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bmvit Bundesministerium für Verkehr, Innovation und Technologie

SZENAMO

– Scenarios of the future mobility of elderly people

Life transition points and their impact on everyday mobility of elderly people; future mobility developments and necessary support measures with special regard to retirement and loss of partner

Work Package 5 – 6

ERA-NET TRANSPORT 2010

ENT14 Keep Moving

March 2010

Final Report

FACTUM OHG
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Keep moving

This report presents results of research performed in the SENTRIP project. SENTRIP ("Senior Life Transition Points and their Implications for Everyday Mobility: perspectives, patterns, scenarios and the issue of car use") is an European Research Area/ERA-NET project within the call Keep Moving. Keep Moving was a joint call under the umbrella of ERA-NET TRANSPORT.

The project is carried out in cooperation between six research environments in Austria, the Netherlands and Sweden. It comprises six sub projects exploring different aspects of how mobility in old age is affected by transition points. The transition points that are studied are transition from working life to retirement and from a two-person household to a one-person household.

More information and publications can be found on ERA-NET TRANSPORTs website www.transport-era.net.

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- March 2010
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ERA-NET TRANSPORT 2010

ENT 14: Keep Moving

"Keep Moving: Improving the mobility of older persons"

Contracting Entity

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1 Introduction

Mobility plays an integral role in every phase of life and in the maintenance of one's quality of life. The abilities to be self-sufficient, to engage in different forms of recreational activities and to maintain social contacts, with family and friends are highly dependent on the possibilities to use different forms of transport and generally on being mobile. The demands in this respect, both on oneself and the environment, vary with age and different phases in life. The changing requirements regarding mobility need to be addressed by political, economical and social actors. The specific needs of the older age groups need to be implemented by adapting the processes of planning and implementation in the context of public space.

In the course of the project "SZENAMO - ***Szena****rien zukünftiger* ***Mo****bilität älterer Personen*", within five different work packages, the relevant factors regarding mobility behaviour of elderly people were identified and evaluated. These factors are undergoing a constant change, influenced by social, technological and structural changes, which were also discussed thoroughly in this project. The effects of those changes lead to different and higher demands on the older members of society, who need to adapt in order to stay mobile and be able to fulfil their own needs. Therefore this project was aimed at examining the extent to which the existing infrastructure is able to meet the specific requirements of elderly people and at identifying measures to guarantee unrestricted access to different forms of mobility.

The report at hand discusses in depth the two life transition points: retirement and the transition form a multi-person to a single-person household. Further factors and their effects on the mobility of elderly people, evaluated in the course of this project include wealth, state of health and the potential benefit that can be derived from technological advancements, e.g. in form of new information and communication technologies.

The results of the quantitative data analysis of the study "Life transition points and their effects on everyday mobility of senior citizens" (Risser et al. 2008), as well as the results of the state of the art analysis are presented based on the work packages of this project.

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2 Course of the project

This study presents possible scenarios of the future mobility of elderly people and points at possible solutions of anticipated problems in this regard. The present study is part of the ERA-NET TRANSPORT 2010 programme SENTRIP („Senior Life Transition Points and their Implications for Everyday Mobility: perspectives, patterns, scenarios and the issue of car use“), involving research groups from Sweden, the Netherlands and Austria.
The research project SZENAMO is the follow-up project of the study “Life transition points and their effects on everyday mobility of senior citizens” (Risser et al. 2008), the data analysis is based on the data derived from this project, and it is the second Austrian contribution to this project line.
The SENTRIP project is concerned with one central question: “What will be the future requirements and needs of senior citizens, regarding mobility?” By applying qualitative and quantitative research methods of social sciences the project attempts evaluate how senior citizens perceive their situation and their possibilities in terms of mobility and being mobile and how they adapt to new challenges. The different perspectives, resources and experiences of the different groups of elderly people are therefore of special interest.

SZENAMO, as Austrian contribution to this project, is divided ino different workpackages:
The first part of this study consists of a state-of-the-art-analysis, representing the current state of knowledge and completed and ongoing projects in this field.
The analysis incorporates a cross-sectional and a long-term study about mobility patterns and mobility needs of elderly people in different regions of Austria (surveys were conducted in Vienna and Burgenland). The third work package implied the development of scenarios regarding future mobility behaviour of senior citizens, based on cohort analysis, the data of long-term studies, evaluation of previous forecasts, etc. In a further step of the project homogenous groups were clustered, in order to serve as a data basis for traffic modelling.
This analysis wase based on the premise, that the group of older citizens is constituted of heterogenous subgroups (“younger” and “older” seniors, living in urban and rural areas, etc.) and that they must be regarded as active actors (rather than “passive victims”) in building their own form of mobility. Therefore a special focus was on the perspectives, resources and experiences of the different groups of elderly people in their everyday mobility.
Hence the method of choice was an explicitly user centred approach. Relevant aspects in this regard are the main life transition points or central life events (such as retirement and the transition form a multi-person household to a single-person household, e.g. when a partner dies, or has to be moved to a nursing home) and have therefore been evaluated extensivlely in order to find out about their influences on the mobility patterns and the modal choice of the elderly.

SENTRIP as part of the ERA-NET TRANSPORT 2010 project line includes a number of different substudies and consists of six workpackages with different responsibilities. Figure 1 presents how the Austrian project part SZENAMO is incorporated into SENTRIP and lists the different workpackages, both on the national and on the international level.

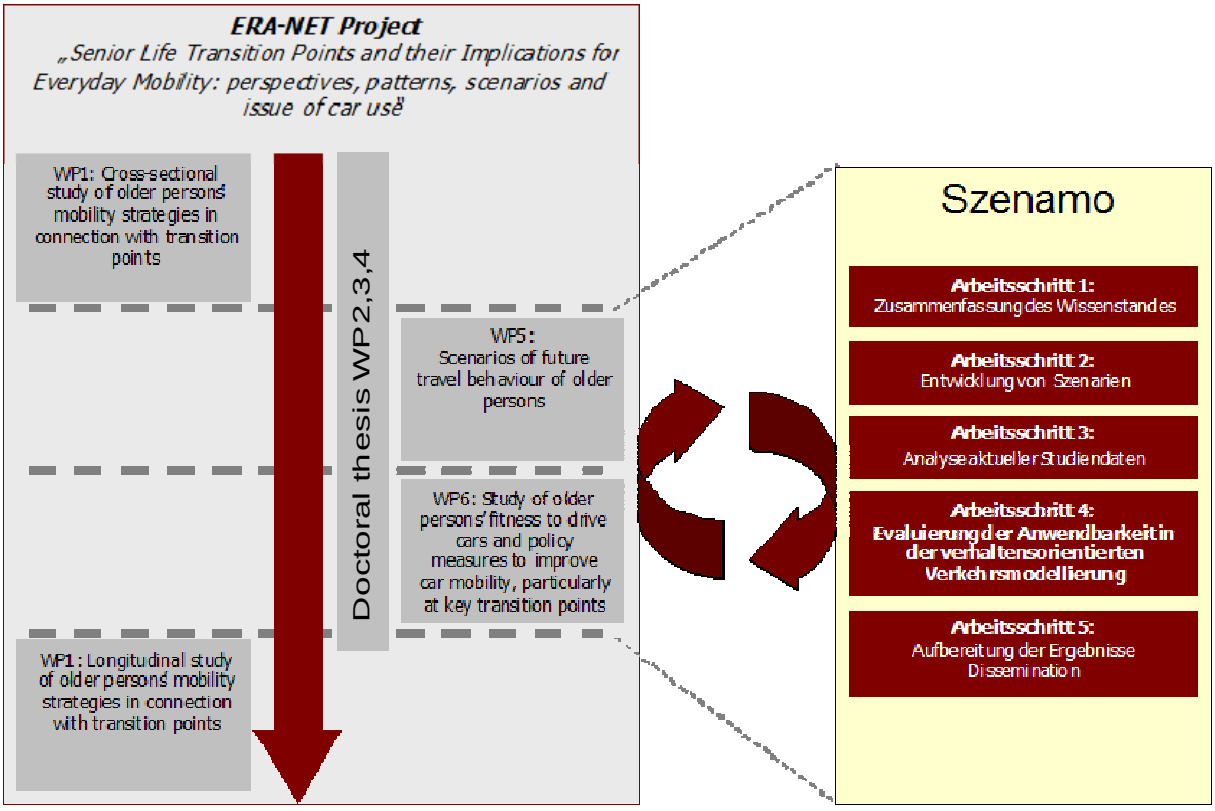

Figure 1: Description of the different workpackages of the project SZENAMO and it's incorporation in SENTRIP

3 Summery of the results

The following section of this report will represent the project SZENAMO by pointing out relevant project parts and achieved goals, before presenting the results of this project in depth by describing every separate workpackage.

The project SZENAMO – „Scenarios of future mobility of elderly people, life transition points and their impact on everyday mobility of elderly people; future mobility developments and necessary support measures with special regard to retirement and loss of partner " – has been conducted during the period between November 6, 2008 and March 31, 2010 by the national project partners FACTUM OHG and PRISMA Solutions EDV-Dienstleistungen GmbH.

3.1 Goals

The specific goals of this project are:

- Facilitate a broad knowledge base about the mobility behaviour of senior citizens
- Evaluate the impact of major life transition points, such as retirement and the transition from a multi-person to a single-person household, on mobility behaviour of senior citizens
- The evaluation of possibilities to implement the research results in behaviour-oriented transport demand models
- Develop different scenarios regarding future mobility behaviour of senior citizens

3.2 Results of the project

Based on the data analysis and methods, such as clustering of homogenous groups regarding mobility behaviour, it could be shown that there are significant differences in the mobility needs between senior citizens who are fully mobile, slightly physically impaired or highly physically impaired. Factors with considerable influence are:

- State of health (especially motor impairments)
- Retirement (decrease in the frequency of leaving home)
- Household structure

Future developments of the mobility of elderly people will be affected by:

- A prolonged working life,
- increased nursing care, due to the increase of older people,
- more differentiated leisure activities

3.3 Possible applications

- A more differentiated illustration of the mobility behaviour of elderly people in traffic models, based on the data fundament of this study.
    - o Typification of people over 60 years according to the criteria: employment, state of health and household structure.
    - o Improved statistical databases due to the surveys on mobility behaviour conducted in Vienna and Burgenland.
    - o Creation of a manual to integrate the gathered results and knowledge into behaviour-oriented traffic demand models.
- Suggestions for planning and implementation of future surveys on mobility based on the experiences made in the course of this study, during data collection, data analysis and dissemination.

3.4 Relevance of the project

The project SZENAMO contributed towards a more secure, barrier-free and socially acceptable mobility of elderly people by means of the following aspects:

- Creating and strengthening the awareness of the diverse mobility needs of elderly people
- Knowledge of possible development paths of the mobility behaviour of elderly people by illustrating them in specific mobility scenarios
- Knowledge of the effects of life transition points on mobility behaviour
- Detailed data source for considering the specific mobility demands of senior citizens in traffic planning and traffic modelling.

3.5 Lessons Learned

Interdisciplinary approach

The joint cooperation with experts from different scientific fields, such as traffic planning, sociology and psychology proved to be fruitful and necessary for a comprehensive handling of the task.

⇨ a general and collective understanding and appreciation of the task is paramount

Transnational coordination

A transnational cooperation promotes different points of view and considerations within the project; in order for the data to be internationally comparable a common appreciation of the task and a well-organised coordination within the consortium are absolutely necessary.

Extensive data on mobility behaviour

The collected data was only able to cover a certain part of mobility behaviour; therefore it was necessary to look for complementary support from other data sources.

⇨ the combination with existing data sets concerning mobility (e.g. traffic and household surveys) helps to complement the existing data.

3.6 Possible further steps

Evaluating framework conditions of the mobility behaviour of elderly people

- By deepening the knowledge regarding different forms of employment of senior citizens by further surveys and data analysis in this field.
- By better differentiations of the purposes und motives regarding the mobility of senior citizens, especially concerning leisure travel and supply traffic.

Implementation in traffic models

- New traffic model for the eastern region of Vienna will take the findings of this study into account
- Further possibilities to implement these findings in existing traffic models

Traffic survey in a longitudinal design

- Provides significant information on the chronological changes in the mobility patterns of senior citizens

3.7 Cooperations and possible future cooperations

Cooperations

- Intensive exchange with experts in the fields of traffic modelling and traffic planning has already been initiated and will be continued.
- The transnational cooperation within the SENTRIP project (Sweden, Netherlands) will continue in case of a second survey.

Possible future cooperations

- Exchange of experiences in the course of future mobility surveys.
- Continuing collaboration of traffic planners, sociologists and psychologists in development and processing available data.

4 Results of the individual workpackages

The SZENAMO project is composed of 5 individual workpackages in course of which the topic of mobility of the elderly has been amply examined. The examination drew from already acquired results of studies and research reports but also from the data obtained of the current survey.

The individual operations are:

- Operation #1: Standard of knowledge/state-of-the-art analysis
- Operation #2: Developing strategies for future mobility behaviour of seniors
- Operation #3: Analysis of latest data obtained of the current survey
- Operation #4: Evaluation of the potential applicability within behaviour-centred traffic simulation
- Operation #5: Dissemination

Based on those working steps the obtained results will be subsequently summarized and presented.

4.1 AS1 – State-of-the-Art-Analysis

4.1.1 Introduction

The evaluation of specific literature on mobility & mobility of the elderly provided a range of important insights about general conditions and trends in following areas:

- Demographic development
- Impact of life transition events on the mobility of seniors
- Implementation of ICT (information & communication technologies)
- Changes in society
- Differences in mobility between urban and rural areas
- Traffic safety of older traffic participants (car drivers among others)
- Scenarios of future mobility behaviour

4.1.2 Demographic development

The population of Austria grows progressively older. Following the prognosis made by Statistik Austria, the population will reach estimated 9,52 m. in 2050; particularly the ratio of elderly persons will increase distinctly (see Statistik Austria, 2010). In 2030 the current 22% ration of persons aged 60/60+ will increase to over 30% (see Statistik Austria, 2010). And it can be said that mobility will always play a vital role for all persons and all groups of people in every stage of life, at every age as it is the medium to secure a certain quality of life and life satisfaction.

4.1.3 Impact of life transition events on mobility of the elderly

Both events - transition from work life into retirement and transition from the two-person-household to single-household – have been frequently identified by many researchers as **crucial in terms of impact on mobility** of elder people (see Verhoeven, Timmerman, Van der Waerden, 2005). Despite that, **very little specific research work** has been done in this particular field; also the impacts of the transition on the choice of transportation (Van der Waerden, Timmermans, 2003:1) or on long-term future mobility haven't been sufficiently examined.

4.1.4 Implementation of ICT

To **maintain autonomous mobility** the ICT (information & communication technologies) proved to be of special importance. Telematic systems provide help for all road users in individual **orientation** (for pedestrians, bikers, car drivers, public transport users); besides they can serve also as **guide-systems** (see Ausserer, Risser; 2006). All these systems can efficiently contribute to a more safe and accessible design of road traffic. This seems to be important mainly for the sake of the seniors' generation to come, because those are the people who have grown up with ICT and are therefore able to operate different technical devices. A couple of examples: guidance-parking-systems, navigation systems, ticketing machines or acoustic equipment for zebra crossings (see Ausserer, Risser; 2006). An important task is to banish the seniors' **fear of technical equipments**. The ways to do it are projects where the elderly become familiar with ICT and learn to understand and operate them (see Homepage vhs.at; 2009).

4.1.5 Changes in society

In future, **the time people spend actively working will progressively grow longer**. The prognosis of Statistik Austria sees the ratio of actively working persons under 30 in 2001 decrease from 26,2% to only 22,3% in 2030. At the same time, the ratio of 28,2% of working persons over 45 will increase to 39.7% (see Statistik Austria, 2008).

Comparing the financial security of the age cohorts we can see that old age presents a higher risk for poverty, but there are huge differences between seniors in their financial assets. It can be expected, that in the near future, there will be a large number of seniors involved in debt but there will be also many of those who will possess sufficient funds or a fair capital or properties (see Kohli & Künemund, 1998).

The better the financial security, the better are the chances to maintain mobility. This condition makes it possible to pay for travel and transportation and also **provides many alternative choices**. It appears that income has a significant impact on the active use of car: while only 23% of the interviewed seniors with low pension use actively their car, there are 63,2% active car drivers among their "richer" counterparts (see Mollenkopf, Flaschenträger, 2001).

Accordingly, **the ratio of 60+ year-old car drivers (driving licence holders**) and particularly female car drivers **will constantly grow** in the future. While in 1950 only 12% of women of over 60 had a driving licence, by 2025 their number will double and reach 24% (see Reiter, 1997, quoted in Limbourg).

Currently there are no significant differences between urban and rural areas in number of licence holders; however, differences can be found in the frequency of the car use. The ratio of active car drivers - 80% - is the highest in sub-urban areas but it is only 69,8% in the cities (the lowest). The number of licence holders on the countryside – 71,9% - isn't significantly higher than that in the city.

4.1.6 Differences in mobility in urban and rural areas

A study of "senior-friendly products" conducted for the Ministry of social affairs and consumers' protection revealed that **seniors living rural areas are less content with the existing public transport** options than their urban counterparts. The high ratio of car drivers in rural areas is the result of a poor infrastructure, lacking fair transport options for the elderly. The findings of the SZENAMO project support the results of the ministerial study. Seniors living in rural areas, who, for a variety of reasons, must **refrain from the active use of a car** and depend therefore entirely on the poor infrastructure are particularly **limited in their individual mobility** (see homepage of bmsk.at; 2010).
The German study FRAME examined the use of car use and found that a rather large number of seniors either have the chance to drive car themselves or have the chance to use a car as co-drivers (total of 87,5%). The ratio of senior drivers in rural areas (93,5%) and in the suburbs (94,9%) was slightly higher than in urban areas (84%) (see FRAME; 2004).

4.1.7 Traffic safety of older traffic participants

It is true that older persons today can manage road traffic much better; still, the **seniors remain an endangered group** among the road users: the numbers of senior pedestrians and senior bikers who are killed in road accidents are above-average. Of 108 fatalities in 2007 there were 61 victims 60 year-old or older which makes up for 56% of all killed pedestrians on the roads. The number of non-motorised elderly women who get killed in road accidents is frequently above-average. By comparison, in **car accidents** is the ratio of senior causalities & senior fatalities substantially **lower** than in bike & pedestrian accidents (see Homepage kfv.at; 2009).

To optimise the conditions of the elderly in road traffic, numerous measures can be implemented today, which can ensure easy and safe accessibility and use of public space for seniors. These measures are divided in four areas (see Limbourg, 2005 – „4 E's"):

- Engineering (planning and technical measures)
- Enforcement (legislative measures, control and monitoring)
- Education (educational & communication measures)
- Encouragement, economy (encouragement measures, costs)

4.1.8 Future scenarios

The evaluation of the scenarios of seniors' mobility proved that still very little research has been done. Detailed studies of future mobility are available: for instance, the Shell-study Mobility scenario 2035 or a study of IFMO (Institute for Mobility Research) called Scenarios for 2020. Though, these studies failed to focus on a more detailed examination of mobility patterns of seniors and its potential impact on the traffic system. Also the heterogenous mobility needs of various age groups have often been neglected by research projects.

The studies, no doubt, made a **valuable contribution** to the current study because of the overall picture of the potential scenarios but, at the same time, they also show noticeable **shortcomings in the research area** of seniors and their mobility.

4.2 AS2 – Creating scenarios

4.2.1 Key factors of mobility

The inputs outlined in operation #1 served as a foundation for the development of suitable scenarios for future mobility patterns of seniors. Longer working life, higher requirements for care and higher seniors' provisions along with advancing mobility in the free time are key factors and must be accounted for in mobility scenarios.

In operation #2 the existing situations and expected developments of the key factors were evaluated in detail. The key factors are:

- Gender
- Age
- Household setting
- Employments and financial status
- Health
- Availability of public transport
- Mobility costs
- Traffic safety

The relevant results of the analysis will be summarised and outlined. What we are dealing with presently is the **aging process within the society**; therefore the research of mobility patterns of seniors is of uppermost importance. The ratio of persons over 60 has reached 23% and will increase up to 30% in 2050. Since the proportion of elderly persons in the outskirts of cities is going to overstep the average, the focus must be directed to mobility patterns and requirements of the seniors living in the countryside. Also the trend of **increasing numbers of female seniors** must be taken into consideration so that their specific mobility needs and **mobility restrictions** can be appropriately addressed. A special focus must be given to the transition points of retirement and life in a single household. It is older **women more often** than men spend the rest of their lives as **singles**. Generally, the trend goes to **smaller households**. The ratio of single-households is currently 15% but will reach estimated 19% until 2050.

Also the number of actively working older persons will undergo changes which will affect the mobility patterns of seniors. An **ever-growing number of elderly people will be actively working** which, again, will have a positive impact on their **financial situation** – their possibilities to participate and make use of mobility options will improve. Employed persons have a stronger affinity towards cars. Since the number of working seniors will grow, an increase in car-oriented mobility-patterns is to be expected.

The **increase in life expectancy** is accompanied by various risks. There is a notable relation between the **risk of falling ill** and old age. With higher age the risk of contracting health impairments is also higher which is frequently followed by restrictions in mobility. Because of the higher life expectancy the number of elderly people in need of care is anticipated to grow progressively. The **transport options** of old impaired or invalid persons are often **limited** because, in many cases, they are not fit to drive a car anymore and, at the same time, the use of public transport is too burdensome for them. Various factors affect the choice of transport mode for seniors. Very clear, though, across all relevant factors (such as age, gender, state of health) is the **tendency to prefer walking** over all other means of locomotion and mobility. **Seniors prefer to walk** when they do their daily errands, when they go to see a doctor or visit friends etc. Typically the **non-motorised senior road users** are particularly prone to high accident risks. With progressing age the accident risk among older women rises notably. Also the tendency to **limit individual mobility** increases when older persons **do not feel subjectively safe**.

4.2.2 Mobility patterns of older people

Based on mobility parameters and the knowledge of relations between various factors and mobility, a very detailed picture of **seniors' mobility patterns** can be drawn (see Verkehrsplanung und Verkehrspolitik, 2002).

4.2.3 Outdoor mobility or frequency of leaving home per person

The out-of-house rate decreases with growing age. Because of longer life expectancy among females their ratio of leaving home is quite low. There is a direct link between the social engagement of seniors and their mobility. If the old person is well anchored in the social network of a community, he or she will leave home quite frequently. The ratio of leaving home among single seniors (women, for the most part) is typically lower than that of seniors living in two-person-households. Consequently, the transition from two (or multiple) person-households to single-person-households implies changes in mobility patterns. The same applies for the transition from working life into retirement. Working seniors tend to leave home more frequently than their retired counterparts. Other factors of influence are: state of their health or their ability to drive car. The mobility patterns of mobile seniors is (almost) the same as that of working seniors. The frequency of daily trips drops because of the cumulative occurrence of health problems.

4.2.4 Lengths of trips/Duration of trips

The length and duration of the trips made by seniors is linked to their choice of transport. Apparently men more often by car; their trips are longer and take longer.
The increase in motorization among women will be likely followed by the extension of both the length and the duration of the trips similarly to those of senior men. Today, the difference between having a driver's licence and the actual frequent use of a car as means of transport is notable particularly among women (OECD, 2001).

4.2.5 Modal Split

The most frequent mode of locomotion among seniors is walking which, with progressing age, gains further importance. The car comes second. But this mode drops with growing age of the driver. Public transport and walking represent the most important mode of mobility for health impaired or otherwise disabled seniors.

4.2.6 Purpose of trip

Following the termination of the daily trips to/from work (due to retirement), the main purpose for mobility trips out of home are provisions (shopping); second come leisure trips.

4.2.7 Scenarios

4.2.7.1 KEEP WORKING

Work life has a strong impact on the mobility patterns of old people. Since life's expectancy increases, the age when people will retire will rise too. According to predictions the age of retirement will start to follow closely the age specified by law. There were only 35 000 people between the age of 60 and 64 years noted as employed in 2001 while in 2025 there will be already 203 000 people of this age group employed (see Statistik Austria, 2006).
In order to get to work employed seniors living in rural areas will be increasingly dependent on cars.

⇨ **A larger ratio of the ever-growing number of the elderly will have to work longer**

Because of the longer working-life and the increased motorization among working seniors, the mobility patterns of seniors have to be differentiated and divided according to "mobility typology" into groups: #1 Mobile; #2 Slightly limited in mobility; #3 Severely limited in mobility.

#1 the working & mobile seniors rank among the age group of 60 to 70 years. Their employability depends on their state of health, their age is almost irrelevant. They use cars frequently and their trips are longer, the prominent parts of those trips are trips to/from work.

There are no health problems to restrict their mobility. Even in this group of physically "fit" mobile seniors, walking presents the most important mode of transport.

#2 in the group of "slightly limited in mobility" we will find mostly older retired seniors. Despite the missing daily trip to work, these seniors use their car quite frequently and do almost as many trips as their working counterparts. Leisure trips and shopping trips have priority. But most often they walk.

#3 the largest part of the group of seniors "severely limited in mobility" ranks in the older age cohorts. There are many persons with serious health impairments. Participation in working life and the possibility of individual autonomous mobility is hardly given or very difficult (lack of wheelchair-adapted working places, lack of accessible barrier-free infrastructure etc.) The most common mode of locomotion is walking. Also the use of transport services is comparatively high in this group.

4.2.7.2 KEEP CARING/ KEEP BEING CARED FOR

When we look at the health, housing and living conditions of seniors and when we examine their options of mobility or immobility, a very heterogeneous picture of the elderly population appears. There is a group of seniors who are still very agile, have no health problems and are highly mobile. But there is also a large number of seniors with serious health impairments and handicaps, contracted especially at old age, who are limited in their mobility and aren't able to move around unassisted. Therefore a division must be made between **seniors who are independently mobile and who are able to take care of themselves or even to take care of others** and those **seniors who depend on support and care** of others.
The trend shows that the group of seniors severely-limited in their mobility or entirely immobile who are able to move only with assistance of others is continuously growing. Especially in rural areas those seniors, who are partially or entirely immobile and frequently not-motorized will be dependet on assistance and help of others, because of a lack of local amenities and/or lacking alternatives to car transportation. Alongside, the trips of professional caregivers together with shopping trips and trips made by informal caregivers assisting immobile seniors will multiply in the future.

Since the accumulation of single, aged and mobility-restricted or immobile seniors, changes in mobility patterns of elder people according to „mobility types" are expected:

#1 the number of seniors who are able to take care of themselves and of others will increase. The number of shopping trips instead of trips to work will increase too. The car will gain importance and to drive those seniors who are limited in their mobility or entirely immobile will gradually become the most important purpose for trips of this group. Correspondingly, the number of visit-trips of mobile seniors will increase too.

#2 Shopping trips for other seniors and "caregiver-trips" will also multiply in the group of seniors who are slightly restricted in their mobility. The car will gain importance and the number of motorized "caregiver trips" will increase particularly in rural areas.

Visiting-trips will multiply and become an important and sole purpose for many trips. Moreover, seniors in this group are expected to take care of themselves longer and to be able to drive car longer.

#3 the ratio of seniors who are severely restricted in their mobility will progressively grow. Catering and shopping trips for them will have to be taken over by others. The demand for transport and delivery services will increase, especially in rural areas (need for shopping, daily errands etc.) Visiting-trips won't be very important for this group.

4.2.7.3 KEEP RECREATING

The most important purpose for trips among seniors are leisure trips and shopping and catering trips. The higher number of seniors will induce an increase of their trips during leisure traffic. A difference must be made between short-distance and long-distance traffic. But higher age brings along a drop in the number of leisure trips while the number of walking short-distance trips rises. Also the ratio of car trips in leisure traffic drops with higher age. The assumed longevity will prolong the retirement period. This will result in a steep **increase of the number of leisure trips among seniors**. The current leisure-model of the 30-50 year-olds will remain the same but will become typical for the generation of future seniors.
As for leisure trips, **cars** will be frequently used **well into old age.**
Since the accumulation of seniors and their longer retirement time, changes in mobility patterns of elderly people according to "mobility types" are expected:

#1 the mobile seniors will remain very agile in their leisure and free time and will feature a high number of trips in leisure traffic. The car remains the key means of transportation, also for female seniors. The car will play an important part in both short & long distance traffic. In this group, the number of long-distance leisure trips will be, as expected, larger than in any other groups.

#2 in the group of seniors who are "slightly limited in their mobility", leisure trips are extremely important. Despite their minor limitations in mobility, seniors of this group will feature a high ratio of trips in leisure traffic. The increase of leisure trips will be quite typical for this group. Contrary to the elderly seniors of today, future seniors aged between 70 and 75 years will keep their good health and agility and will frequently make long-distance trips. They will also use cars more frequently compared to today.

#3 "seniors severely limited in their mobility" will, unlike other seniors, spend leisure time mostly locally, not far from home. Assisted mobility (leisure trips) will become very important; this will cause an increase in number of motorized leisure trips. Long-distance travel will play a rather minor role, compared to other seniors.

Those seniors who are severely limited in mobility will in the future more frequently participate in leisure traffic although the frequency of their trips compared to that of mobile seniors and seniors with slightly limited mobility won't increase significantly.

4.3 AS3 – Data analysis

4.3.1 Research data

The data for the project SZENAMO was gathered by a quantitative telephone survey conducted during the foregoing project “Senior Life Transition Points and their Implications for Everyday Mobility: perspectives, patterns, scenarios and the issue of car use” (Risser et al. 2008) in March 2008. The Austrian survey was conducted by MAKAM – Market Research by carrying out the survey in a representative sample of the target group, in a CATI lab.

CATI stands for **C**omputer **A**ssisted **T**elephone **I**nterview and usually implies that both the questions of the questionnaire are predefined by a computer and the received responses are directly entered in the computer system and a computer specifies the telephone number that has to be called. This methodology includes the possibility of permanent protocolling and supervising process in the course of the interviews and possible random failures.

The sampel size incorporated 1500 persons, with 750 interviewees living in Vienna and 750 in Burgenland.

The respondents’ age ranged from 62 to 95 years at the time the interviews were conducted and are distributed as follows:

- **Age groups: 60% (62-74 years), 30% (75-84 years), 10% (85+ years)**
- **41 % men, 59 % women**
- **40 % single-person households, 50 % two-person households, 10% muuulti-person households**
- **78 % retired, 22 % working**
- **72,5% urban / 27,3% rural**

In the course of the data analysis the statistical data material of all three countries has been evaluated and consequently compared according to the relevant questions.

The survey instrument included the same set of questions in all three countries, whereas the survey in Sweden was conducted via e-mail questionnaire (2033 respondents) and in the Netherlands via webpanal questionnaire (2213 respondents).

To complement the general data analysis, homogenous groups of mobility behaviour based on the Austrian data set have been clustered to serve as necessary data basis for traffic modelling.

4.3.2 Substantive results

The data analysis discussed in the following chapters produced results indicated by the previously conducted state of the art analysis.

Therefore significant differences were found between the different age groups, between men and women, elderly living in different household structures and between those who are still employed and those who are already retired. These differences regard mobility behaviour, mobility needs, state of health and modal choice of elderly people and the subjective assessment of their individual mobility.

Conclusively there are significant differences between men and women in the frequency of leaving home and also in the preference of the mode transport mode. Both men and women frequently prefer walking as a mode of transport although women like to walk more often than men. Men, by comparison, use cars more frequently (see fig. 2).

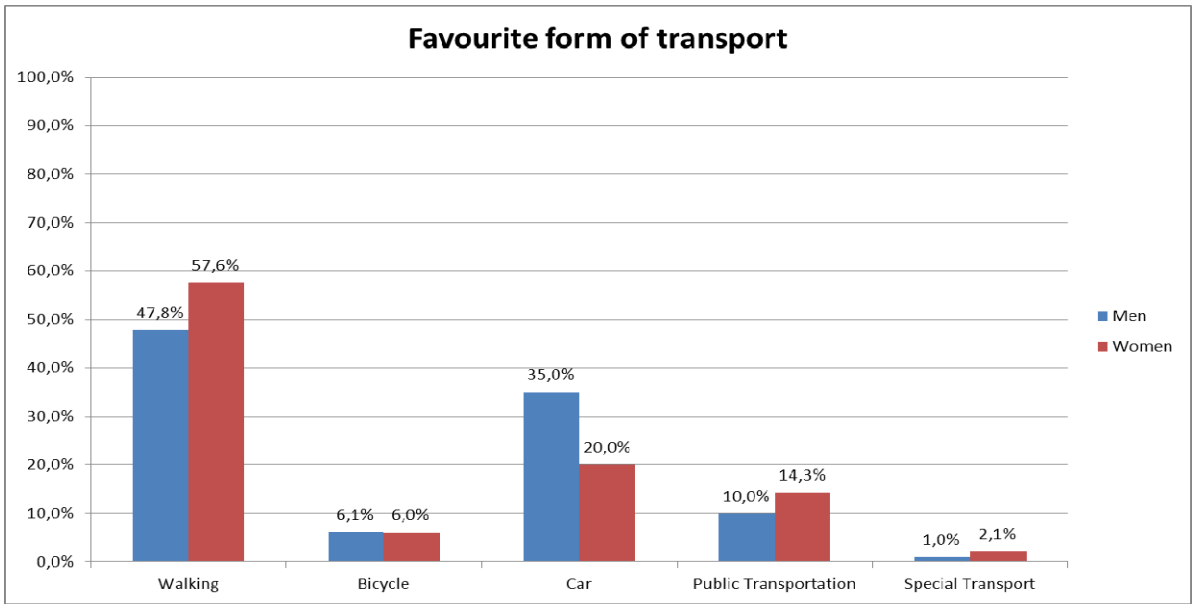

Figure 2: Favourite form of transport – Gender comparison

When the frequency of leaving home according to gender is compared, it is obvious that men (in the examined age sample) leave home significantly more often than women, whereas the ratio of 3% of female seniors indicated that they leave home seldom or never. In addition, a significantly higher ratio of men than women assessed the possibility of driving a car as very good.

A look at the modal choice of the Austrian sample shows that walking is the most frequently used mode (see fig.3). About 52% of Austrian seniors chose walking over car driving (26%). The least frequent modes are cycling and special transport services.

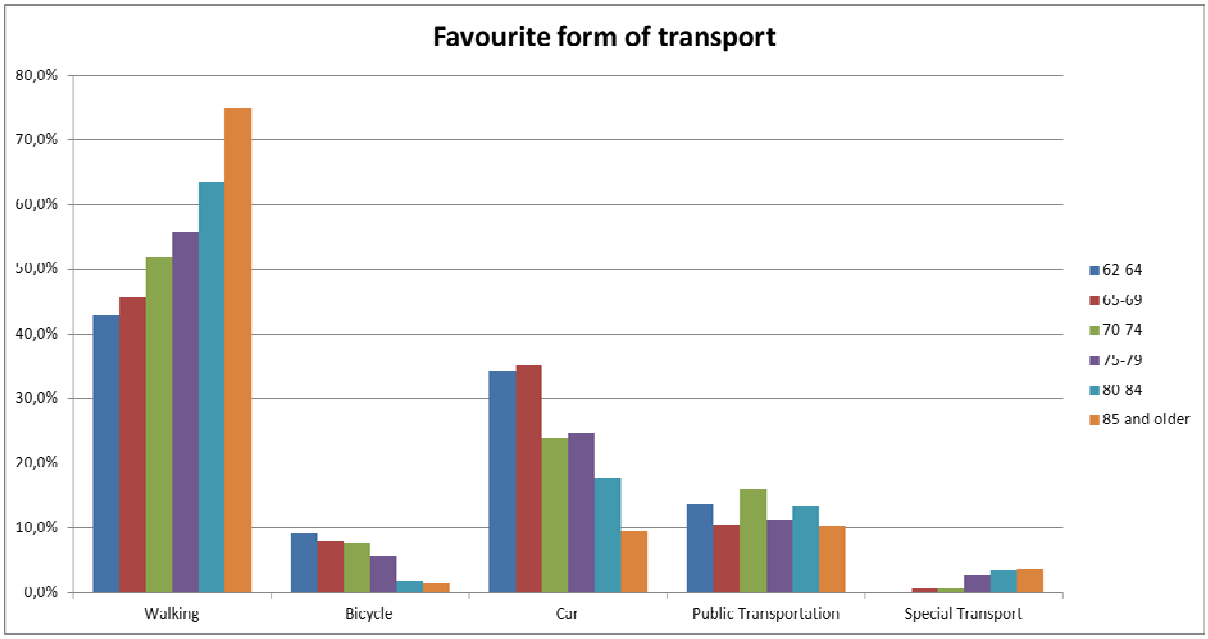

Figure 3: Favourite form of transport – age group comparison

In comparison public transport ranked third (12%) among the preferred modes of transport. Besides, the modal choice according to age reveals that with growing age all age groups show a clear inclination towards walking. It is also obvious that the younger respondents use cars more frequently while the older respondents prefer walking even more distinctly. There are also significant differences within age groups in the frequency of home leaving (see fig. 4). The younger respondents leave home more often. A ratio of 11% in the age group of 85 year-olds indicated that they seldom or never leave home, which is a marked difference compared to 0.6% in the group of the 62 to 74 years olds.

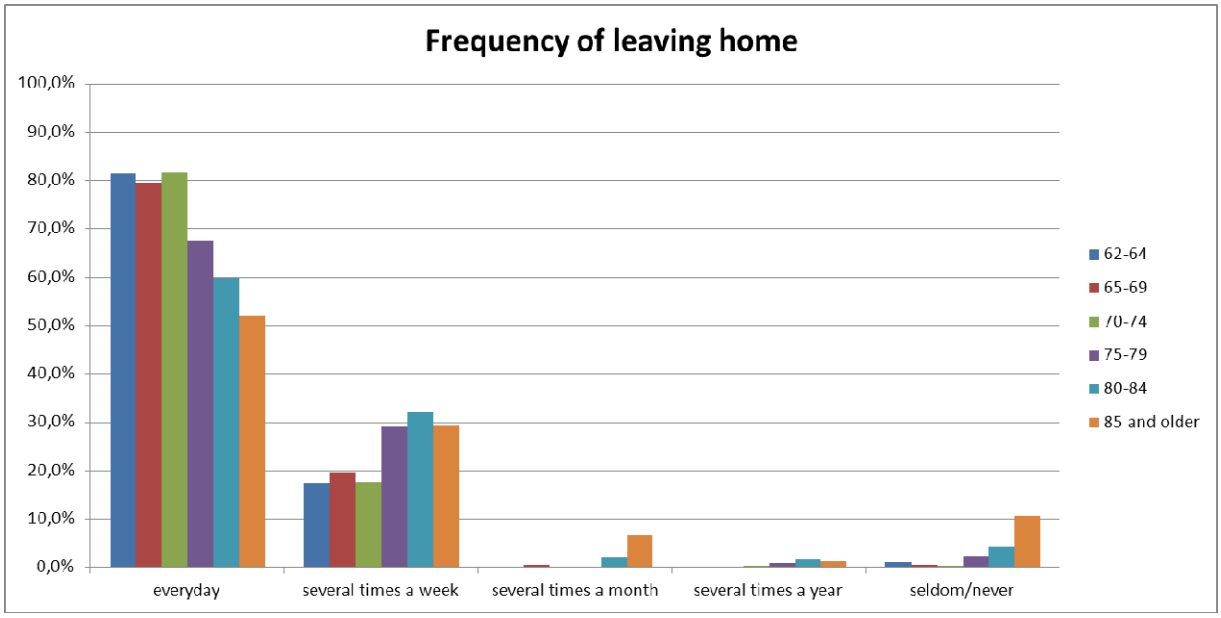

Figure 4: Frequency of leaving home – age group comparison

When mobility is examined there are two important life events – the transition from working life to retirement and the transition from a two/multiple-person household to a single-person household – which have a major impact on mobility behaviour. Under the assumption that these two events have a measurable impact on mobility of surveyed seniors, the following picture can be drawn:

The persons who retired within the past two years leave home significantly less often than before their retirement (see fig. 5). It is also apparent that persons who still work (working seniors) assess their possibilities to leave home significantly better.

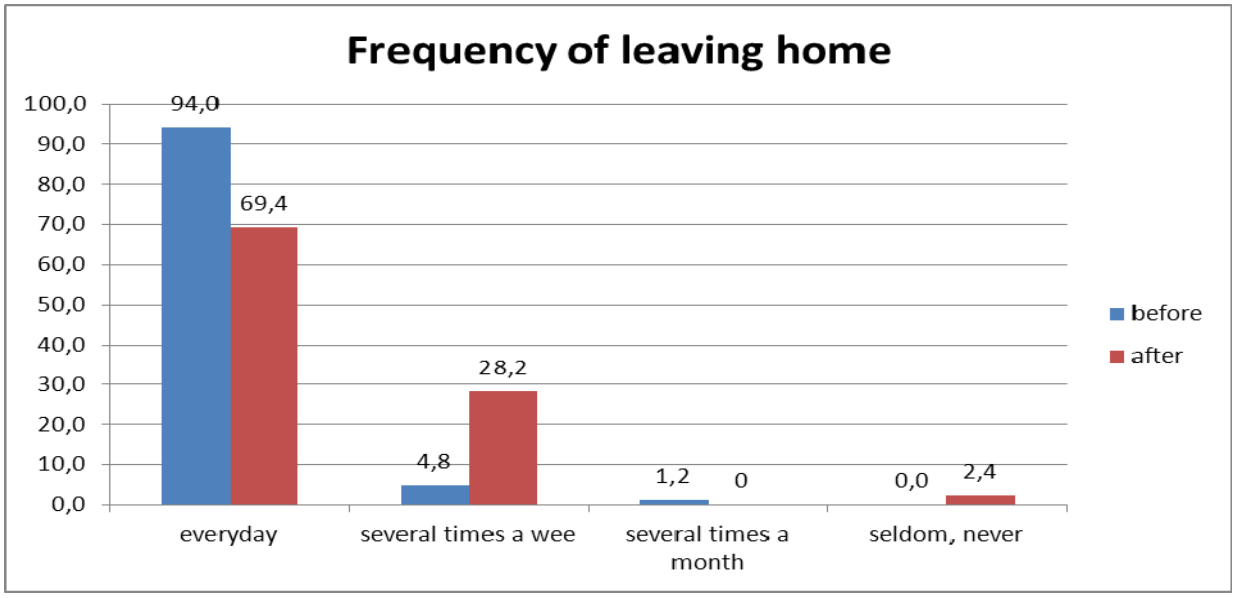

Figure 5: Frequency of leaving home – comparison before and after retirement

When it comes to the transition from two/multiple-person households to single-person households, no significant difference appears between the out-of-home mobility prior and after that event.

Although, there is a difference: those persons who live in two/multiple-person-households assess their individual mobility significantly better compared to those who live in single-person households. Also the car is significantly more often mentioned as preferred mode of transport by persons who live in two/multiple-person-households (see fig.6). On the other hand, persons who live alone marked distinctly more often walking and public transport as preferred modes of transportation.

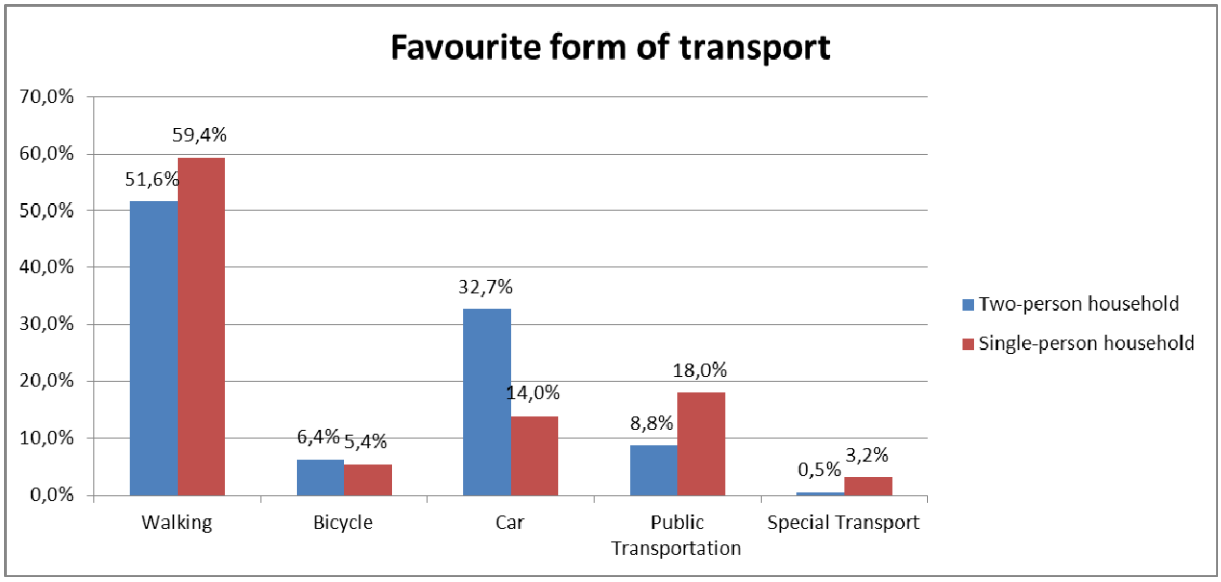

Figure 6: Favourite form of transport – comparison between household structures

Significant differences also appear when the state of health is examined. These differences are related to demographic factors and to mobility itself. On the one hand, it is obvious that in old age the number of health impairments will increase; on the other hand, the individual assessment of a person's health has far-reaching consequences for this person's mobility and the individual assessment of possibilities to leave home. Respondents who assess their health as good tend to leave home significantly more often than those who rated their health as poor. Also the possibility to leave home is seen as good by those who indicated their subjective health as good.

It is not surprising that persons who suffer from more than one ailment do not leave home very often and they also judge their possibilities to leave home as poor. In this regard the specific form of physical impairment of which a person suffers is also relevant. Persons who suffer from motor impairments leave home significantly less often than those who suffer from mere sensory handicaps or from impaired vision or hearing.

4.3.3 Results of the country comparison

The main differences between the three countries, participating in the SENTRP project, regarding elderly people in the age range of 62 to 95 years, appear to be related to:

- Modal choice
- Modal choice by residential area
- Frequency of leaving home
- Frequency of car use

The most striking difference in preferred means of transport in the three countries is the frequency of walking among seniors in Austria (see fig. 7). Both in Sweden and The Netherlands, the ratio of walking seniors is by comparison much lower – about 20%. The second most prominent difference is the preference of car use among Swedish seniors (over 60%) – a feature which is strikingly low in Austria (about 26%). Also in The Netherlands the frequency of car use is the highest compared to other transport forms (over 46%). In return, of all three countries, the highest preference for cycling is found among Dutch seniors.

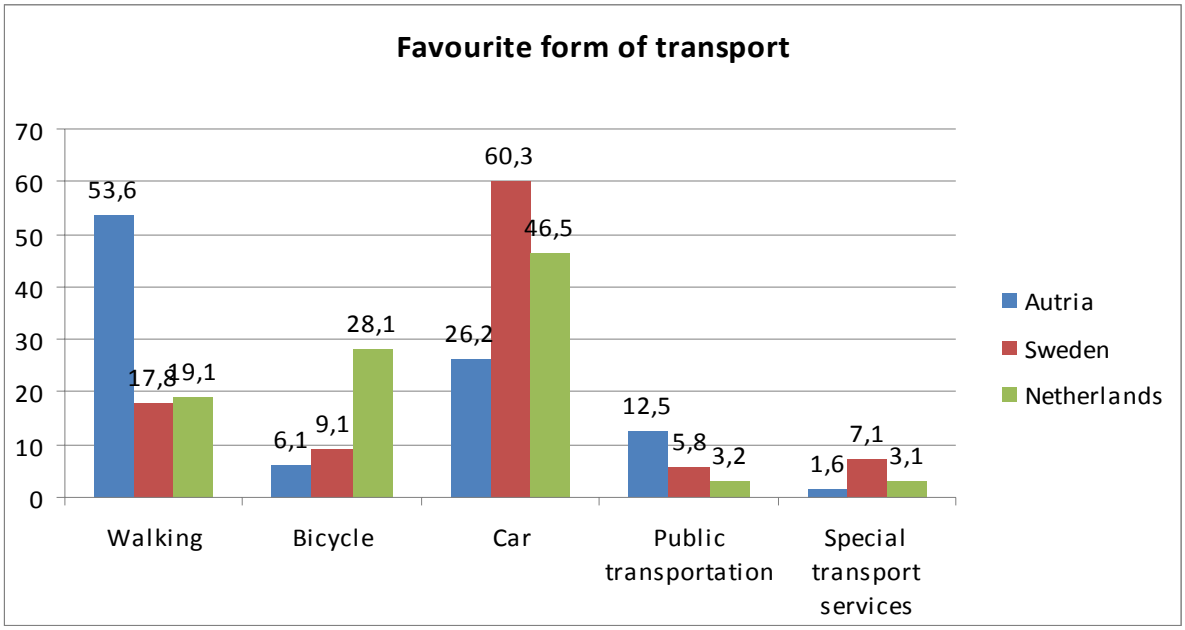

Figure 7: Modal Split – country comparison

The data evaluation offers an illustrative country comparison of modal choice, also in the category of residential area, because the results suggest that there are significant differences between urban and rural areas when it comes to the favourite form of transport in the individual countries.

A look at figure 8 reveals that in both countries, Sweden and Austria, cars represent the most preferred mode of transportation in in rural areas, while the walking is preferred mostly in rural areas as means of locomotion. The Swedish sample features another inclination: 72% of the seniors who are living in the countryside prefer cars while this applies to only 39% of rural senior citizens in Austria.

The Dutch sample shows that cars are preferred mainly in the cities and that cycling is practised predominantly on the countryside.

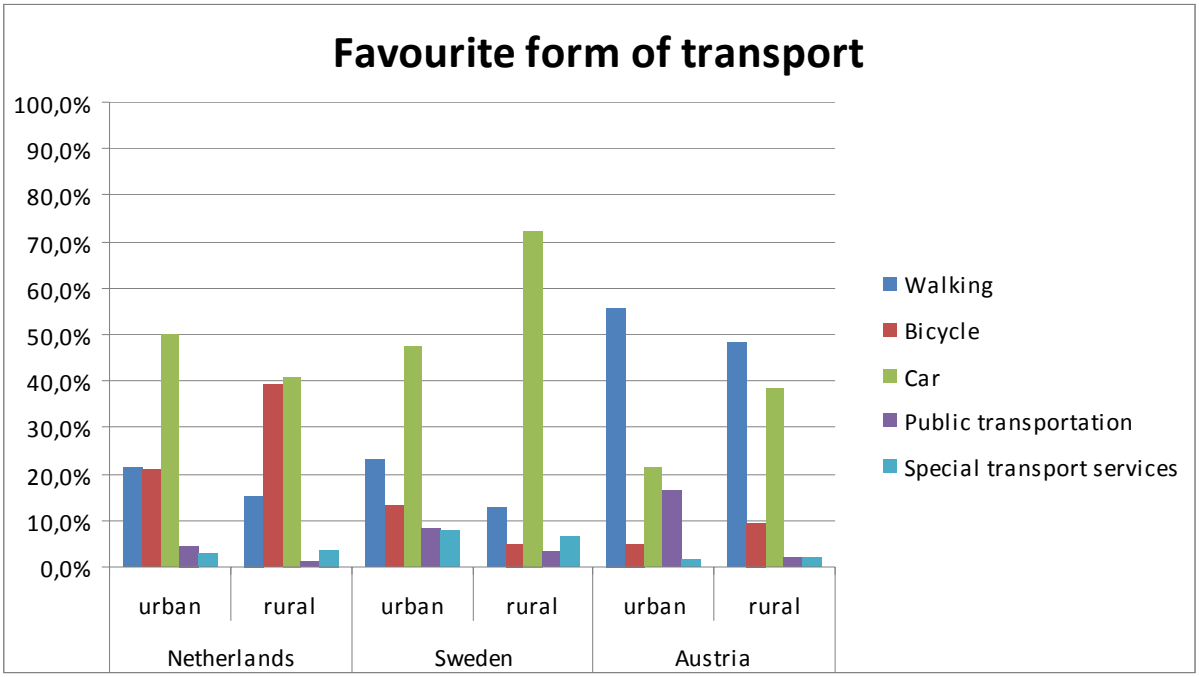

Figure 8: Modal Split – urban/rural country comparison

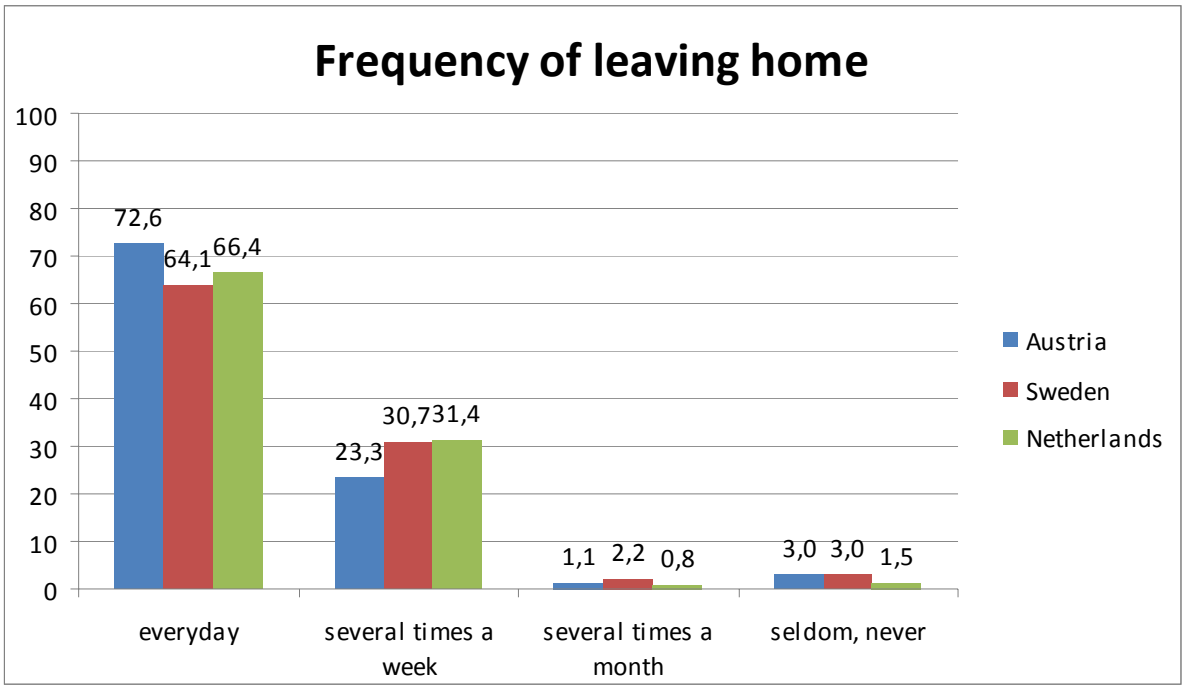

Figure 9: Frequency of leaving home – country comparison

When assessing the frequency of leaving home it appears that with a ratio of 73%, who state to leave home everyday, the Austrian seniors leave their home most frequently. In Sweden this ratio is the lowest but there are no significant differences when comparing Sweden and the Netherlands (see fig. 9).

Comparing the countries by means of the frequency of using a car it appears that in Sweden the ratio of seniors who use a car every day or at least several times a week is by far the highest. The Netherlands rank second and Austria comes in last with a ratio of 40.5% of seniors who "seldom or never" use a car. The high ratio of 28% in the Netherlands' sample, who state to seldom or never use a car, stems also from the fact that 22.3% of the Dutch respondents stated having no driving license (see fig. 10).

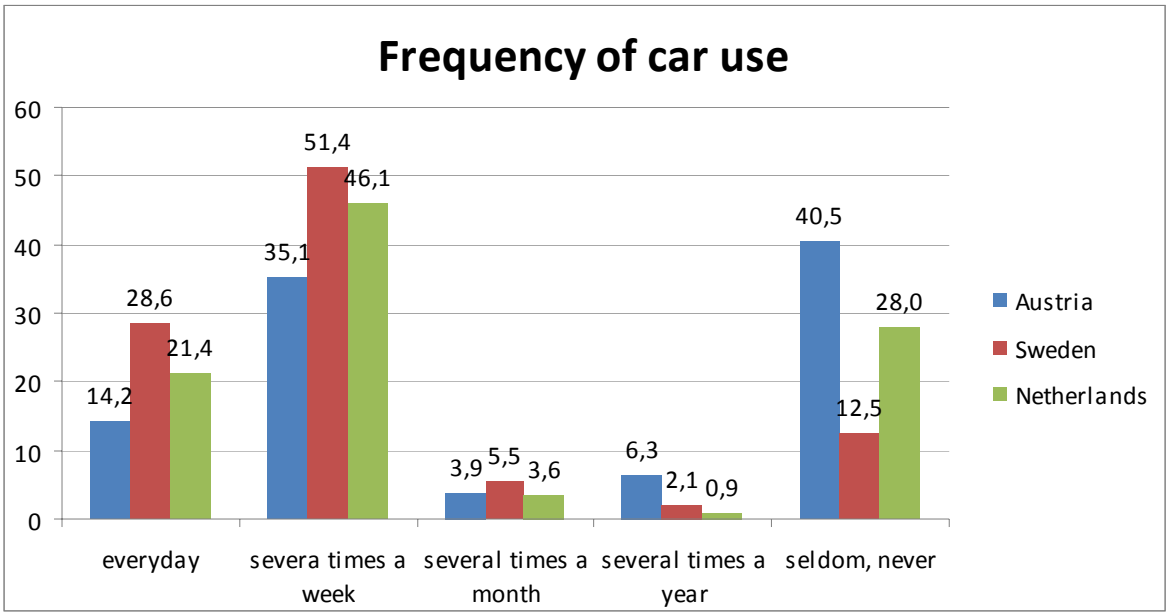

Figure 10: Frequency of car use – country comparison

The comparison of the frequency of car use revealed that this category rated highest in Sweden; about 80% of the Swedish seniors indicated that they use cars daily or at least a couple of times/week (see fig. 10). The Netherlands ranked second and Austria came last with 40,5% of respondents who indicated that they use cars seldom or never.

In the category of retirees, it appeared that 75% of all seniors who retired within the past two years did not change the frequency of leaving home. For 22% of seniors, there is a drop in mobility after retirement – an effect which is quite prominent in seniors living in the countryside (35%).

The transition from two/multiple-person households to single-person households demonstrated the most negative impact on seniors' mobility in Sweden, where 30% of the respondents indicated to leave home less frequently since this event. By comparison, in Austria the ratio of seniors living in urban areas, who leave home more often after the transition to single-person household, is the highest.

Hence, it can be concluded that there are some very clear differences when comparing these three countries.

- One of the most obvious differences lies in the preference of certain transport modes: walking in Austria tops the list while it's the car in Sweden. The Netherlands show the highest ratio of cyclists.
- Austrian seniors leave home more often than their counterparts in Sweden and The Netherlands.

To secure seniors' mobility in the future, these country differences and particularities in mobility patterns must be accounted for. These differences must also be respected in national measures and adaptations in the fields of traffic and infrastructure.

4.3.4 Types of mobility

It is necessary to find methods and ways to reduce the complexity of mobility patterns. When the mobility pattern of an individual can be delimited, the whole population can be classified and allotted accordingly into mobility-behaviour types. To do that, mobility must be standardised on the basis of various parameters.

4.3.4.1 Status Quo

It is one of the main goals of traffic planning and especially traffic modelling to aggregate the different mobility patterns by building homogenous groups of indiviuals.

An expert survey, with specialists from the scientific field of traffic modelling, conducted in the course of this project, showed that especially the parameters age, employment and car-availability are important for the clustering of types of mobility. It is therefore assumed that persons differ significantly in their mobility behaviour according to these factors.
What is remarkable is the fact that the age group beyond 60 years is currently only divided by car-availability. A more specific differentiation would be appreciated by the interviewed traffic planers, but has yet not been introduced, because of a lack of empirical evidence and the corresponding data fundament. Considering the conventional approach of differentiating persons, who are at least 60 years old, soley on the availability of a car shows, based on the data of this study, that a percentage of 54% of the interviewed seniors have the possibility to use a car, whereas 46% do not have a regular or active access to a vehicle. It also seems obvious to additionally analyze the employment state among respondents of this study.
This showed that a percentage of 51.8% of the respondents who are already retired, do not have access to a car. In contrast, 48.2% of the already retired respondents stated to still have access to a car. According to the conventional models of traffic planning seniors, who are at least 60 years old, are a homogenous group regarding their mobility behaviour, beside car-availability and their respective employment status.

These assumptions have led traffic planners in the past to presume, that senior citizens do not need to be differentiated any further regarding their mobility behaviour and their mobility needs. Factors such as household structure or state of health are therefore not considered in most models.

Evaluation of the subjectively assessed possibilities to leave one's home in relation to the availibilty of a car showed significant differences between those who have access to a car and those who don't. It is evident that those who have access to a car assess their possibilities to leave their home significantly more positive than those who don't have access to a car. These differences however do not reveal how persons, who are at least 60 years old, behave, because a percentage of 75.7% of those respondents, who don't own a car, assess their possibilities to leave home as being good.

It is therefore possible to differentiate senior citizens according to car-availability and employment status, but it seems to be a problematic presumption to assume that those who don't own a car or those who are already retired show the same mobility behaviour or the same needs in this regard.
According to this it seems to be advised to provide a more comprehensive view on the mobility of the age group above 60 years, including all relevant forms of behaviour and needs, by applying the methodology of social sciences, in order to serve as a basis for future endeavours in the fields of traffic planning and traffic modelling.

4.3.4.2 Development of types of mobility

The triggering factor for the development of specific types of mobility was the aforementioned situation concerning the conventional typification of persons who are older than 60 years in regard to their mobility behaviour. The discussion and the description of a portion of the Austrian population that is expected to rise up to 34% of the total population until the year 2050, soley based on car-availability and employment and age just doesn't seem to be enough. Therefore the increasing life expectancy, the current changes and individualisiations of life styles, the changing working conditions and forms of employment and the concurrent changes in needs and expectations of the older age groups need to be taken into account by a comprehensive evaluation and discussion of mobility issues as an integral part of quality of life. Thus it is absolutely necessary to evaluate the mobility behaviour of this specific portion of the population by means of a diverse set of different factors. The results of the study at hand have proven that the factors age, employment and car-availibilty are significantly correlated with the mobility behaviour of the respondents.
Furthermore, it was shown, that there are additional factors of great relevance that have to be taken into account in future evaluations and analysis.
Factors such as household structure, and therefore the social integration, state of health, objectively assessed by type and quantity of physical impairments, subjectively by the level of contentment with one's state of health, have a significant impact on the frequency of leaving home, on the general assessment of the possibilities to leave home and on the assessment of the possibilities to use a certain form of transport.

According to this all of these factors need to be included in a comprehensive model of the mobility behaviour of persons, who are at least 60 years old, which needs to be capable of serving as a representation of the current situation in this regard.

Therefore the variables „state of health"(measured by physical complaints and the contentment with the state of health), household structure and the employment status were included in a cluster analysis in order to divide the respondents into homogenous groups according to their mobility behaviour.
In the course of the data analysis and after consultation with a group of experts from the fields of sociology and traffic modelling, three different types of mobility were formed (see fig. 11).

Fully mobile Seniors	**Slightly physically impaired seniors**	**Highly physically impaired seniors**
• Mostly still working • Mostly younger than 70 years old • Highest proportion of car drivers • Assess their possibilities to leave home and drive a car better than the other groups • Highest proportion of seniors living in multi-person households • Leave their home more frequently, than the other groups.	• Mostly already retired • Mostly in the older age groups • High contentment with health state • Hardly suffer from physical impairments • Prefer walking and cycling • More than half of the seniors in this group live in multi-person households.	• Mostly over 70 years old • Mostly dissatisfied with the own state of health • Highest proportion of seniors, who suffer from motor impairments • Highest proportion of seniors who prefer public transportation and special transport • Leave their home less frequently, than the other groups • Highest proportion of seniors, who live in single-person households

Figure 11: Description of 3 different types of mobility

The results of these analyses show clearly, that there are behaviour patterns within the age group above 60 years, which are relevant for a differentiated evaluation of the mobility behaviour and a comprehensive understanding of the diverse needs of this specific group.

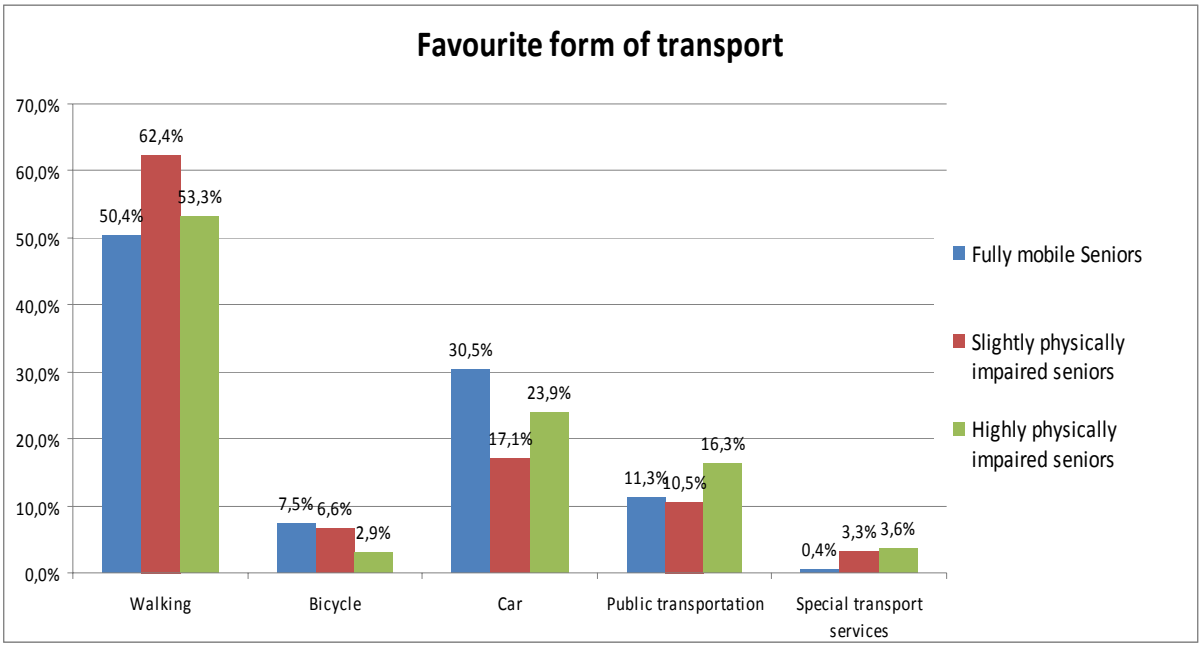

Figure 12: Favourite form pof transport – mobility type comparison

Analysis showed that these three types of mobility differ significantly in terms of mobility behaviour. These differences refer to modal choice (see fig. 12), the frequency of leaving home, the necessity of different forms of transport in order to be able to engage in a range of different activities and the subjective assessment of one's individual mobility.

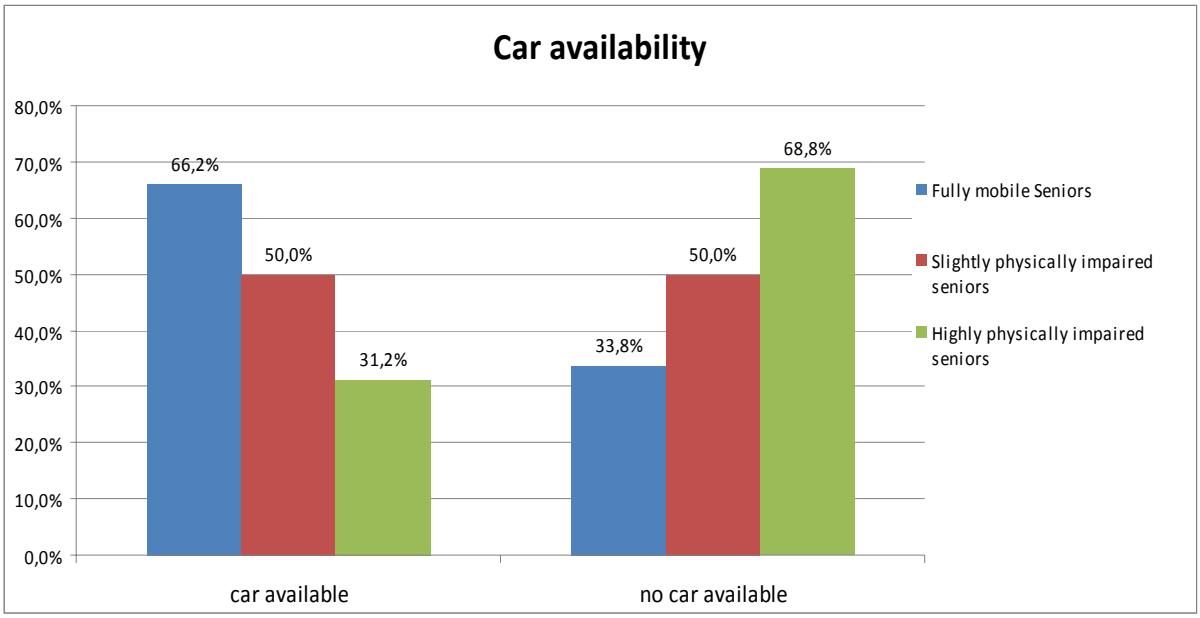

Figure 13: Car availability – mobility type comparison

Concerning car-availability, analysis showed that a percentage of 66.2% of the group of those who are fully mobile and a percentage of 50% of the group of those who are slightly physically impaired have the possibility to use a car. Among those who are highly physically impaired, a percentage of only 31.2% stated to have the possibility to use a car (see fig. 13). A classification of the respondents soley based on car-availability would be insufficient, because in this case a percentage of 33.8% of the group referred to as fully mobile seniors, would have to be classified as immobile. This approach would lump together different groups of seniors, regardless of the actual differences concerning their mobility behaviour and needs. When additionally taking the employment status into account, analysis shows again, that a differentiation based on only these two factors, cannot cover the whole spectrum of the structures represented by these types of mobility. There is a percentage of 26.2% of the group of fully mobile seniors, who do not have the possibility to use a car and who are already retired. On the other hand 6.7% of those who are slightly physically impaired and 3.2% of those who are highly physically impaired state to, both have the possibility to use a car and are still working.

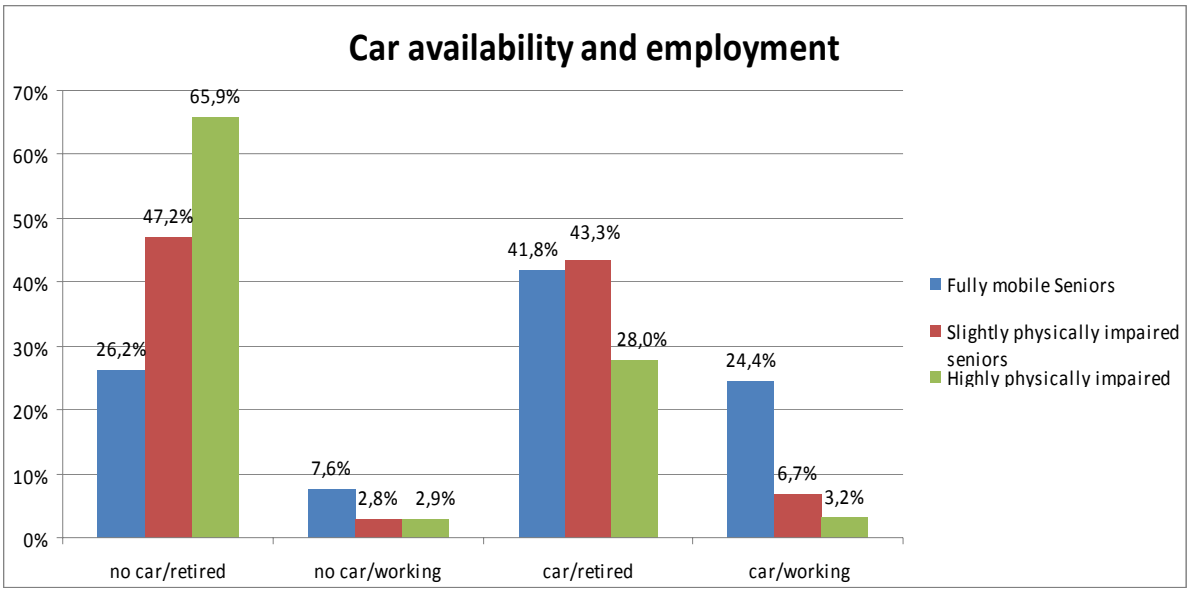

Figure 14: Car availability and employment – mobility type comparison

Moreover, a ratio of 41.8% of the respondents, who were assigned to the group of those who are fully mobile, are already retired and have the possibility to use a car. This also applies to a ratio of 28% of the group of highly physically impaired seniors. Therefore it can be assumed that, on the one hand, both car-availibility and employment status determine the mobility of this age group, but they cannot explain mobility behaviour of seniors comprehensively.

Analysis proved that there are seniors, who neither have a car, nor are they working, but they do leave their homes frequently, assess their individual mobility very positive and are in good health and are therefore able to exhibit forms of mobility behaviour generally attributed to seniors who are still working, or persons from younger age groups.

On the other hand, it was found, that there are people, who are still employed and do have the possibilities to use a car, but they leave their homes comparatively infrequently and suffer from restricted capabilities of movement due to physical impairments.

Based on these results it is assumed, that, both mobility behaviour and mobility needs are very heterogenous in the age group of those who are 60 years and older, and therefore cannot be explained by only two factors, such as car-availability and employment. In this context, state of health and life transition points, in particular retirement and the transition from a mult-person to a single-person household are equally important in explaining mobility behaviour.

The approach of building homogenous groups and types of mobility has the potential to describe mobility behaviour comprehensively, based on the number of available items, and in relation to relevant factors on the one hand, and on the other hand it is possible to establish a more differentiated picture of the mobility needs, without relying soley on car-availability and employment. The benefits are especially to be found in the possibility to take all important dimensions and factors into account.

In this context, especially follow-up surveys offer enormous possibilities to evaluate possible changes and variations over a period of time. Therefore further cross-section evaluations would help to describe and assess the permanently changing circumstances of the different life domains, which in fact are determined by factors such as age, employment and household structure and their impacts on mobility and mobility behaviour, by creating and analysing a comprehensive empirical data basis.

4.4 AS4 – Traffic modelling

Behaviour-oriented traffic demand models are more and more becoming a basis for transport policy decisions, among relevant actors on state and federal levels and in private planning institutions. These models are based on the assumption that different population groups with different socio-economic backgrounds exhibit the same mobility behaviour.

The objective of the workpackage presented in the following section of this report, is to illustrate specific mobility needs and to incorporate them into already existing traffic models.

The emphasis of the expert interviews conducted during this project was laid on present and future areas of applications of traffic models and on the possibilities to implement the specific mobility behaviour of the older age groups in these models.

Expert interviews showed that traffic models in their actual form are primarily used to illustrate the impacts of infrastructural measures on the overall traffic system. These experts working within the SZENAMO project outlined other potential fields of application for these instruments:

- planning of new options in public transport networks
- user-specific planning of transport options
- traffic safety analysis

Mobility needs of elderly people are hardly considered in actual traffic models. One of the main findings of the conducted expert interviews is the fact that a differentiation of seniors, who are at least 60 years old, soley based on car-availability and employment status, cannot cover the actual heterogeneity of this group. Up until now there has not been a more differentiated and comprehensive approach due to a lack of empirical data, especially regarding the mobility behaviour of elderly people.

Based on the results of the scenario development it was concluded, that a better differentiation of the different purposes of trips – especially concerning leisure trips and supply trips - will be a factor of special interest in the illustration of the mobility behaviour of elderly people in traffic models.

In order to improve the illustration of the mobility behaviour of seniors, the empirical data of the research study "Life's transition events in seniors and their impact on their daily mobility – A study with special regard to life's transition events and their impact on daily mobility and the role of car use" (see Risser 2008) was used as a fundament for the subsequent analysis (see also chapter 4.3).

Due to the obliginess of the representatives of the Province of Upper Austria, the project team was able to analyze the data of the Upper Austrian household survey 2010, with special regard to transport and mobility behaviour, in order to supplement the existing data set.

Based on the data of the preliminary study the main emphasis was on clustering homogenous groups according to mobility behaviour (see chapter 4.3.4. for the exact proceedings). These types of mobility serve as a fundament of a better differentiation of elderly people in Austria regarding mobility behaviour.

Due to the suitable data fundament the main focus of the analysis, conducted in the course of this work package, was on creating behaviourally homogenous types of mobility, in the age group of 62 to 95 years. For a detailed description of the applied procedures see chapter 4.3.4. By applying these typifications a clearly more detailed differentiation of elderly people into behaviourally homogenous groups is possible.

The next phase was concerned with evaluating possibilities to implement these results into already existing traffic demand models. In order to discuss all relevant aspects of this endeavour, experts of the field of traffic planning, who had already been interviewd in one of the previous stages of this work package, were invited to participate in a workshop meeting. Main goal of this workshop was to put up the results of the data analysis to discussion within the context of the specific needs and demands of traffic planners. This discussion led to the common cognition that implementing behaviourally homogenous groups and the corresponding model input data into already existing traffic models would impose considerable efforts on traffic planners. According to the experts the results of the data analysis would prove to be most useful if implemented into new or updated traffic models.

Therefore the new traffic model for the eastern traffic region of Vienna, created by VOR (acronym for "Verkehrsverbund Ost-Region") will take the results of the project SZENAMO into account. In order to facilitate the implementation a manual was drafted, which is able to respond in detail to the application of the used data set. This manual is available to anyone who is interested.

The empirical data collected by the study "Senior Life transition points and their impact on everyday mobility – A study with special regard to life's transition events and their impact on daily mobility and the role of car use" (see Risser 2008) provides the opportunity to significantly improve, both the data basis of traffic models and the clustering of homogenous groups of elderly people in the age group between 62 and 95 years.

4.5 AS5 - Dissemination

Dissemination has been already launched at several national & international workshops, courses, round-table discussions where the findings of SZENAMO were made accessible to large audiences of professionals in various fields – from psychologists and sociologist over to engineers and traffic planners.
Disseminations in the course of the project were:

- In the course of this project a rich international exchange between the participating countries – The Netherlands, Sweden and Austria – took place. An international workshop was organised in Vienna from November 23 to 24, 2009, where the work on remaining tasks and future project work were co-ordinated.
- A national experts' workshop took place on 4th of December 2009, where representatives of ministries, traffic companies, state traffic enterprises, road building & consulting companies (BMVIT, VOR, ÖBB, ASFINAG und HERRY Consult) participated. The results of this study were presented & discussed and also the positions and ideas of the stakeholders with respect to applicability of the obtained results to traffic modelling were collected.
- The results of the study will be published on the SENTRIP website where they can be viewed and downloaded by all involved parties. That way the interested & professional public will have the chance to draw from our findings and to build on them in their research work.

Additional dissemination of the results:

- A paper of Ralf Risser called "A Roadmap for Ageing Research in Europe" at the workshop of EU-coordinating action FUTURAGE in Heidelberg on March 4, 2010 (a follow-up will take place in June 2010 in Lund, Sweden)
- The study results have been presented & discussed with students as a course of the European masters programme "Human factors in the management of transport systems" at the University of Lissabon ("Universitas") from 8 to 12 March 2010
- A presentation of the results at the meeting of the Standing Committee of "Verkehrspsychologie der Europäischen Föderation der Psychologen-Verbände

EFPA“ in Brussels on March 20,2010; additionally the summary of the project was printed on a poster.

- At the network-workshop Ways2Community, organised by BMVIT und FFG in March 2010 in Wien, the SZENAMO project was presented to the other Ways2Go project teams, and later discussed.

- A presentation at REAL CORP 2010 – “Promising vision or unrealistic fantasy?” from 18 to 20 May, 20101 in Wien.

Besides these dates, the project partners will stay connected even after the completion of the project and the final evaluation of its results and a future course of action – with respect to a follow-up survey – will be discussed. Finally, a meeting will take place in The Netherlands between October 21 and 22, 2010, where representatives from Sweden, Austria and The Netherlands will discuss the implementation and dissemination of the results in scientific publications.

5 Summery

When we deal with the issue of seniors' mobility, partly against the background of former findings and existing literature sources, partly based on the evaluation of the upcoming data, a whole range of measures can be identified. The suggested measures play an important part in the scientific discourse of the mobility topic and also in the practical and technical implementation when traffic models find their application in the planning of traffic for the elderly.

The data analysis suggested that the measure has to be applied at various levels; only that way individual mobility can be provided also for those who, due to certain physical or other impairments, are disadvantaged. Specific measures must on the one hand respect the conflicting priorities of all factors relevant for both traffic and mobility and on the other hand make provisions for various needs and requirements of concrete groups of the population.

Hereafter is a list of suggested measures which will further complement the empiric results of the foregoing study ("Life transition events in seniors and their impact on their everyday mobility"). The measures were collected at workshops, from experts' interviews and the state-of-the-art analysis in the course of the SZENAMO project.

5.1 Measures based on the different levels of the traffic system

Using the schema of “Traffic Diamant” (see Haindl, Risser, 2006: 28ff; see Fig. 15), existing barriers and corresponding proposed solutions, related to the five levels of relevance, will be outlined here.

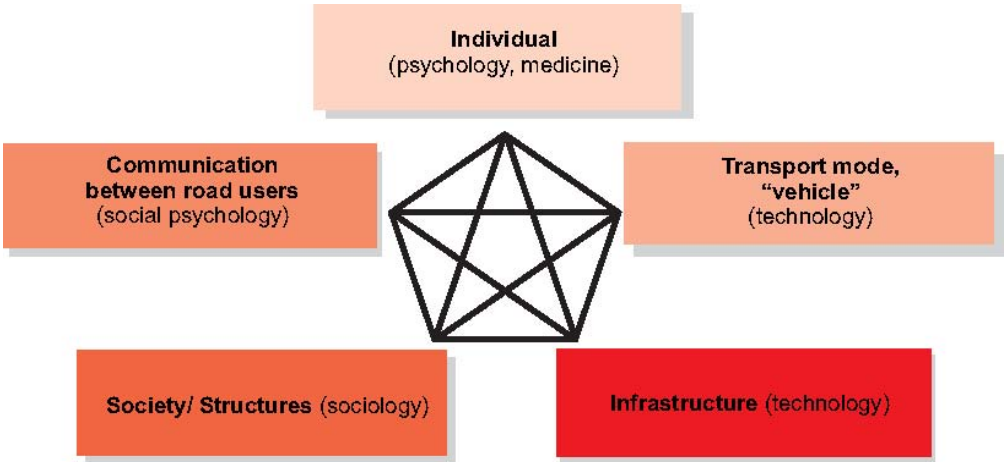

Figure 15: The diamond (Risser, 2006)

5.1.1 Individual level

On the individual level it is important to enhance the feeling of subjective safety among seniors. This can be achieved by increasing the presence of police and security personnel and installation of security cameras in public places.

For the victims of harassment and assaults in public places professionals (psychologists, social workers) must be available at contact points; also platforms or support groups for victims where they can work through their trauma in order to overcome their fears.

This aspect is of major importance when it comes to maintaining mobility among seniors because untreated traumatic experiences can cause a drop in outdoor activities as the affected person will avoid public spaces which, later, may lead to social isolation and avoidance of community matters and social life.

Beside the aspect of security in public places and victim support, the problems of elderly car drivers must be addressed too. Special driving courses and safe-driving courses for seniors can make a valuable contribution to long and active car use. Part of the training is to learn about person’s individual limitations and restrictions and about the necessity of pre-planning a trip, to learn when to avoid certain weather conditions (night, frosty roads and misty conditions) and to assess correctly one’s own fitness-to-drive. At the same time, seniors’ attention should be directed towards alternative means of transportation, too.

The switch to another mode of transport follows for the most part only when car driving isn't possible anymore. Such a late change carries potential dangers because of the lack of previous experience. An early start in learning how to use other means of transport can prevent this and limit the potential impact of one's own lost ability to drive a car.

5.1.2 Social level

At the social level, an intense exchange between planners, politicians, scientists, professionals of various disciplines and other persons concerned is necessary as only in such thorough processes all relevant issues and dimensions can be covered. The involved political body is expected to generate mobility plans which analyse and address properly existing problems. New approaches must be sought and measures proposed to remove old deficiencies and replace them by new solutions.

Awareness-raising measures can be the starting point for a positive and considerate approach, which enhances the understanding for age-related problems and differences between generations. When we understand the actions and re-actions of others, we are able to respond adequately to those actions; while our own perspective becomes wider.

When seniors are part of different stakeholder groups - from the local administration of their city or village through to EU-related bodies - they are purposefully included in decision-making processes and are hence able to present their issues on a political forum. Centres for seniors where the elderly meet and cultivate their social contacts, nurse their hobbies or are involved in other social activities need financial and spiritual support. These centres offer the possibility of social exchange reaching far beyond family and usual social circles and are places where persons of the same age can meet. For some, they are the only place of socialising when partners and friends have already died.

5.1.3 Communication level

The communication level describes the interpersonal behaviour between road users. A positive communication or interaction can be positively influenced and optimised by special training and spatial design. When planning for infrastructure, communication should always be considered. The infrastructure design of traffic space constitutes the grounds for interaction. To achieve a positive interaction, the communication between different road users must be accounted for in the infrastructural planning process. Measures enforcing speed controls and speed reductions are necessary as they positively affect communication on the road and promote safe interaction between road users.

Employing radars and cruise control and implementing a suitable spatial design (e.g. elevated crossings, road islands and traffic calmed zones) are only a few examples of such measures. In addition, telematic-systems can bring relief for the driver as they enable him to fully focus on traffic.

Though, when telematic-systems are used, caution is advised at the point where the human being interfaces with the machine as this should not interfere with social communication. As far as the individual level is concerned, communication can be trained, at driving courses for instance, and practiced. Communication is a key factor in road traffic interaction and we can conclude that road accidents are more often than not a result of missing or failed communication.

5.1.4 Infrastructural level

Many different measures have to be employed on the infrastructure level because roads present a multiple-purposed space. It is important to engage all road users and make especial allowances for the vulnerable ones – pedestrians and cyclists.

Public space must be safe, accessible and useful for everyone equally; therefore, in spatial planning process a special attention must be paid to children, the elderly and disabled persons.

Above all, safety must be enhanced as an effective accident prevention measure. SIZE suggested following measures:

- Stricter speed limit enforcements to reduce pedestrian accidents; can be achieved by installation of radars, traffic calmed zones, narrowing of roads, introducing speed limit 30km/h, residential streets etc.
- Improvement of pavements: colour coding, slip-proof surfaces, regular check-ups and cleaning of pavements etc.
- Construction of special lanes for cyclists, skateboarders, etc. Separating them from pedestrians.
- Senior-friendly design of road signs and traffic lights (shorter walking distances, shorter waiting times, longer crossing times)

Besides safety, aesthetics and comfort also play an important role if public places want to attract pedestrians and cyclists.

- Public places must be equipped with enough places to sit on (to be senior-friendly the seats may not be placed too low) and a sufficient numbers of toilets (toilet facilities: must be generously sized, hand holders are important!).
- The spatial design must account for the fact that public places are spaces of social interaction where enough room must be accounted for gatherings of people and other social activities

Very important are areas predestined for the elderly; where they are able to meet and gather.

5.1.5 Vehicle Level

Here, an adequate vehicle design is required which matches the specific needs of seniors. The measures proposed by SIZE are partly overlapping with the suggestions made by Limbourg (see figure above). The adjustment of public transport to the needs of seniors is essential. Low-floor buses and trams and buses that can be lowered (drivers operated devices) are user-friendly and facilitate the get on/get off for seniors enormously and should be therefore generally introduced into public transport systems. The improvement in public transport can be additionally enhanced by shorter intervals between courses and higher timeliness. Further, a wider range of alternative forms of transportation (call taxi, call bus, mobile shops etc.) must be provided for seniors. Last but not least a senior- customized vehicle design and equipment (automatic gear, colour-coded controls and gears, a clear and simple dash board, rotable driver seat etc.) will round off the choices for seniors.

A large selection of telematic or information and communication systems in both traffic and vehicle industry, and in the field of infrastructure is available today. These devices improve accessibility to mobility. It is likely that the next generations of seniors will be able to draw from the options and benefits of new technologies more that the seniors of today. While today the elderly often struggle to understand and operate technical gadgets, it can be assumed that in the future, seniors will adapt and be able to operate modern technologies better because they have been using them since their early years. These seniors will be very well equipped for the handling of innovative technologies that facilitate the handling of traffic situations.

5.2 Measures according to the different modes of transport

Our findings revealed that the barriers the elderly face are, quite often, linked to the means of transport they use. Equally clear is the necessity that measures must be individually tailored to the particular mobility needs of seniors of the given country.

Accordingly, based on the state-of-the-art analysis and the data evaluation of our survey, following measures were suggested:

5.2.1 Measures to improve traffic systems for elderly people

Beside the well known **barriers and hindrances which prevent the elderly from participating in traffic,** they are also **subjectively felt safety deficits** which additionally limit the mobility of seniors. The **most serious problem** for the elderly is **car speed**, no matter what form of transport they are using. But particularly vulnerable and at risk are seniors when they walk. 75% of accidents where seniors are involved are caused by car drivers (see Limbourg, 2005).

Speed limits facilitate traffic participation for seniors in both situations – non-motorised and as car drivers – because when the driving speed is slow there is more time left to assess the situation and react accordingly (see Limbourg, 2005).

5.2.2 Measures for elderly pedestrians

When **crossing a road**, **elderly pedestrians are often quite challenged**. Most of all, the available time for crossing is a problem because the elderly, impaired in their mobility, need more time for crossing. The empiric data of the study "*Senior Life Transition Points and their Implications for Everyday Mobility*" showed that 25% of the respondents perceive non-separated (from road) pedestrians and cycling paths as restriction; and 20% of respondents perceive the short green phases as restriction.
Technical measures the elderly pedestrians will benefit from are:

- **traffic lights** with phases customised to the needs of slower or otherwise impaired road users;
- **good audible acoustic signals** as crossing-aid for persons with limited vision (see Limbourg, 2005).
- seniors listed also **zebra crossings and light signal equipments** as aid device wanted for crossing.

Generally, an improvement of infrastructure for walking is an important issue for seniors.
Seniors wish for a **larger number of well maintained, clean and broad sidewalks clearly separated from the road for the exclusive use of pedestrians.**

5.2.3 Measures for elderly bicyclists

The foregoing study "*Senior Life Transition Points and their Implications for Everyday Mobility*" revealed that **bicycle** represent another **alternative form of mobility to car driving and/or walking** mainly for persons with unrestricted mobility. Although, with growing age, walking gains head while cycling falls behind.

The improvement of conditions for cycling and for walking the elderly wish for has to do with **deficient infrastructure**. A generous expansion of cycling paths is wished for – a requirement that, too, points out the need for safety (see Sammer et al. 1999).

5.2.4 Measures for elderly public transport users

We can expect to have a growing number of senior car drivers in the near future. To be ahead with a plan of action it is necessary to address the usual problems linked to the use of public transport as early as possible as all investments and reconstruction projects for the public transport sector are planned for long periods in advance. A relevant factor here is the **city vs. countryside gradient** when it comes to the existing local public transport

infrastructure. Currently, many seniors living in rural areas depend on individual motorised traffic partly because of the lack of viable public transport options, partly because difficult availability and accessibility.

A study of Sammer pointed out that seniors wish for **shorter intervals**, **timeliness** and for an **easy access to** public transport **vehicles** (no steps). Moreover, among other improvement measures they listed: **soft acceleration** and **more seats for the elderly** (see Sammer et al. 1999).

To make the use of public transportation attractive for seniors, a couple of requirements need to be fulfilled: good and easy **accessibility; comfort and affordability**; **user-friendly schedules** and a **larger selection of** viable **transport options**.

Since many a trips are “multi-modal” (i.e. first walk, then public transport, then walk againetc.), certain provisions will also be necessary: for instance the walk to the bus stop must be designed senior-friendly (see Mäder, 2001).

The results of public transport data evaluation revealed that for 24% of seniors reading of the small letters in the schedules poses a problem; 17% of seniors see the long intervals between courses as troublesome.

The use of public transport is felt to be tedious when the **walking distances between stops are too far apart**; when **no information about transport is available** or when they are **lacking the user competence** how **to read schedules** or how **to operate ticket machines**. A solution for these problems could be specially trained service personnel or training courses for the elderly where they learn to operate these machines (see Limbourg, 2005).

5.2.5 Measures for elderly car drivers

45% of the seniors in this study complained about **ruthlessness of car drivers.** This criticism was mentioned most frequently. Second most common complaint (27%) was about **lack of respect and consideration** on the part of others; 26% complained about **lack of public toilets** and finally 23% of the interviewed seniors criticised **high driving speeds** as one of the major barriers in traffic.

Supporting measures for elderly car drivers feature, for the most part, technical equipment of cars and have been amply described before (see Engeln, 2001). In a survey in the Federal Province of Styria, seniors wished for **more parking sites** and **improved enforcement of traffic**, and also for **better and broader roads** (see Sammer et al. 1999).

5.3 Requirements for future mobility surveys

Further analyses and surveys must be able to differentiate relevant and determining mobility factors to be able to understand the specific needs and behaviour patterns of the examined age group. Also the specific working situation must be taken into consideration in the course of defining the concept of “work”. To obtain additional information not covered in the survey it might be necessary to employ secondary sources. An approach that deasl with mobility typologies based on empirical data might prove to be fruitful.

The results of this study showed that the variables which are examined first and foremost in traffic surveys and which are related to mobility behaviour on one specific test day only can be extremely useful. Such data provides full explanation about purpose and distance of a trip, its duration, the number of trips, and about chains of trips.

Another important factor in mobility surveys about the elderly is the examination of their state of health, which has been identified as a highly conclusive feature; many differences can be found here: for instance older persons who subjectively assess their health as “good” display similar mobility patterns as (younger) working seniors.

Our study proved that the age group of 60-year-olds isn’t a homogenous group in terms of mobility. Future studies may further build on this fact, primarily because we assume that mobility patterns and requirements of future generations will drastically change and a shift towards more homogeneity in this age group will occur.

Representative surveys, such as SENTRIP, provide the opportunity to explore the reality drawing from settings, attitudes and evaluations. This gives a ground for representation of social reality related to mobility and opens up the possibility for statements about this important part of quality of life.

In this context, longitudinal studies offer enormous possibilities to pursuit changes of relevant factors which have been examined at an earlier stage. Additionally, cross-sectional data analysis give an opportunity to explain phenomenons which are subject to permanent change (such as age, working life, household size etc.) and which affect mobility behaviour and mobility patterns and which can be described by using empirical data.

As mentioned above, the use of secondary data can be very useful. That way, the relevant variables obtained from secondary data sources help to describe the mobility types established earlier. In this case the data of the mobility survey conducted in 2001 in Upper Austria were included to promote a better understanding and a more detailed description of mobility behaviour of the examined groups. A combination of these data can serve as a useful ground for traffic planning and traffic modelling and in addition allow a better adaptation of existing mobility structures and new mobility types to the changing needs of various age groups.

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