudes and opinions in depth.

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SFZ/ILS, Umweltbundesamt – study about psychological and social factors of mobility behaviour\textsuperscript{41}

Besides theoretical behaviour models, as presented in chapter 2, the UBA study examined reasons for car-free mobility, since a major influence of car ownership or car availability on travel behaviour could be discovered in Germany and Switzerland.

First there is the group of "involuntary car-free persons". An important reason for this group is the regional structure. The proportion of this group rises steadily with increasing regional magnitude. An important reason for this difference can be seen in the infrastructural conditions. The urban conditions of a large city, and especially the core areas with a large number, variety and density of activities, housing, workplaces, shopping, cultural and leisure facilities, together with the provision of public transport, support the car-free life. Also the urban structure of many centers and the scarcity of parking spaces limit the possibilities of motorization. Other relevant factors include the income or social status, the age or the number of children in the household. Thus, in 70% of car-free households you can find either an unemployed person or a low income. The majority of car-free households has also an elderly person. One-and two-person households make up the largest group of car-free households.

From this typology can be concluded that the way of life of those people in car-free households is often not voluntarily chosen, but rather for economic or other constraints, they currently have no way out of the possession and use of own car. This suggests the theory, that a car-free life is perceived as dilemma with drawbacks.

However, there was a high level of satisfaction of those affected by the situation (75% in Germany, 86% in Switzerland), 90% of respondents said that they have adjusted well to it. However a car-free life is perceived as deficient in leisure travel.

Another group is "voluntary car-free". They have a higher household income and educational status, are often younger, with a high political orientation. Life without a car is increasingly seen as a separate life form and an increased quality of life and marks and communicates the social belonging. 25% of the voluntary car-free users are seen as an example for others.

The following figure illustrates the different reasons for the renouncement of a car. Primary reasons for are change in mobility patterns are financial reasons and changes of the personal (living-/work-) situation. To 10.4 %, the attractiveness of public transport was mentioned as a reason. Further reasons are the physical ability and environmental consciousness.

\textsuperscript{41}Cf. SFZ/ILS, on behalf of Umweltbundesamt: Bedeutung psychologischer und sozialer Einflussfaktoren für eine nachhaltige Verkehrsentwicklung – Vorstudie, 2002.
While in this study environmental awareness did not show a significant influence on travel behaviour, recent surveys show a high approval on environmental factors. For example, a Swiss survey has a consent of 49.1% of respondents. It can be assumed that the non-possession of a car more or less strongly influences the environment settings in the way that one is aware that it is a contribution to the protection of the environment with the renouncement of a car. Other important factors are cost, especially for the public transport offer, habits, positive attitudes towards alternative transportation, less stress and problems with parking and car availability.

Figure 17: Reasons for the renouncement of a car, UBA
Figure 18: Motivational factors for a car-free life, UBA, 1999.

### 4.4 Interim Conclusion - Need for USEmobility

A quantitative analysis of the factors, as seen in the analysis of the 18 studies, results in the following values:

- Because the public transport offer is sufficient for our needs: 55% agreement, 4% total disagreement.
- Because we protect the environment: 49% agreement, 27% total disagreement.
- Because we prefer spending the money in other things: 56% agreement, 19% total disagreement.
- Because we are used to a life without a car: 48% agreement, 26% total disagreement.
- Because we do not want a car: 54% agreement, 27% total disagreement.
- Because we like to use public transport: 37% agreement, 27% total disagreement.
- Because we like to go by foot to use the bicycle: 33% agreement, 29% total disagreement.
- Because we have more time and less stress when renouncing a car: 33% agreement, 22% total disagreement.
- Because of the traffic jam and no parking spaces: 31% agreement, 25% total disagreement.
- Because insurance, repair etc. mean much expenses: 38% agreement, 22% total disagreement.
- Because driving a car is too stressful: 37% agreement, 15% total disagreement.
- Because of the risk of accidents: 41% agreement, 18% total disagreement.
- Because we cannot afford expenses for a car: 68% agreement, 30% total disagreement.
- Because nobody of us has a driving license: 68% agreement, 30% total disagreement.
It becomes clear, that lots of factors are determining mobility behaviour, which makes it a complex decision. On first sight, it is obvious that most studies focus on costs, infrastructural aspects, the attractiveness of the offer and car availability. These factors seem to play a major role in mobility decisions and are examined well.

However, other factors have to be considered as well, when intending to influence mobility behaviour towards a greener policy. In the last years, environmental awareness has been increasingly examined. But also individual attitudes, values, habits and experiences, the social environment and changes of the situation are important factors for the mobility decision. In most of the studies, those aspects play a minor role and are not analyzed further, because they seem to have a lower impact than costs, infrastructure etc.

In the last years, especially in Austria and Germany, recent studies could identify the importance of attitudes and individual aspects for the mode choice, which are not covered with conventional mode choice models. It also becomes clear that multimodality as such is not in the focus of most studies. The transport modes are regarded separately, which do not allow a clear statement concerning the transport mode decision within a transport chain. There is a further need for research, which includes these factors and which examines them in a large survey with an adequate survey design.

**USEmobility** will be an opportunity to create an overall overview of factors influencing mobility behaviour, hereby focusing on social behavioural factors and on multimodality. Especially individual values, experiences, habits, attitudes and emotions, which have not specifically examined so far, will be considered in an extended ex-post survey of an aspired number of 10,000 persons, who changed their mobility behaviour in the last five years, by using public or car transport more or less often.

A further particularity of USEmobility is the fact, that the survey will be conducted in six countries, which will create comparability between the countries concerning social behaviour in mobility decision, which does not exist yet.

Figure 19: Quantitative overview of analyzed factors (number of mentions).
4.5 In-depth-analysis of influencing factors

The USEmobility concept seeks to understand the influencing factors of mobility behaviour in detail. Many studies are satisfied with naming the factors, as seen in chapter 4.2. As a basis, it is reasonable to know about standard sets and tendencies of the importance of the factors. However, to be able to develop concrete and adequate measures, it is crucial to acquire a deeper understanding of the factors, knowing about the background and a categorization/classification of the reasons. This knowledge will help to gain a deeper understanding of multimodality, to develop an adequate questionnaire and to recommend interventions for policy and transport service companies that are directly pointed to specific factors of mobility behaviour.

The factors will be divided by the following scheme in objective offer-related factors, subjective offer-related factors, subjective environmental and situational factors, subjective external personal factors and subjective internal personal factors.

Figure 20: Factors of Mobility Behaviour.
4.5.1 Objective offer-related factors

The objective parameters of the choice of transport mode, mainly costs and travel time, can be measured and thus modeled and calculated. For the choice of the means of transport, utility functions are used. The value of the utility can be used to compare different modes - the higher the utility, the more use or benefit a consumer gets from it and the higher is the probability to choose a certain mode of transport.\(^{42}\)

In the context of mode choice, the utility for each mode consists of the attributes (or features) of each mode which are relevant to the decision making process. The attributes most commonly used include:\(^{43}\)

\[\text{COST} = \text{the cost of each mode, e.g. ticket fare, parking cost, petrol cost} \]
\[\text{IVT} = \text{the amount of time spent travelling on each mode of transport (in the vehicle itself)} \]
\[\text{WAIT} = \text{the amount of time spent waiting for the bus train etc. to arrive,} \]
\[\text{WALK} = \text{the amount of time spent walking to, from or between buses, trains etc} \]
\[\text{IC} = \text{the number of interchanges needed (e.g. between buses, trains)} \]

The utility for each mode can be formed from the weighted sum of the attributes of choice, so for example the utility for mode m could be given by:

\[U(m) = b(m) + b1*\text{IVT}(m) + b2*\text{COST}(m) + b3*\text{WALK}(m) + b4*\text{WAIT}(m) + b5*\text{IC}(m)\]

\[U(m) = \text{the utility of travel by mode m} \]
\[b(m) = \text{the perception of mode m (or mode constant)} \]
\[b1, b2, b3, b4, b5 = \text{weight of each attribute} \]
\[\text{IVT}(m) = \text{the accumulated time spent in vehicles while travelling by mode m} \]
\[\text{COST}(m) = \text{the accumulated fare for travelling by mode m} \]
\[\text{WALK}(m) = \text{the accumulated time spent walking while travelling by mode m} \]
\[\text{WAIT}(m) = \text{the accumulated time spent waiting while travelling by mode m} \]
\[\text{IC}(m) = \text{the number of interchanges needed to make the trip by mode m} \]

Faced with a choice between alternative modes of transport, the traveller would find out the value of each attribute (e.g. cost, in vehicle time, walk time, wait time and the number of interchanges), weight and add them so as to calculate the utility for each mode of transport. He (or she) would then compare the utility of each mode of transport and (in principle) choose to travel on the mode with the highest utility. For modelling more than one person, we need to consider the mathematical form of the choice model.\(^{44}\)

The EU Kite project\(^{45}\) analyzed different parts of the utility function, which describes the preferences of the travellers undertaking long-distance journeys. These preferences show the re-

\(^{43}\) Cf. ibid.
\(^{44}\) Cf. ibid.
\(^{45}\) Cf. Kite, A knowledge base for intermodal passenger travel in europe, http://www.kite-project.eu/, retrieved:
uirements of the users and their requirements towards a more sustainable use of transport means, e.g. under which circumstances they would change the transport mean and use public transport instead of the car. The study analyzed the factors Travel Time, Costs, Access time, Change (transfer) and in a further analysis also socio-economic factors such as income and a frequent flyer status.

The utility can be shortly generally described as follows:

\[ U_{ij} = V_{ij} + \varepsilon_{ij} \]

- \( V_{ij} \) deterministic term
- \( \varepsilon_{ij} \) error term

\( V_{ij} \) is a combination of the different attributes of the available alternative, which characterize the decision situation (selected here: Travel Time, Costs, Number of Changes and Access time). Based on these assumptions, the probability to choose a certain alternative can be calculated by:

\[ P_j = \frac{e^{V_j}}{\sum_i e^{V_i}} \]

as the modelled probability for the choice of alternative \( j \). To estimate the parameters of the utility function, the Maximum-Likelihood-method is used.

Costs

The fact, that cost play a role in the selection of the modes of transport is not only shown by the above-mentioned studies, which mention time and again the price / cost as the reason for the use or non-use of public transport or cars, but also by more detailed investigations, such as the TÜV Rheinland study. This study shows that about one quarter of respondents would increase their use of public transport when a significant reduction in ticket prices takes place. This applies to almost all trip purposes. Only for holiday traffic the ticket price is evaluated as little less important (named by 18% of all respondents). The different reaction with regards to a price increase shows that the perceived costs (in contrast to objective costs) play a major role in the mode decision. Persons would decide whether they still can afford car use in future with higher costs. This study asks about hypothetical decisions, if a certain occurrence happened, which makes it difficult to prove if the named actions actually take place.

By contrast, about one-third of respondents would use public transport more if the cost of car use (push factor) would increase significantly. The most significant increase could be recorded.

30/03/2011.

for shopping / personal business trips with around 37%. In particular, the increased parking fees in the inner city and the introduction of a congestion charge would influence this purpose, while the increase in fuel costs and the introduction of a general road pricing on motorways only play a minor role. Similarly there is a high importance for holiday trips (36%). In this case, road pricing and increasing fuel costs are of extreme importance.

For the trip purpose "leisure" an increase in the cost of car use would be relevant for some 34% of respondents. The biggest influence would have an increase in fuel prices, followed closely by the introduction of a congestion charge and increasing parking fees in the downtown area.47

For journeys to / from work only about one quarter of respondents said, they would use public transport more, should the cost of car use increase strongly. For this purpose, this means that the push factor is therefore, in comparison to the other way for purposes of secondary importance. The most obvious would be a reaction with an increase in fuel prices

However, by about 41% of the respondents, increased use of public transport, regardless of various pull and push factors, is refused. For trips to work / training, the proportion of this group with about 47% is even higher than it tends to be for shopping (37%) and leisure services (36%), for which is a greater willingness to increase the use of public transport.

Also, a study by the Institute Infas 48 examined the behaviour dependent on the mobility costs in a more detailed way. The majority of respondents (59%) would change their mobility behaviour in the case of an increase in the cost of mobility. Asked about what they would change with increased mobility costs, 24% would reduce their car journeys, in some extreme cases it would even result in the renouncement of their vehicle. 15% would change their leisure activities and adjust their holiday mobility, 11% would change their mobility behaviour and 13% would increasingly use the bike. Only 5% would limit their job mobility. In the study, again the perceived costs, in contrast with the actual cost play the major role.

Particularly price sensitive in terms of mobility costs are persons in training (63%) and unemployed (67%). With increasing income, as expected, the price sensitivity of respondents decreases. However, with increasing mobility costs, the group of car-free persons (50%), households with young children (45%) and residents of rural counties (44%) would hardly change their routines.

The most common behavioural changes are provided by the limitation of car trips (24%). This change will be made especially by those who already use the bicycle (31%), people in training (38%) and unemployed (35%). Likewise, 50-64 years old and older / retired persons (31%) respond would use the car less with rising costs. Even among the classic car users in the peripheral regions, at least 30% would reduce their car journeys in this case. With rising mobility costs cyclists (23%) and unemployed (23%) would use the bicycle for even more ways. Even households with 3 or more cars (23%) would more likely than average switch to the bicycle.

The population is divided regarding the assessment of their mobility costs. Half of the respondents assess their own mobility costs as appropriate, as many as inappropriate. Only 11% describe the mobility costs as not at all adequate.

**Time**

Besides costs, as seen in the utility function and in the surveys above, travel time is an important factor for the choice of travel mode. The function includes in travel time the time for the access, the waiting time, the time needed for changes and the time for the journey itself.
The Belgian study „De sociale effecten van basismobiliteit in nietstedelijke gebieden“ emphasizes that especially the age group 25-45 years has a limited use of public transport because of a high time pressure and the desire to spend as less time possible for a journey, which is in favor for the car. Once the pressure drops, public transport becomes more attractive. This applies primarily to non-workers. The same argument is also used at weekends. Over the weekend, more time is available and public transport is evaluated better.

The frequency of the offer directly influences the choice, because it is an important factor for the wellbeing of users. Also in the context of the availability over time, the lack of an appropriate public transport offer is seen as a nuisance when waiting too long for a service. The lack of flexibility is certainly a barrier to use this service. This applies not only to the frequency, but also to unpredictable hours, which can make it difficult to use the bus service. A limited supply of public transport not only has an effect on the time when one can move, but the journey is likely to be unreasonably long.

The Hungarian study „A Budapestre bejárók közlekedési preferenciái“ shows that approximately 13% of respondents claim they would certainly, 19% probably increasingly use public transport, if the frequency was increased.

**Structural characteristics and multimodality**

The infrastructure of a region and the structure of urban development, which determine the public transport offer, are further factors, which have a high impact on the choice of transport mode and which can be assessed in an objective way.

The Austrian study „Soziale Aspekte von Mobilität“ stresses that car mobility is, in addition to the household income, strongly determined by regional conditions. The lower the population density, the higher is the demand for car travel, in order to make trips to work and procurements.

According to the study „Mobilität in Deutschland 2008“, the structural distribution of population, jobs and infrastructure is a key element for the explanation of mobility. Areas with a high population density have a high contact potential, which favors the establishment of businesses and infrastructure. Therefore, it is potentially possible to carry out ways of everyday life in small distance. Conversely, in sparsely populated areas, longer distances are often needed to reach places with higher centrality with public transport.

The transport system determines the shape of the areal and settlement structure. The performance of the traffic system and the expense of the user (time and cost) determine the favour of a location and the accessibility of the activity locations. A high density of the transport system leads to a high public transport share in modal split.

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The combinations of car-public transport or bicycle-public transport still play a minor role in Germany. Nevertheless, for almost ten percent of the trips by public transport, a combination of public transport and car as a driver or passenger takes place. For five percent of trips, there is a combination of public transport and bicycle. The data shows that the use of combinations is higher in rural and concentrated areas. It can also be observed that all possible combinations have experienced significant growth, compared to 2002. The combination of "public transport and car driver" has tripled in the condensed and rural districts. In contrast, in the central cities, the proportion of the use combination "public transport and car driver" was halved.

Increased slightly in all county types has the combination of "public transport and car passenger". There is also a visible growth everywhere for the combination of "public transport and bicycle".

Factor analysis was conducted with the 12 service attributes, which resulted in three factors. Factor 1 appeared to reflect the travel time. Factor 2 is representing the travel comfortableness. Finally, factor 3 is labelled as consumer relationship.

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A frequent bicycle use takes place mainly in rural districts, where 43 percent of all persons (almost) daily or three times a week use a bicycle. In the urbanized districts, the percentage is 39 percent, in urban cities, it is only 36 percent.

Also in Austria\textsuperscript{54}, inhabitants of rural districts use the car above-average. An above-average use of public transport, however, have central city residents (40%), while the rural areas, which are relatively poorly connected to public transport, use public transport below average.

A high level of attractiveness of public transport results in lower car density and a higher proportion of public transport in the modal split, especially in urban centers. For example, the proportion of public transport in Vienna is 35%, 17% in Austria in average and 4.8% in rural areas.

According to a Belgian study, which analyzes mobility data in Flanders\textsuperscript{55}, respondents from regional urban areas show a relatively small share of trips by car. The largest share of car trips can be found in the countryside. The percentage travel without a car here is the smallest. The share of non-voluntary use of the car is the largest in the regional urban area. In small urban areas, the share of car trips is approximately 75%. In other areas it ranges from 79 to 82%.

In the Brussels metropolitan public transport has the largest share compared to all other Belgian regions. Both the public transport use without a vehicle available and the percentage that do have a car reach their available maximum. The supply of public transport is the biggest. In the regional urban area, there is the smallest proportion of car trips. The number of trips on foot or by bicycle is the predominant. The proportion using public transport without an alternative is here largest. In the structure of small urban area is the maximum of voluntary public transport use. In the rural area car trips have the highest share, no doubt both by greater

\begin{center}
\includegraphics[width=0.5\textwidth]{Figure23.png}
\end{center}

Figure 23: Multimodal combinations with public transport, Mobilität in Deutschland, 2008.

\textsuperscript{54} Cf. VCÖ, Multimodale Mobilität als Chance, 2009.
distances between all the other amenities and a smaller supply of public transport.

The VDV study „Kundenbarometer ÖPNV Deutschland 2009“ shows a different frequency of the re-selection of public transport use by region. While in metropolitan areas and cities 90% would surely or probably use public transport again, only 75% plan re-selecting it in the surrounding areas. 1% of persons in the agglomeration say that they will rather not use it any more, in the rural areas 7% respond they will not use public transport any more for sure.

The frequency of daily car use is in the agglomeration areas 48%, 46% in the city and in the surrounding countryside 58%.

Also the study „Deutsches Mobilitätspanel“ includes the population / settlement structure in the mode choice influencing factors. Within the survey, multiple answers are allowed, which means that persons can exclusively use public transport / car transport or use both. When the population numbers is over 100,000, 47.9% are public transport users and 64.2% car drivers. With populations of over 100,000 in the surrounding areas, there are only 23.8% public transport users and 83.7% car drivers. In smaller cities with 20,000-100,000 people, the share decreases further to 20.9% public transport users and 75.7% car drivers. In areas with 5,000-20,000 inhabitants 17% public transport users and 81.2% car drivers can be found. In places with fewer than 5,000 inhabitants, 11.3% public transport users and 87.0% car drivers are identified.

According to the study „De sociale effecten van basismobiliteit“, a great distance from/to a bus station has negative consequences on the use of public transport, especially in rural areas. The distance to a stop for many people is undoubtedly an obstacle to take public transport.

The study “onderzoek in opdracht van het vlaams ministerie van mobiliteit” stresses that the greater the distance to the bus stop, the larger the proportion of car trips. Both the number of forced choice and the number of passengers decreases with distance from the bus stop.

The regional and settlement structure therefore affects both the public transport offer and the accessibility of a place. High accessibility means easy and rapid reaching of targets; low accessibility targets are difficult to reach and with greater cost, which often prevents the use of public transport.

57 Cf. Institut für Verkehrsweise, Universität Karlsruhe (RH), on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Deutsches Mobilitätspanel (MOP), 2008.
4.5.2 Subjective offer-related factors

Security/Safety

According to the Belgian study „De sociale effecten van basismobiliteit“\textsuperscript{60}, the feeling of security or insecurity is as we previously seen not least in the context of well-being. Those who feel insecure will feel uncomfortable. That certainly applies to the choice of public transport. There is a distinction between traffic safety and social security. A lack of traffic safety leads to a form of disaffection among the interviewees. In addition, it also affects the travel behaviour. People will avoid certain situations, e.g. using public transport. Besides the traffic safety there is the social insecurity, which influences the choice of a travel mode, especially in the night hours. If the fear of crime is well founded or is not reasonable, does not make a difference.

It becomes clear that persons are often not able to realize the objective safety of public transport in comparison to much higher accident rates in car transport. For example the death risk in Germany is 63 times higher when travelling by car than by train. Also the risk of injury is 96 times as high.\textsuperscript{61} Objective traffic safety seems to be superimposed by the perceived safety and the perceived social security, due to the fact, that the car driver believes to be able to control the risk by him-/herself.

Complexity of the offer

According to the Belgian study,\textsuperscript{62} the complexity of the journey plays a role when choosing the transport mode. When a direct connection to the destination is offered, the use of public transport is comfortable and easy to manage. However, if there are a lot of necessary changes and little information about the tariffs and timetable, public transport becomes very complex. The complexity of the movement is closely related to the distance, that must be bridged. For very short distances, public transportation often does not provide a benefit, for slightly longer distances, bus and tram gain significance and for even greater distances, the train might be a good alternative to the car.

The presence of children are changes in the mobility patterns of the parents. Before one goes to work, the children first must be dropped off at childcare or school. The same needs to be done after work to return the children. If, during the same journey several locations must be reached, public transport loses much of its comfort.

Accessibility

The physical accessibility of stops and vehicles are especially for disabled and elderly persons

\textsuperscript{62} Cf. ibid.
a specific issue. The Public transport use is not merely a matter of distance to the stop, but also disabled access to public transportation, which is often very limited. To meet their needs, the attention given to individualized transportation and additional requirements in terms of access to infrastructure and from the stops. These are sufficiently wide sidewalks, sloping surfaces and the security of crossings.

The VDV study examines the subjective evaluation of accessibility of the usual targets of respondents with the use of public transport. In the metropolitan area, 67% indicated the targets can be reached very good or good, in the city even 77%, in contrast in rural areas only around 34%. A poor or very poor accessibility was was evaluated by 10% in urban areas, in big cities with 5% and in the surrounding area with 31%. No accessibility at all occurs in 2% of the cases in urban areas and 6% in the surrounding area.

According to the study „Mobilität in Deutschland 2008“, the car is the transport mode, which is generally evaluated the best when it comes to the assessment of accessibility. Public transport is especially assessed rather poor for the accessibility for shopping trips. The same is assessed the accessibility for workplace and training.

The closer a stop of public transport, particularly of rail passenger traffic in the vicinity of the home, the more likely the presence of targets with public transport is evaluated as positive. High accessibility means easy and rapid reaching of targets; with low accessibility goals are difficult to reach and need more time.

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64 Cf. VDV/ TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.
Information

According to the study „De sociale effecten van basismobiliteit“\(^{66}\), information about the available transportation is important. Information appears to have a crucial role in the use of public transport. The interviews showed that the regular use of public transport was hampered by a lack of information on both the compounds, the distances and the times of the services. Using public transport is for many interviewees a complex matter. This is especially true when one is not used to public transport.

For those, not using internet information, remain in some cases unaware of the potential of public transport. Information about the use of public transport is proving to be very important for the wellbeing of users. Waiting is unsatisfying and thus it is important that the schedule is known. Besides the connections, times and distances it was also a lack of information or clarification about the ticket fares which lead to dissatisfaction.

According to a Croatian telephone survey\(^{67}\), information is an important factor. The survey showed that a lot of persons are not informed in the right way. Only 17% (2007) were aware of special / occasional / excursion trains. Only 10% were aware of the organizational restructuring of Croatian railways. With regard to the assessment of the timeliness of information (regarding timetable, new trains etc.) 19% responded to be informed regularly, 51% almost regularly and 8% (2010) to be informed irregularly.

The Hungarian survey "A külföldi turisták véleénve a budapesti tömegközlekedésről"\(^{68}\) emphasizes that information about the offer and fares is very important to facilitate the selection of the means of public transport. More than three-quarters of those surveyed (77 percent) wished for more information about certain lines, more districts, including a timetable for passenger information cards and booklets sale.

4.5.3 Situational factors

Luggage

According to an analysis of Belgian mobility data\(^{69}\), the presence of children and luggage has little relevance to the choice of transport. It is surprising because one would expect that the presence of children or baggage leads to increased car use, and less common in the selection travelers. The problem with the analysis is that "baggage" can be a satchel, or a single plastic bag. Even children are not clearly defined.

\(^{68}\) Cf. MONITOR Társadalomkutat´Intézet és Módszertani Központ: A külföldi turisták véleénve a budapesti tömegközlekedésről.
The study „De sociale effecten van basismobiliteit“\(^{70}\) differs in a more detailed way and finds an influence of the burden to be carried. In some of the cases, the comfort in the first place was coupled with the burden carried during the journey. Besides the problem of additional costs that must be contributed when travelling with children, in the interviews it was found that systematically public transport is rejected for "big" shopping. In these cases, it mainly concerns the weight of the load.

Sometimes the burden is aligned with an accessibility problem, e.g. a buggy for children hampers parents to use public transport.

**High Traffic/Congestion**

According to a Belgian study\(^{71}\), congestion will encourage people to seek alternatives for the car. During our interviews, it became strikingly pointed to trips to the city by public transport because one does not want to drive into the city with a lot of traffic, especially at peak times.

**Weather**

An additional element of comfort criteria is the weather\(^{72}\). The choice of transport mode can be influenced by rain and wind by low and high temperatures. The influence of weather is most pronounced in travel behaviour of children. If the distance permits, thy prefer the bike when the weather is nice. At bad weather, they take the bus or the parents drive them. The temperature is an important criterion for some, whether to use or not use public transport.

4.5.4 Sociodemographic and external personal factors

Many studies examine mobility patterns by life cycle phases, which distinguish the target groups by socio-demographic characteristics of age, household size, including number of children and employment.

**Age**

Age plays an important role in the choice of transport mode. The study "Mobilität in Deutschland 2008"\(^{73}\) proves that the use of cars of those in the middle age phase (30 to 59 years) is higher than average.


\(^{72}\) Cf. Ibid.

\(^{73}\) Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.
One of the striking results of the study is, that over all age groups public transport is used more than in 2002. Young persons use car transport less than in the past. Apparently, there is a trend in mobility behaviour towards an increase use of public transport. For the elderly (aged 65) in comparison to the past, an increased car use can be observed. This is due to attitudes (higher need for mobility), an improvement of physical facilities by an increase in health / fitness and cohort effects (mobility biographies).

The study "Multimodale Mobilität als Chance"\textsuperscript{74} proves that differences exist between the age groups of the Austrian respondents. Young adults use cars higher-than-average. An above-average use of public transport show 18-34 year olds (25%) and seniors (25%),

According to „De sociale effecten van basismobiliteit“\textsuperscript{75}, looking at the share of trips for the passengers in total for different age groups, the share of public transport passengers is the lowest (12%) for persons between 24-42 years. For those aged over 75 years, the share is 26%.

The study „Deutsches Mobilitätspanel 2008“\textsuperscript{76} stresses, that age is one of the factors influencing mode choice. Thus, 18-30 years old are 43.7% public transport users and 75.6% car drivers. 30-50 years are 24.8% public transport users and 86% car drivers. 50-70 years are 29.2% public transport users and 72.4% car drivers and of the 70 and older 42.1% are public transport users and 47.0% car users. This shows, that mainly the youngest and oldest age groups use public transportation.

The survey „NÖ- Ergebnisse der landesweiten Mobilitätsbefragung“\textsuperscript{77} also states that for persons under 49 years of age, it is observed that the older the person, the more journeys they make. The highest rate of mobility has the group of 35 - to 49-year-olds (3,6 trips). Only the 50 - to 64-year average have a similar number of trips per day like the 18 - to 34 - year-olds. In the over-65s it should be noted that the paths per mobile person are equal to 3,1 as for the under

\textsuperscript{74} Cf. VCÖ, Multimodale Mobilität als Chance, 2009.
\textsuperscript{76} Cf. Institut für Verkehrswesen, Universität Karlsruhe (RH), on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Deutsches Mobilitätspanel (MOP), 2008.
\textsuperscript{77} Cf. NÖ Landesregierung, Ergebnisse der landesweiten Mobilitätsbefragung, 2008.
18-year-olds. The number of journeys depending on the age influences the mode choice.

The study „Onderzoek in opdracht van het vlaams ministere van mobiliteit”\(^78\) emphasizes age as important factor for the choice of the means of transport. Journeys of children from 6 to 12 years are often made by car, but also in other means of transport. This is seen as forced choice, since they are not able to use the car and a driver must be available. From 18 to 24 there is a shift. The share of the car rises to 45%, and forced and voluntary use of alternative transport back down. From 25 to 54, the highest proportion of pure car use (± 61%) and the share of public transport decreases to the lowest share (± 10%), compared to all other ages. This is logical because in these ages almost everyone has a license. After 55 there will be more compelled alternative transport use, especially for women over 65.

Also, the VDV\(^79\) asks about the frequency of public transport use by age. The age group 16-29 years uses public transport higher than average, 28% of them daily, 28% never or almost never, which could also indicate a future trend towards an increased use of public transport. A significantly lower usage shows the age group between 30-39 and 40-49 years. Only 13% use public transport every day and 44% and 45% of them never or almost never. The 50-59 year old use it every day and only 9% to 52% never or almost never, the 60-year-old to 7% daily and 44% never or almost never.

Within public transport, the Croatian study „Telefonska anketa Stavovi stanovnika Hrvatske o Hrvatskim željeznicama Prosinac”\(^80\) showed that the train is preferred by 25-44 year olds, compared to the bus.

**Gender**

Gender also has an influence on the choice of transport.

According to the study „Mobilität in Deutschland 2008”\(^81\), men are still the predominant car drivers. Women are less mobile, which means that they travel smaller distances and shorter daily distances than men.

Also „Deutsches Mobilitätspanel 2008”\(^82\) considers gender as one of the factors, influencing mode choice: Men are 27.6% public transport users and 85.2% car-drivers, while women are 35.5% public transport users and only 63.4% car drivers.


\(^{79}\) Cf. VDV/ TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.


\(^{81}\) Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.

\(^{82}\) Cf. Institut für Verkehrswesen, Universität Karlsruhe (RH), on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Deutsches Mobilitätspanel (MOP), 2008.
The study „Multimodale Mobilität als Chance“\textsuperscript{83} shows differences within the modal split between the sexes in Austria. Thus, men use public transport, walking, cycling to 59%, women use those types of transport to 72%, while the car makes up a share of 41% for men and for women of 28%.

According to NOE\textsuperscript{84}, the proportion of women as car driver is 47% and 59% for men. As a car passenger, it is among women 15% and 8% for men. For bicycling, women, with a share of 8% are also before men (6%). For the use of public transport, women use it with 13% slightly more than women. In both cases the differences are not as clear as with the other transport means.

The study „onderzoek in opdracht van het vlaams ministere van mobiliteit“\textsuperscript{85} emphasizes, that in Belgium, there are relatively more men who only use the car (54.23% men versus 50.42% women) and men take more trips than women (at least 3 trips a day).

Household size

The household size is another factor that influences the choice of transport. According to „Mobilität in Deutschland 2008“\textsuperscript{86}, young single-person households are the most mobile type of household. Single person households, in which the person is 60 years or older, are among the least mobile. Almost half of single households is without a car. Multi-person households usually show full motorization.\textsuperscript{87}

Also according to „Deutsches Mobilitätspanel 2008“\textsuperscript{88}, household type is one of the factors influencing mode choice. Single-person households have a share of 46.9% public transport users, 56.3% car drivers. Two person households without children show a 29.3% share of public transport users and 75% car drivers. Two or more person households with children are even 21 % public transport users and 91% car drivers.

According to „De sociale effecten van basismobiliteit“\textsuperscript{89}, the family composition influences the desired comfort with a movement and has a clear impact on the number of movements made with a certain transport mode. Families with children prefer the car for many journeys over public transport. Travelling with children and all additional carriage makes the use of public transport more complicated. For singles it is more attractive to use public transport. The study also underlines, that in Flanders about 35% of single parent households had no car. It is evident that single–parent households are more than other family types dependent on using other modes of transportation, including public transport. Single-parent households, having a weaker income position than two-parent families, consider the price of public transport as

\textsuperscript{83} Cf. VCÖ, Multimodale Mobilität als Chance, 2009.

\textsuperscript{84} Cf. NÖ Landesregierung, Ergebnisse der landesweiten Mobilitätsbefragung, 2008.


\textsuperscript{86} Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.

\textsuperscript{87} Cf. ibid.

\textsuperscript{88} Cf. Institut für Verkehrswesen, Universität Karlsruhe (RH), on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Deutsches Mobilitätspanel (MOP), 2008.

important factor for their choice.

The VCÖ study „Soziale Aspekte von Mobilität“\textsuperscript{90} stressed that, compared to households with two adults, the proportions of the use of public transport and non-motorized transport are higher in single-parent families. This may be partly funded in a particularly efficient mobility planning of single parents.

\textbf{Employment}

According to „Mobilität in Deutschland 2008“\textsuperscript{91}, the job density of a region has an indirect impact on the employment situation and thus on the income and equipment level. Non-employed persons have a significantly higher proportion of public transport use.

The study „Multimodale Mobilität als Chance“\textsuperscript{92} emphasizes that full-time professionals and the middle class use the car more than the average. An above-average use of public transport, however, have people in training (44%).

According to the study „Onderzoek in opdracht van het vlaams ministere van mobiliteit“\textsuperscript{93}, the mode choice in Flanders is dependent on the work status. For students, low proportion of car users and a high proportion of forced alternative means of transportation can be found. For those who do not work outside (private household work, unemployed, retired, disabled), the share of sole car users is between 45\% and 55\%. For those who do outdoor work (worker, employee, environment, professional, independent) this share is between 60\% and 70\%. The proportion of people who only use forced transport are those who do not work outside the home are 15-25\%, but 3-15\% among the employed only.

„Deutsches Mobilitätspanel 2008“\textsuperscript{94} also includes the employment status to the mode choice influencing factors. Workers are found to have a share of 26.1\% of public transport users and 86.3\% of car-driver. Students are 56.4\% public transport users and 70.2\% car-driver. Others are 33.8\% public transport users and 59.7\% car-driver.

\textbf{Income}

Household income is, according to „Mobilität in Deutschland 2008“\textsuperscript{95} an important factor of the modal choice. There is a positive dependence of household income and car ownership, which

\textsuperscript{90} Cf. VCÖ, Soziale Aspekte von Mobilität, Zukunft, 2009.
\textsuperscript{91} Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.
\textsuperscript{92} Cf. VCÖ, Multimodale Mobilität als Chance, 2009.
\textsuperscript{94} Cf. Institut für Verkehrswesen, Universität Karlsruhe (RH), on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Deutsches Mobilitätspanel (MOP), 2008.
\textsuperscript{95} Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.
is however superimposed by factors like "regional structure", "household size", "children in the household" and settings such as "voluntary renunciation of the car". The higher the economic status of a household, the less will go on foot, the less will use the bike and the less will travel by public transport.

The reason for a renouncement of a car are most often the costs. In average, this answer was given by about half of the respondents, from households with children even 73%. This result makes clear that in fact public transport is less expensive than car transport, emphasizing that the factor „costs“ as a reason against the use of public transport is due to a wrong subjective perception of costs in the mobility decision.

The study „Soziale Aspekte von Mobilität“\(^{96}\) stressed that mobility is strongly determined by the income of a household (in addition to population density). While the first quartile (persons with a low income) spend 129€ monthly, the fourth quartile (persons with a high income) spend 714€, mainly due to a high use of car transport.

The higher the income, the more traffic benefits are claimed. However, car use increases disproportionately with income.

Access and quality of mobility options result in the actual use, the real extent and way of mobility. People with low incomes only have a small part of their monthly household budgets available for mobility. The lower the income, the less likely one owns a car and the more journeys are made by foot and by public transport.

The study „De sociale effecten van basismobiliteit“\(^{97}\) also shows that income is a strong differentiating factor in travel behaviour. The lowest income bracket daily makes 2,9 trips in average. This number increases systematically with the income level to an average of 3,8 trips per day at maximum income groups. Also the average distance doubles (8 to 15 km) comparing the highest with the lowest income group.

The relationship between low income and other vulnerability (disability, elderly, vulnerable household types) is great and so it is in terms of the number of journeys.

An assessment of the cost of a trip is not only the concern of the elderly population. The family unit plays a important role, especially because the cost of using the car is to share by the number of users in comparison to public transport.

According to a Belgian study\(^{98}\), respondents with a lower net personal income are often forced to use an alternative mean of transport to the car. Children and young people naturally have a very low income. The main change is between the transition from 500-1.250 euro per month to

1.250-2.500 euro per month. 17% of respondents from the first income class answer to use public transport, for the second income class it is only 6-10%. When looking at household income instead of personal income, the fact that children and youth do no have an income is avoided. The proportion of respondents who only uses the car is the lowest for the lowest incomes and the highest for the middle class (increase in relative row percentages). The percentage of people that only uses alternative transport use decreases by the family income, but remains stable from 1.850 euro per month.

**Education**

According to the study "Soziale Aspekte von Mobilität"\(^9\), there is a correlation between education level and mobility behaviour. This is reflected both in the number of trips as well as the number of kilometers traveled and the time used for this purpose. They all increase with the level of education. While academics pass in average 54 km per day and 4.1 ways, persons that are leaving school without qualifications travel about 25 kilometers and 3.3 ways. The share of mobile persons of graduates of a university is the highest and is 89 percent. For people who have left school with no degree, this value is 78 percent.

Another analysis\(^10\) shows that the share of people who only make journeys with public transport, decreases as the diploma "increases". 31.8% of individuals without a diploma are without a car. For subjects with lower level education, this share is 26%. For persons with a secondary degree it is around 12-17% and that of people with a higher degree is still about 9%. Adults with no qualifications are only 3.12% of the population, but they do form 7.68% of the passengers, forced to use public transport. For persons with a certificate of lower secondary or lower classes without car also represented a over proportional share. For people with a higher education qualification is a shift to car use. Also previous research shows that the higher the academic degree, the higher is the mobility of the persons.

**Car availability**

According to a NÖ study\(^11\), mode choice is strongly influenced by car availability (availability at any time / part-time availability or no availability). 95% of the lower Austrians aged 18 and older, who hold a driving license have a car available, 83% of them at any time and 12% partially.

According to a Belgian analysis\(^12\), car ownership is an important factor for the choice of transport mode. The lowest incomes rather use the bike or go by foot and also use more often

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\(^11\) Cf. NO Landesregierung, Ergebnisse der landesweiten Mobilitätsbefragung, 2008.

public transport.

However, if one owns a car the cost of car often seems low, e.g. to go to town, when making the tradeoff between the cost of parking and the cost of public transport (indirect cost).

In some cases the choice is limited or even nonexistent, when individuals or families do not have a car available. For single-earner, in 56% of cases the existing car is used for commuting. During this period, other family members (home working women, children) rely on other modes. In dual earner households with a car, the car is used to 56% by men and in 43% of the cases by the women.

The car availability varies by region. According to VDV\textsuperscript{103}, 85% of respondents have in average always / usually a car available, 13% occasionally, and 3% never. In urban areas, 81% have always/usually a car available, in large cities 74%, in the surrounding areas even 89%. Occasionally a car available have 15% in urban areas, 23% in cities and 9% in rural areas and never a car available have 3%, 4% and 2%. According to VDV, the frequency of the use of public transport changed dependent on car availability. Thus, 43% who had a car available, use public transport never daily or almost daily and only 9% daily or almost daily.

**Availability of Parking**

According to „De sociale effecten van basismobiliteit“\textsuperscript{104}, the lack of parking will encourage people to seek alternatives for the car. During our interviews, it became strikingly pointed to trips to the city by public transport because no parking can be found. As already mentioned before, the VDV study\textsuperscript{105} identified „no parking problems“ as one of the main reasons for using public transport.

**4.5.5 Subjective internal personal factors**

**Attitudes and opinions**

In a study of opinions about public transport and attitudes towards measures to reduce traffic congestion in the towns, four attitude types could be identified: car fans, car refusers, tolerant and rational transport users and distant indifferent persons. In a next step, a quantitative distribution of the four types in relation to the eight-SINUS milieus (lifestyles) was conducted, which is shown in the figure below.\textsuperscript{106}

\textsuperscript{103} Cf. VDV/ TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.


\textsuperscript{105} Cf. VDV/ TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.

A further study “Life styles and everyday mobility ” took into account the variables of age, sex, location, activities and post-materialist / materialistic value orientations.\textsuperscript{107}

As a result, different groups of car drivers are identified. Strongest car drivers are the "action-oriented workers (68%), followed by the "open-minded ordinary people ",(61%) and the" post materialistic younger women (53%).

The lowest car use can be observed for the "integrated older people (36%) and the "students"(37%). The highest use of public transport (15%) is shown by the "culturally interested city residents". Most ways by foot are made by "integrated older people" (33%) and most ways by bicycle are found for the "students" with a share of 20% of transport use.

In the „CITY: mobil” study in Schwerin and Freiburg, 9 types of mobility could be identified. In Schwerin, there could be identified "The unsettled status-oriented" and "The mobile experience-oriented," "The unobtrusive environmental worried" and "The aggressive drivers" In Freiburg could be found "The traditional domestical," "The risk-based car enthusiasts," The status-oriented car-oriented, "The traditional nature-oriented " and " The ecologically decisive "

Behind these nine types of mobility four basic mobility-relevant basic orientations can be identified:

- orientation towards protection and road safety
- orientation towards risk
- variety and adventure
- Status-orientation and orientation towards the experience of nature

The mobility behaviour can not only be explained on the basis of functional characteristics of the physical-regional traffic situation. Rather, the symbolic content of mobility decides about whether and how mobility takes place.

There are four basic symbolic socio-cultural dimensions (= mobility-specific settings and styles) of mobility: autonomy, adventure orientation, status and privacy.

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**Autonomy** can be understood as freedom, flexibility and individuality. It is the ability to comfortably reach all geographic targets, where the desired social activities take place. The way to reach these targets should be associated with a minimum of time and organizational effort.

With the car a geographic flexibility, temporal autonomy and social independence, individual freedom and independence is connected. However, the car can not always fulfill the autonomy claims, e.g. in urban areas.

**Status** describes the degree of social recognition, which results from the way of mobility. High mobility opportunities and the decision about which transport mode to use, some of which is dependent on the socio-economic status, is associated with social power and social recognition.

The car can be a representation with public appeal of the social status of its owner, which serves to convey a certain image or to achieve social identification and demarcation. But also the conscious decision to avoid a car can be used as identity creating function, because the car-free persons voluntary choose another form of everyday mobility.

**Adventure orientation** means positive feelings arising from the specific nature of the movement and describe the value of mobility. In the past, adventure orientation could experience a sharp increase. An increase in leisure travel and the distance tourism could be observed.

Each mode of transport has other priorities: The walk provides sensory experiences and keeps a person physically fit. The bike provides an experience of speed, sensory experience and supports the sporting and health aspect. The aircraft is a symbol of mobility without boundaries. The car can have a fascination with the combination of automotive and technology. For public transport it is difficult to convey an adventurous symbolism, because it is perceived extremely different by different groups of people.

**Privacy** identifies the need for a self-determined privacy and the avoidance of unwanted social contact. The car is used for mobility in public space while securing individual privacy. Public transport can not offer such regulation of privacy.

An empirical study of Hunecke (2000)\(^{111}\) for the mode choice in the city of Bochum identified the two variables “autonomy car” and “adventure public transport” as important factors, influencing the choice of transport. As a combination of symbolic dimensions with a norm-activation model, the enlightened behavioural variability as a whole increased. From the symbolic dimensions in the integrated model, however, only the variable "autonomy car" proved

as behaviour relevant, the factor "experience public transport" did not reach the significance threshold.

A segmentation of target groups of the Rhine-Main Transport Association (RMV), makes a distinction by lifestyle / mobility styles. The basis of differentiation are the use of transport, general values, orientation and mobility-related socio-demographic characteristics. There is a distinction between "stress-avoiding public transport users", which can be clearly identified as exclusive users of public transport with a preference for public transport. In contrast, there are “flexible car preferring and family-oriented car and bicycle users”, which can be understood as groups refusing public transport with a clear car preference. In between, there is a potential group, formed by the “adjustable-oriented car drivers”, purpose-oriented car-public transport-users, “experience-oriented multiple users”, “nature-loving bike preferring persons”.

According to Hunecke\textsuperscript{112}, a differentiation of lifestyles and societal individualization in the information approaches and explanations of mobility behaviour needs a closer attention. In addition to economic and socio-demographic factors, also mobility demands and attitudes of specific groups need to be taken into account (life context, values, orientations and expectations).

In the course of the study Zimona\textsuperscript{113} a secondary analysis of two empirical studies (UMove, mobility styles in leisure) took place, in which attitude-based target groups have been determined.

Zimona assumes, that the evaluation of transport modes, differ in terms of their symbolic effect, depending on the individual background of experience of users. From the investigation, different ZIMONA mobility types resulted. Those are independent of specific, local, geographic and cultural factors and result, in comparison to other differentiating aspects (such as life cycle phases and household types), to the most obvious group differences in the use of car and public transport. In addition, a higher intervention guidance is given as in other approaches.

There have been an item and factor analysis conducted to determine clear type features. These items could be assigned to six independent dimensions that can be interpreted as different mobility orientations:

1. Public Transport Control: Assessment to be able to make good use of public transport.
3. Public Transport Experience: The use of public transport has an adventurous and recreational value.
4. Public Transport Privacy: Identification of the protection of privacy in bus and train
5. Car Experience: A strong car orientation, which includes both the adventure, fun and individual flexibility value of the car as well as the privacy.
6. Eco-Standards: refers to both the own environmental awareness and to the environmental expectations of the immediate social environment.

\textsuperscript{112} Cf. Hunecke, Marcel;/Schubert, Steffi/ Zinn, Frank, Mobilitätsbedürfnisse und Verkehrsmittelwahl im Nahverkehr, Ein einstellungsbasierter Zielgruppenansatz, 2005.
\textsuperscript{113} Cf. ibid.
This was followed by a quantification of the influence of the attitude dimensions on the modal choice. The public transport control was found to be the most relevant factor influencing the choice. Car Experience, Public Transport Status and Eco-Standards showed only a moderate influence. Public Transport Privacy and Public Transport Experience were not directly related within the mode choice.

With regards to the acceptance of transport-related interventions for all of them a significant influence could be detected.

From their distribution to the dimensions, mobility types were developed:

![Figure 28: Mobility Orientation of the mobility types, Hunecke.](image)

**Public Transport-oriented:**
High environmental awareness, consider public transport as easy to handle, relaxing, entertaining, ecological orientation, reinforced by environment, experience rated value of car as low, contact with other considered as non-negative.

**Public Transport-sensitized:**
Public transport seen as relatively interesting and relaxing, however not for everyday use, average ecological awareness, see purpose of the car.
**Pragmatist:**
Positive but rational attitude towards public transport, public transport seen as relatively relaxing and does not feel restricted in privacy, low environmental awareness, no social support of public transport, car distant and without emotions.

**Public Transport-distanced:**
Ambivalent about public transport, uncomfortable with the closeness of strangers and driving perceived as not interesting, average environmental awareness, appreciate people who use public transportation, car provides them with desired personal space and represent a disproportionately large positive values experience.

**Public Transport-averse**
Reject public transport in general. The use of buses and trains is equivalent to the loss of liberty, privacy, self-determination, environmental values are only marginally pronounced, car promises freedom, fun, positive experience, self-determination and self-expression.

**Disinterested:**
Reserved opinion towards public transport, public transport seen as not interesting, use does not appear desirable and useful, but difficult, does not feel privacy affected, car offers neither adventure value nor safety potential.

The mobility types also differ when looking at their transport equipment, as the following figure shows.

![Figure 29: Equipment with means of transport, Hunecke, 2000.](image)

There are clear differences in the mode choice between the mobility types.
For the trip purpose work, the car is used to 30% by the Public Transport-oriented, to 83% by the Public Transport-sensitized, by the Pragmatists to 39%, the Public Transport-distanced to 66%, the Public Transport-averse to 83% and by the Disinterested to 81%. The public transport is used by the Public Transport-oriented to 28%, by the Public Transport-sensitized to only 2%, by the pragmatists to 38% and by the Public Transport-distant to 10%. The Public Transport-averse use it to 6% and the Disinterested to only 1%.

During leisure, the car is used by 33% of the Public Transport-oriented, to 55% by the Public Transport-sensitized, 33% by the Pragmatists, 52% by the Public Transport-distant, 57% by the Public Transport-averse, 56% by the Disinterested to 56%. The public transport is used, however, by 13% of the Public Transport-oriented, 1% by the Public Transport-sensitized, 12% by the Pragmatists, 4% by the Public Transport-distant, 1% by the Public Transport-averse and 1% by the Disinterested.

For the purpose „shopping“, the Public Transport-oriented use cars to 24%, the Public Transport-sensitized to 68%, the Pragmatists to 24%, the Public Transport-distant to 53%, the Public Transport-averse to 67% and the Disinterested to 63%. In contrast, the public transportation is used by the Public Transport-oriented for shopping, by the Public Transport-sensitized only to 1%, by the Pragmatists to 6% and by the Public Transport-averse to 12% and of the disinterest group not at all.

However, no significant differences could be detected in terms of their distribution on different regional structures.

For the mobility types, intervention measures work differently. Public Transport-oriented show a high acceptance and can be especially motivated positively for a change by price cuts, speed optimization, comfort and cheaper tickets. Public Transport-averse would change their behaviour only in case of a strong increase in the price of the car but not otherwise. For Disinterested no measure seems to directly motivate towards the use of public transport. Public Transport-sensitized can be motivated by an increased costs of car use to change, less of the other factors. Pragmatists can be motivated by price, communication and special offers. Public Transport-distanced are motivated by comfort and information, not by other factors.

Also, the NÖ study „Ergebnisse der landesweiten Mobilitätsbefragung“ is concerned with the influence of attitudes on the mode choice. There were young people aged 13-26 interviewed about attitudes and opinions towards transportation, the choice of transport modes and environmental protection on a scale of 1-5.

Rated the best was, on average, the statement "I enjoy driving" (grade 2,1), followed by the statement. "Driving a car means freedom" (grade 2,3). This is a first indication of the strong affinity and emotional connection to the car, which is already present in young people aged 13 years (even with the youngest 13 to 16 years, these two statements were rated the highest).

\[^{114}\text{Cf. NÖ Landesregierung, Ergebnisse der landesweiten Mobilitätsbefragung, 2008.}\]
In the survey, the statements follow with gradees from 2.7 to 3.2, which deal with the affinity for young people towards environmental-friendly transport modes. The best rated in this group were the statements. "I like going by foot or bike." (grade 2.7) and "I admire people who adjust their daily lives so that they no longer need to have their own car" (grade 2.8). With a grade of 3.2 is the statement "I think bus and train travel is en vogue" rated. The statements, rated the worst are those with influences from outside ("When cycling, I feel often harassed by other people." - grade 4.2 or "If I take the bus or train, I sometimes feel like a human being of second class, grade 4.0). Feedback from the environment ("If I'm traveling a lot with public transport, my reputation from other people increases" – grade 4.1 or "With a car I can show that I've achieved something" – grade 3.8. This suggests that young people in general are very ego-centered and that it can be difficult to influence the transport behaviour. An intervention in the travel behaviour will probably be often understood as an interference to their own freedom and their own selection.

These statements were used to identify "mobility types" between the adolescents and recognize the differences between these types.

Figure 30: Mobility types between young people, NOE 2008.

The result of factor analysis shows that among young people, there can be distinguished essentially two groups (mobility types), which can be divided each into two further subgroups:

About 30% of adolescents may be associated with the mobility of type 1, among which are 18% public transport-loving adolescents and 12% bicycle-loving young people.

Accordingly, these young people have a continuous positive attitude towards environmentally-friendly transport modes (public transport, bicycle, foot). This group mainly consists of persons between ages 13 and 16 but also 22 to 26 and many trainees. It can be seen no difference between the sexes and they are often found in larger communities. The share of public transport is 49%, which is 12% points above the average for all young people in Lower Austria.
About 70% of adolescents are attributable to the mobility type 2. 43% count to the car-loving adolescents and 27% are characterized as "generally dissatisfied", with a dislike against the environmentally-friendly transport modes (especially for walking and cycling). In the age between 17 and 21 years, the car affinity is greatest; between the sexes are no differences. The mobility type 2 can be mainly found in smaller communities and among young professionals. The continuous availability of a car is higher than average for this age group.

According to „Mobilität in Deutschland“\textsuperscript{115}, 20% of households without cars renounce because of attitude reasons (5%) or because they find that they do not need it. They are more likely to be found in central cities and in households without children.

Obviously, attitudes are a very important distinguishing factor when it comes to mobility behaviour. Recent studies have shown that when looking at those groups stronger differences can be discovered than when differing between sociodemographic or other criteria. For USEmobility this means that attitudes should be considered and the survey should examine which target groups can be identified and should finally be addressed by decision makers.

Environmental awareness

The UBA study "Umweltbewusstsein in Deutschland 2010"\textsuperscript{116} showed that almost two thirds of respondents (62 percent) believe that the state should do more for the environment. Environmental protection is particularly important for women, higher income groups, highly educated and West Germans. A majority of respondents (58-68%) also sees opportunities for themselves to do something for the environment, mainly through environmentally friendly consumer behaviour or less car use and less air travel. In particular, the socio-ecological milieu is especially and consistently interested in environmental concerns. The socially disadvantaged, but sometimes also the more conservative milieus, also see the needs and prospects for environmental and climate protection in general, but are often more cautious in view of the environmental claims and action.

In general, the proportions among lower-income groups are lower. One out of four motorists finds car sharing appealing, especially young and well educated people, women, West Germans and people with a household income of less than 1.000 €.

According to the study „Kostenentwicklung und Klimaschutz, 2009“\textsuperscript{117} climate protection is important for a large majority of Germans (88%), for 51% it is very important and for only 3% it is not important.

For women, climate protection is more important than for men, for public transport users more important than for car drivers and for older persons more important than for younger ones. The

\textsuperscript{115} Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.
\textsuperscript{116} Cf. Umweltbundesamt, Umweltbewusstsein in Deutschland, 2010.
\textsuperscript{117} Cf. Infas, on behalf of Deutsches Verkehrsforum: Kostenentwicklung und Klimaschutz, 2009.
citizen sees himself as a major player, 17% assign a significant influence to politics, the majority wishes a more active role of politics in climate issues. Some citizens already make an active contribution to climate protection, but there is much untapped potential for future behaviour change. Of high importance is the compatibility with everyday life with minimal impacts, especially on budget. 7% are active in climate change and prepared to change their routines in favor of climate protection. 50% offers potential because of a basically positive attitude. 43% are indifferent or even have a resigned attitude.

A majority of citizens (60%) are opposed to the full transfer of costs of climate change to the customer. Likewise, only a minority is willing to take on the additional costs of climate change in their mobility purchase. It is important to understand that so-called climate change "captives", which are the people with little financial means, are not always in a position to change to a relatively low-emission vehicle or transport mode if the alternative is more expensive.

A majority of respondents say they would contribute to the climate protection in the traffic sector. The majority sees a contribution by behavioural changes, for example by a reduced number of trips, conscious / more efficient car driving (31%) or change to other means of transport (19%). 15% of the population increasingly cycle or walk. In contrast to other population groups (27%), urban core residents (20%) would reduce their trips not so strongly. In rural areas, switching to bike or walking is an option for much less citizens. The proportion of respondents who would make greater use of buses and trains decreases from 9% in urban areas to none (0%) in rural districts, dependent on the public transport offer. According their own words, with 16%, an over-average number of young adults aged 18-34 years are currently not contributing to climate protection. Higher income is not a guarantee for greater environmental friendliness. Thus, an over-average number of households with a net monthly income of from 4,000-5,000 € (15%), respond to not contribute to climate protection, while only 9% of income groups 2,000-4,000 € and 12% for incomes above EUR 5,000 12% give this answer.

There is in general a willingness to change one's own mobility behaviour in favor of climate protection. Especially measures, that change daily mobility routines to a small degree. Thus 95% of people would improve their journeys, 85% would pay more attention to the environmental performance of their mode of transport in future. A clear majority would be prepared to completely change to a relatively climate-friendly versions of their means of transport or switch completely to another transport mode (66%) and would abandon trips in everyday life (65%). Slightly more than a half of the respondents would also implement this for leisure mobility (59% fewer weekend trips, 52% fewer holiday trips). Important aspects are, however, the reconciliation with the everyday activities (preferably small impacts) and the budget impact. 55% of citizens are willing to change their behaviour to protect the climate. However, on the other side 44% of citizens would not change their mobility behaviour. Higher mobility costs of climate change would be accepted by only 39% of citizens.
Figure 31: Change of mobility behaviour for climate protection, Infas.

Low income groups / households with less money are more willing to give up vacation trips for climate change than others. Older people in employment (69% of 50-64 year olds), housewives /-men (72%) and residents of rural counties (68%) would be willing to give up some weekend trips for climate change. However, younger people regard recreational activities on weekends as very important. Thus, an above-average number aged 18-34 years (23%), trainees (22%) and young households without children to 24 years (25%) would not give up weekend trips in favor of climate protection.

The young people are rather willing to pay more for climate change (45% of 18-34 olds, 54% in education, 48% to 24 young households without children). The willingness rises above all population groups with increasing household income from 39% to 51%.

Predominant users of bus and train (82%), bycycle (75%), car-free persons (84%) and pedestrians (74%) show a higher than average willingness to a complete change to relatively climate-friendly versions of their means of another mode of transport. Both urban core residents (71%) and residents of rural counties (72%) are willing to change above-average. It is of particular interest, that against the background of a lower number of alternatives in less densely populated districts compared to urban centers is the equal willingness for a change of particular interest.

Pedestrians, cyclists, older working adults (50-64 years), persons with a low income and households with small children are willing to abandon some ways for the future climate. Pedestrians and car-free persons regard the optimization of their ways as more difficult, only 89% and 86% see it as an option (vs. an average 95%). Those who already changes to "CO2-free ", such as pedestrians and cyclists, do not see a need to change their mobility behaviour.

Pensioners (60%) and persons with low income (52%) consider themselves above average.
incapable to change their travel behaviour for climate protection. You can thus regard them as "captives", who maintain their behaviour patterns due to financial conditions. So are unemployed less than average willing to ensure the use of environmental friendly means of transport (23% rejection).

The NOE study\textsuperscript{118} examined the assessment of young people of 13-26 years on environmental protection in the context of mode choice. The ranking of the statements using the average rating among the different age groups differs only slightly, which means that the settings for the environment and travel behaviour are formed even for the very young group between 13 and 16 years.

Top rated is by the young people, the statement "I can afford with a more environmentally friendly transport choices to contribute to environmental protection " with an average grade of 1,9, followed by the grade of 2,2 for the statement "The car traffic is a major problem for the environmental protection". The high grades for these two statements suggest that the young people are well aware of the environmental problems in the transport sector. At the same time the responsibility is also something pushed away, documented by the scores 2,3 and 2,8 for the statements "The companies are responsible for the development of environmentally friendly forms of transport" and "The solution of transportation-related environmental problems is the task of the state." At the end of the rating scale, the two statements "I have a feeling of guilt towards the environment when I go by car "(grade 3,8) and" My friends think I should use public transport instead of the car" (grade 4,4).

Obviously, the young people are conscious of environmental issues in transport, but this is projected only to a small extent to oneself. In addition, the use of public transport as a contribution to environmental protection is hardly a topic, which is relevant to the friends of young people.

The VDV survey\textsuperscript{119} also asked for a coherence between public transport use and attitudes towards environmental protection. Overall, 8% indicated that they consider environmental protection as behaviour-relevant, in order to take buses and trains as often as possible. 60% say protecting the environment is important, but the behaviour is mainly dependent on cost and convenience of public transport. 12% consider the low attractiveness of the offer of public transport an obstacle to execute an environmentally friendly mobility behaviour. 15% consider environmentally friendly travel behaviour as not important and they consider the car as the only alternative.

\textsuperscript{118} Cf. NOE Landesregierung, Ergebnisse der landesweiten Mobilitätsbefragung, 2008.
\textsuperscript{119} Cf. VDV/ TNS Infratest, Kundenbarometer ÖPNV Deutschland 2009, Der ÖPNV im Urteil der Bevölkerung, 2009.
For **USEmobility**, environmental awareness is especially interesting, because it aims to influence mobility behaviour towards eco-friendly behavior. The studies show that there is often a big difference between environmental awareness and actual behaviour. USEmobility needs to find out adequate measures how to support this trend towards environmental awareness and to help persons implementing their attitudes.

### Emotions

The study “Das Entscheidungsverhalten bei der Verkehrsmittelwahl”\(^\text{120}\) showed the impact of emotions and motivations on mobility behaviour. Emotions and motivations result in a certain attraction or aversion towards specific modes of transport. In situations under high involvement, emotions have a higher impact than for habitualized transport mode decisions. On the one hand, emotions exist during the journey and on the other hand emotions are created, which influence the mode decision after the journey.

The study especially examines the factors “disgust” and “fear”, which can lead to an avoidance of specific forms of transport. Fear is evoked by a perceived threat of physical integrity (death, injuries, weirdness). For example the fear of injuries is present when scaring the speed, the way of stopping and steering of public transport modes. Also the common use of public transport with other persons, e.g. in dark stations, can lead to fear.

Also social fears can occur, when being afraid of social refusal (embarrassment, timidity). This situation could happen when for example a person does not know how to buy a ticket or how to read a complex timetable.

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\(^{120}\)Cf. Zemlin, B., Das Entscheidungsverhalten bei der Verkehrsmittelwahl, 2005.
The study “Das Entscheidungsverhalten bei der Verkehrsmittelwahl”\textsuperscript{121} shows that also motives play a role when choosing a mode of transport. The study differs between common-sense and extra motives. Common-sense motives comprise the physiological and security motives (e.g. comfort, protection of noise, odour, weather, desire for visual amenities), time and costs savings, reliability, independence or privacy. Extra motives are referred to the experience of a social role, such as reputation or respect or self-centered motives, which are independent of the social environment, e.g. self-fulfillment, adventure and success.

For many people, the car satisfies common sense motives better than public transport, since time and costs are subjectively distorted, as already described. Also when considering extra motives, the car seems to have advantages, because with a car, power and prestige can be demonstrated more easily. For \textit{USEmobility} this means that it will be important to examine the positive and negative emotions occurring when using public transport to find measures how to avoid or support them. Also attitudes could be changed when a more positive view of public transport in society would be proclaimed.

Mobility restrictions

„Mobilität in Deutschland 2008”\textsuperscript{122} explains, that changes in mobility patterns - whether on own initiative or because of external constraints can occur, if sufficient possibilities are available. A big factor is the physical performance. Against this background, in the past, changes in behaviour, especially for the group of older people were expected: The physical fitness of older people has improved in recent years, thanks to medical advances. An increasing number of older people has a car available and the proportion of older women with a driver’s license increases.

According to a NÖ survey\textsuperscript{123}, the growing group of older people has special requirements to the transport system. With increasing age, the probability of averse health effects rises. 7% of the lower Austrians (primarily older people) responded in the mobility survey, to be limited in their daily mobility behaviour due to health restrictions.

According to a Belgian study\textsuperscript{124} a reason for the mode choice is the physical and emotional usability of a car. A number of groups are not able to drive a motorized vehicle, based on their medical condition. Others may be declared for driving a motorized vehicle, but must then meet certain conditions or have certain restrictions. Depending on the physical and mental status, conditions and restrictions in terms of the risks associated with driving a car and the

\textsuperscript{121} Cf. Zemlin, B., Das Entscheidungsverhalten bei der Verkehrsmittelwahl, 2005.
\textsuperscript{122} Cf. Infas/DLR, on behalf of Bundesministerium für Verkehr, Bau und Stadtentwicklung, Mobilität in Deutschland 2008, 2010.
\textsuperscript{123} Cf. NÖ Landesregierung, Ergebnisse der landesweiten Mobilitätsbefragung, 2008.
confrontation with traffic situations, car use is limited.

In public transport a number of potential barriers can occur, most significantly in terms of accessibility.

In old age, the number of people with disabilities increases rapidly. This leads to a renouncement of the use of cars by the elderly because one does not feel confident enough in traffic. Examples are the loss of vision, loss of concentration, reaction time and other important skills. For such persons, the public transport is just about the only transport mean that they can use without relying on others. Thus, especially for the most vulnerable population groups (elderly, financially weak, disabled) public transport is particularly important for independence or autonomy and personal wellbeing.

5 Conclusion

The information about the theoretical background from three different perspectives, the overview of currently existing studies on national level of the five selected countries Austria, Belgium, Croatia, Hungary and Germany and on European level and finally the in-depth analysis of the factors lead to a deeper understanding of mobility behaviour and the specific character of the factors and allows a comprehensive view on the research topic of USEmobility.

The studies give an insight into the evaluation of different transport modes, their perceived strengths and weaknesses. The characteristics of public transport help to understand the potential for multimodal mobility, by building on these strengths.

The results of the numerous studies show that objectively measurable factors such as costs, travel time and infrastructure play an important role when it comes to mobility decisions. Together with the personal situation, that is characterized by car availability, income, employment, household size, mobility restrictions and socio-demographic features, they form a framework or a ‘corridor’, in which the mobility decision takes place.

For USEmobility it is especially interesting what happens within this ‘corridor’. To understand mobility behaviour, it is crucial to consider situational factors as well as social behavioural factors such as attitudes and opinions, experiences, habits and environmental awareness. The analysis showed that mobility types, differed by attitudes, can show the highest relevance when distinguishing between groups.

The studies also show that changes in mobility behaviour are possible. Focusing mainly on costs and environmental awareness the results show that the mobility decision is not fixed and options of interference exist. It also becomes clear that, especially for younger generations, there are certain trends towards an increase of public transport, mainly due to environmental concerns and the life in urban centers, which carries a high potential for an increased future multimodal mobility. The fact, that this change has not been examined yet in-depth by other
studies, leads to a further need for research. **USEmobility** will ask about specific reasons for the change, not only focusing on environmental or cost factors. These results will finally enable policy, transport operators, civil societies, such as passengers’ associations and other decision makers to systemically influence mobility behaviour.

Consequently, the analysis forms the basis for the composition of the questionnaire with regards to contents, since it makes clear which topics are relevant to examine. It makes clear that the survey needs to try to find out more about the different aspects of social behaviour and the change towards multimodal mobility. The survey with its ex-post-design will be able to confirm or reject results of the existing studies, that were gathered for much lower sample sizes and under different circumstances on national level and eventually add new results.

When remembering the overview of factors, which influence mobility behaviour, there was a distinction between internal personal factors (human individual), external personal factors, physical ability, situational factors and offer-related factors. The following figure shows how those different factors directly or indirectly (via the offer) influence mobility behaviour.

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**Figure 33: Impact Relations of different factors.**
Thus, decision makers have different possibilities of influencing the system. Influencing the multimodal offer and a change in attitudes, emotions, perception and knowledge of the users are in the core of USEmobility. The following figure gives an overview about areas in which changes could take place.

Figure 34: Possibilities of a change in mobility behaviour.

To give an idea about possible recommendations, some areas where change is possible can be found below.

Within the first area, interventions can include factors which are directly related to the offer such as

- the distance to the stop/station
- the frequency, time availability
- travel time
- number of necessary changes
- transparence of offer
- capacity
- services and gastronomy
- price
- tariff system

Within the other areas, decision makers could for example influence the quality of the offer:

- efficiency
- vehicle equipment
- punctuality
- reliability
- information about delays
- other information

Furthermore, system access is facilitated when influencing the following characteristics:

- information before the journey
- reduction of complexity in the tariff system
- barrier-free access of stations
- multiple languages
- payment systems
- personal contacts
- park and ride offers
- bike and ride offers
- carsharing and other cooperations

A further possibility is influencing soft factors such as:

- friendliness
- identification of employees
- abilities and competences of employees
- cleanliness
- no vandalism
- safety and security
- odor
- other inconvenience (noise, motion)
- clear arrangement (of stations)
- atmosphere in vehicles and station

The report has shown the state-of-the-art of current knowledge on theoretical, practical, national and international level and has analyzed the specific factors in-depth. This input is a basis for the survey, which will serve to understand the change of mobility behaviour much better.

It becomes obvious that decision makers have a lot of possibilities of influencing mobility behaviour. To generate a sustainable impact, it is necessary to know in detail about the factors, especially social behavioural factors, influencing mobility behaviour to derive adequate recommendations and measures.
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