User needs and expectations relative to accessible transport

Framework for mobility planning

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Work package 2: Users needs and expectations

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Preface

This report is the deliverable from Work Package 2 Users needs and expectations within the project For a European Accessibility of Public Transport for People with Disabilities (Euro Access), a project under the 6th Framework Programme of the European Commission, Scientific Support to Policies.

The objective of the Euro Access project is to contribute to the development of EU policy on the accessibility of public transport systems in the member states, in order to promote social integration and active participation in society by people with disabilities. The Euro Access approach is to propose a framework for the transferability of good practice between EU countries, based on knowledge of current policies and legal frameworks in the countries, the needs and expectations of people with disabilities, and best practices in the field of accessible public transport systems.

The three main objectives of Work Package 2 are firstly, to review existing literature on the needs of disabled people regarding accessible transport. Secondly, the aim is to survey how well different user groups’ needs are met in reality by public transport. Thirdly, based on the previous steps, the aim is to develop a framework for mobility planning for disabled people.

The main source of information used in this report is a literature review, conducted by screening various databases. The secondary source is a survey, targeting the needs and expectations of people with disabilities and older people through disability and senior organisations in Europe. Results from Work Package 1, Review of current policies and regulations, serve as necessary input.

The survey could not have been carried out without the help of Maria Nyman at the European Disability Forum, and Isabel Borges at the AGE-Platform Europe. With their kind support, we were able to contact user organisations, which despite high workloads and poor resources were able fill in our questionnaire. To the responding organisations, we would like to express our deepest gratitude, and hope that we have been able to grasp the main essence of their appraisals and concerns. Furthermore, Luca Lucietti (Fit Consulting), Ann Frye (Ann Frye Ltd), and Cosima Pilz (UBZ) made valuable contributions in the response collection phase.

The Department of Technology and Society at Lund University has headed the work and written the report. The work at the department was carried out by Anders Wretstrand and Agneta Ståhl, with the latter as leader of Work Package 2 and project leader. We would like to thank the reviewers, Aline Alauzet (Inrets, France), Philip Oxley (Oxley Research, UK), and Richard Fisher for valuable comments and corrections.

All partners in Euro Access have had input in the literature search strategy, questionnaire and framework development, and report structure. However, for the final version, the authors take full responsibility for any remaining errors.

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Executive summary

An estimated 10% of the world’s population experience some form of disability. The number of disabled people is also increasing, primarily due to population growth, ageing, chronic diseases and prolonged life. Therefore, disability issues have become a core activity for the WHO. Its activities are primarily based on two guiding documents: the UN Standard Rules and the World Health Assembly (WHA) Resolution on "Disability, including prevention, management and rehabilitation".

For the EU, disability and participatory issues are also important, not least due to vocational matters, since there is a need to include more people outside the conventional labour market, stipulating disabled people as key priority groups. Accessibility is part of the Agenda adopted from the EU Council of Lisbon 2000, which targeted 2010 as the goal for full accessibility. This agenda will affect many people: children, adolescents, people today excluded from higher education and the conventional labour market, and not least a European population rapidly growing older.

Ensuring mobility for all EU citizens is a great challenge for the member states. In order to meet this challenge, the overarching objective of the Euro Access project is to contribute to the development of EU policy on the accessibility of the transport systems in the member states, in order to promote the social integration and active participation in society of people with disabilities. The main goals are:

1. To establish an inventory as comprehensive as possible of current legal frameworks and regulations concerning public transport in the EU.
2. To highlight the best practice in the EU on national policies, technical innovation, services provided and their potential correlations with the employment of people with disabilities.
3. To make recommendations for a common legal framework in the EU on the accessibility of transport systems

The work is split into six work packages (WPs). These are:

- WP1: Review of current policies and regulation
- WP2: User needs and expectations
- WP3: Best practices/innovation and related cost benefit analysis
- WP4: Recommendations for EU policies
- WP5: Dissemination activities
- WP6: Coordination activities

The present deliverable D2 (User needs and expectations relative to accessible transport: Framework for mobility planning) is part of Work Package 2. The three main objectives of WP2 were firstly to review existing literature on the needs of disabled people regarding accessible transport. Secondly, the aim was to survey how well different user groups’ needs are met in reality by public transport. Finally, based on the previous steps, the aim was to develop a framework for mobility planning for disabled people. The main methods have been a literature review and a questionnaire survey sent to user organisations.
throughout Europe. Disability organisations were reached by co-operation with EDF (The European Disability Forum), and senior citizen organisations were accessed through co-operation with AGE-Platform Europe.

In order to understand the basic features of both user prerequisites and accessibility concerns, a thorough review of theories and concepts revealed some interesting and important features. Different aspects of disability are encompassed by the ICF model of WHO:

- The model consists of functioning and disability:
  - Aspects of the body, the activities of an individual, and individual possibilities of participation
- The disability context is determined by:
  - Environmental and personal factors

However, the social model of disability is equally important in a mobility and transport context. That approach emphasises how disability is created by society, and also constantly recreated, even in documents such as this (labelling, grouping, separating an individual from a “normal state”). Therefore, both the ICF and the social model provide valuable input into transportation accessibility analysis, since transportation is framed in a social and cultural context.

Mobility and accessibility for all people cannot be achieved without a holistic approach, e.g. by employing the travel chain. The chain must be solid, due to the dynamic forces involved. Important elements of the travel chain are:

- Accurate, clear and concise information
- Barrier-free built environment
- Universal design
- High operational standards, intermediate solution between individual and mainstream transport option
- Appropriate, effective and accessible vehicle design
- High levels of perceived comfort and safety
- Trained personnel

If these elements were to be realised, the transport system could also meet usability requirements, viz. highly apparent accessibility for all.

Reversing the perspective from the system to the different user groups, it becomes evident that different groups have different needs. Nevertheless, they all have in common the necessity of high disability awareness among stakeholders, planners and field staff.

- Mobility impaired people have high requirements on physical design. Vehicles must be accessible, systems must be reliable, and stops and terminal facilities must be proximate and user-oriented.
- People with sensory impairments (sight and hearing), cognitively impaired people, and people with mental health problems have, in many cases, the same requirements as mobility impaired (MI) people. However, increased emphasis must be placed on information and orientation. For some, trained and supportive staff is essential.
People with environmental sensitivities and allergies constitute a large group of users. Their main concerns target climate, surfaces and passenger/staff encounters.

Some system aspects need to be stressed, regarding links to employment, education and training:

- The integration of disabled people into the labour market, into supportive training and into higher education requires seamless public transport with a focus on commuter problems.
- Mainstream public transport and individual transport solutions meet the needs of some, but not all. Intermediate transport solutions are necessary transit forms for closing systems gaps, particularly regarding the large population of ageing users.

The work also contained a survey of how well different user groups’ needs are met in reality by public transport. The response from different user groups in different European regions concludes that:

- User groups are aware of existing policies, legislation, action plans and other local documents.
- According to users, the policies contain clear directions “towards all people”. However, the legal framework and the implementation tend to focus more on “traditional” physical aspects, thus neglecting “soft barriers”.
- Contrary to the position of governments, the user groups hesitate to label their influence as important, particularly senior organisations.
- On a five-grade scale, the perceived accessibility state lies below average (neither accessible nor inaccessible).
- Users emphasise that current pricing strategies fail to meet their needs.
- Policy work lies far ahead of the implementation processes.

Based on the findings from the literature review and the survey results, a framework for mobility planning for disabled people was developed. Using the travel chain perspective, addressing the gap between policy and practice, and incorporating the essence of mobility and the discrepancy between accessibility and usability, the framework was drafted as a conceptual model for the mobility planning procedure.

As policies today often mention Universal Design and mainstream efforts, three phases were identified (from each perspective):

- Planning perspective
  - Environment phase, with input from
    - Legislation
    - Norms
    - Standard
  - Person phase, with input from
    - Objective analysis
    - Inventory procedures
- Expert assessments
  - Mobility phase
    - Subjective analysis
    - User involvement in planning and implementation
    - Usability studies: field and lab tests
  - Usability phase
  - User perspective
    - Design phase, affected by
      - Infrastructure
      - System
      - Information
    - Accessibility phase, affected by
      - Barrier-free design
      - Proximity – within or out of reach
      - Supportive structures and information
    - Usability phase, creating
      - Societal integration
      - Participation in human activities – the reason for transportation
      - Freedom of choice – the choice of modes and activities

The developed framework underscores an iterative planning process towards successful implantation of universal design. The feedback for planners and stakeholders is necessary for reaching the policy goals.

Successful implementation of measures today is characterised by many, if not all, of these issues. Much progress has been made toward improving accessibility to public transport, albeit the implementation has often proven difficult and slow. Some examples have all in common that improved co-operation between public transit service providers and local authorities can ensure better accessibility. However, the extent to which improvements to accessibility actually have resulted in increased mobility is often difficult to assess. Best practise examples often lack of passenger and/or financial data. Some cases however imply that fleet renewal (low-floor buses and trams), accessible bus and tram stops can in fact increase ridership; not only for disabled but for all passengers. Another showed that fleet integration increased ridership and reduced overall costs.

The cost-effectiveness of measures is often context-dependent. On one hand, it is of little use to remove all environmental barriers, if the bus fleet is still inaccessible. On another hand, passengers will never use the low-floor buses, if the streets are dangerous and over-crowded. This once again underscores the importance of improved co-operation between public transit service providers and local authorities, so that measures match and support each other. It is suggested to start out with fleet renewal, together with urban planning focusing on vulnerable road users (pavements, crossings, bicycle lanes). If transport planning has a focus on public transport and aims at reducing congestion, this will be of benefit for society as a whole, particularly for vulnerable, older and disabled road users in urban communities.

It should be emphasized that no community can be fully served with a single transportation mode, and that different public transit services must be responsive to individual needs. A
focus on supportive structures, proximity, and accessible information about the system has proven to be crucial mobility factors. For example, Service Routes and FlexRoutes are intermediate transit solutions that have improved the mobility of older and disabled people in operating areas.

While reviewing the existing literature, it was easier to find studies on barrier effects rather than on evidence-based facilitator effects. For example, the Mobilate EU project emphasised two types of environmental barriers:

- spatial and technological barriers
- impediments caused by a lack of mutual consideration, heavy traffic flow and perceived fear in public spaces

The Mobilate study concluded that there is a need for integrating transport policy, urban and societal planning in order to remove or reduce these barriers.

Moreover, some issues for further work and analysis should be mentioned. The needs of mobility-impaired people are quite well known. However, physical barriers still exist, and more emphasis must be given to barrier reduction and evidence-based studies.

For blind people and people with visual impairments, more research is needed for supportive tactile design.

The needs of people with cognitive impairments, learning disabilities or mental health problems are particularly neglected. More work is needed here, e.g. actively involving users in the process.

The information and communication technology (ICT) development could also serve sensory-impaired users (as well as people with cognitive impairments and mental health problems) more efficiently than today.

The gender aspect of mobility and accessibility has to be further addressed. Other areas worth pursuing are the development of the taxi industry and accessible taxis.

Finally, the work concludes that best practice of systems design needs to emphasize barriers to transferability. While the institutional and organisational prerequisites vary throughout Europe, it might be that unified policies fail due to inefficient implementation and organisational obstacles. Seamless public transportation, accessible for all users, requires work across sectors and across different authorities with different budgets.
1. Introduction

1.1. Disability – a global perspective

An estimated 10% of the world’s population experience some form of disability\(^1\). The number of disabled people is also increasing, primarily due to population growth, ageing, chronic diseases and prolonged life. The most common causes include chronic diseases such as diabetes, cardiovascular disease and cancer, injuries (road traffic, falls, war/conflicts), malnutrition and HIV/AIDS. These trends are creating overwhelming demands for health and rehabilitation services throughout the world (WHO, 2005a).

Disability is an umbrella term, covering impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; a participation restriction is a problem experienced by an individual involved in various life situations (this will be elaborated further down in the text). Thus, disability is a complex phenomenon, reflecting an interaction between features of a person’s body and features of the society in which he or she lives (ibid.).

From a global perspective, the question might arise: what is being done to improve the daily lives of people with disabilities? About 600 million people live with functional limitations of various types due to the above mentioned and other reasons, many of which are closely related to poverty. As mentioned, this number is increasing, and 80% of disabled people also live in low-income countries with poor or non-existing rehabilitation facilities. Therefore, disability issues have become a core activity for the WHO. Its activities are primarily based on two guiding documents:

- The UN “Standard Rules” on the Equalization of Opportunities for Persons with Disabilities (UN, 1994)
- The World Health Assembly (WHA) Resolution on "Disability, including Prevention, Management and Rehabilitation" (WHO, 2005a)

The UN General Assembly adopted the Standard Rules in 1993. The rules represent a strong commitment from governments to take action to achieve equal opportunities for disabled people. The rules, serving as a direct foundation for the work of WHO, are

- awareness-raising
- medical care
- rehabilitation
- support services

Note that the first rule is awareness-raising – the way disabled people are perceived, conceived of and categorized by governments, the national private and public sectors and of course other non-disabled citizens.

The 58\(^{th}\) World Health Assembly in 2005 (WHO, 2005b) adopted a resolution aimed at improving the daily lives of people with disabilities. Countries, supported by WHO, were

\(^1\) Definition according to ICF (WHO, 2002).
requested to strengthen national policies and programmes on disability, including community-based rehabilitation services. A clear mission of the future plan (WHO, 2005a), coordinated by the Disability and Rehabilitation team (DAR), stated that:

- All persons with functional limitations shall live in dignity, with equal rights and opportunities

1.2. Disability – facts from a European perspective

Analyses of the most recent socio-economic data (OECD, 2006) have disclosed the strong connection between disability and ageing. It has also become evident that disabled people in Europe continue to be excluded from the labour market. The situation of disabled women is worse than that of disabled men. Furthermore, people with cognitive impairments are even less likely to be working than people with mobility impairments.

The exclusion of disabled people from the labour market is a serious concern, particularly from the perspective of equal opportunities. Considering a shrinking workforce resulting from demographic change, the 2006 Spring European Council (EU, 2007) emphasised that there is a need to further include people outside the conventional labour market, and disabled people are thus key priority groups.

These facts together create a strong demand for accessibility (EC, 2007c). The market for accessible products and environments is increasing and has become a driver for innovation, especially in the US and Japan, in areas such as information and communication technology (ICT). Accessible built environment and public transport, the theme for the current project, can make the difference between a disabled person being active in the labour market and being dependent on social welfare (EC, 2007b).

The social services sector is also growing, creating new jobs to meet the increasing demands of an ageing population. In 2004, the sector providing services to disabled people employed more than 8 million people, registering an annual turnover of about €68 000 million for the 27 EU countries (ibid.), and the figures are expected to increase (Lafortune & Balestat, 2007). It is a concern that

- older persons in need of care will more than double by 2050 (EC, 2007a)
- though disability prevalence rates have declined, the ageing of the population can be expected to lead to increasing numbers of older people with severe disabilities and in need of long-term care (Lafortune & Balestat, 2007)
- mental health problems now account for at least 25% of new disability benefit claims in the EU and are becoming a leading cause of disability (EC, 2003)

Regarding participation among those considerably restricted in their ability to work:

- only 63% of those aged 16-19 participated in education or training, compared with 83% of those not restricted
- over 50% of those aged 25-64 had no educational qualifications beyond compulsory schooling, compared with 32% of those reporting no restriction
The employment rate of disabled people remains stable (50%), but is still well below that for the rest of the population (68%). This gap tends to increase with age and with the level of functional limitation:

- about 27% of those aged 16-24 were employed compared with 45% for those with no such restrictions
- only 15% of those aged 55-64 were employed compared with 45% for those not restricted
- barely 24% of those (considerably restricted) aged 16-64 were employed compared with 62% of those restricted only to some extent.

Cognitively impaired people are much less likely to work, but even disabled people with higher education are much less likely to be employed in high-level jobs than non-disabled. Restrictions in mobility to and from work have a greater effect on participation in the labour market than restrictions affecting the kind or amount of work, hence the particular significance of an accessible and usable transport system (EC, 2007b; Ward & Grammenos, 2007).

1.3. Towards an accessible Europe

Accessibility is part of the Agenda adopted from the EU council of Lisbon 2000, which targeted 2010 as the goal for full accessibility. If this goal is achieved, it will have a substantial impact on the daily lives of parts of the European population, for whom the built environment, infrastructure and public transit create barriers in daily life can prevent participation and full benefits of citizenship.

It can be estimated that there are about 40 million disabled people in Europe. This figure remains quite uncertain. The reasons are twofold: the statistical sources still need to be refined in order to be fully useful for follow-up purposes, and the way disability is defined has differed from one context to another and from one region to another.

Nevertheless, the agenda of full accessibility will affect many people: children, adolescents, people today excluded from higher education and the conventional labour market, and not least a European population rapidly growing older. An integrated accessible transport system throughout an enlarged Europe may not be the only enabling solution, but it will inevitably help in bridging the existing social gaps.

1.4. The Euro Access project

In order to meet its objectives of social participation for disabled people, the EU is facing a great challenge to ensure the mobility of all. This challenge is all the greater for new member countries that joined recently on May 1st 2004 and on January 1st 2007. These new members should be able to benefit from the practices and knowledge of “old” EU member states. Conversely, some of these new member countries may have developments or innovations that could be appropriate for inclusion and promotion on a pan-European level.

In order to take on this challenge, the overarching objective of the Euro Access project is to contribute to the development of EU policy on the accessibility of the transport systems in the member states, in order to promote social integration and active participation in society by disabled people.
The main Euro Access goals are:

1. To establish an inventory of current legal frameworks and regulations concerning public transport in the EU
2. To highlight the best practice in the EU on national policies, technical innovation, services provided and their potential correlations with the employment of disabled people
3. To make recommendations for a common legal framework in the EU on the accessibility of transport systems

The present deliverable D2 is part of Work Package 2. The total work is split into six Work Packages (WPs). These are:

- WP1: Review of current policies and regulation
- WP2: User needs and expectations
- WP3: Best practices/innovation and related cost benefit analysis
- WP4: Recommendations for EU policies
- WP5: Dissemination activities
- WP6: Coordination activities

1.5. The Euro Access Work Package 2

The main objectives of WP2 were originally:

- To review the needs of disabled people regarding accessible transport, employment strategy and the interaction between mobility and work/education access
- To develop a framework for mobility planning for disabled people

In order to achieve these goals, two sub-tasks were defined.

1.5.1. Task 2.1 User needs

This task aims at reviewing research studies, reports and other available documents on the needs of disabled people in terms of transport and active participation in society (including education and employment). Ideally, the analyses should be done at a group level for different impairments, here categorized as mobility impaired (MI), vision impaired (VI), hearing impaired (HI), cognitively impaired (CI), people with mental health problems (MHP), and people with environmental sensitivities and allergies (ESA). The literature review is a basis for the analyses.

The second part of task 2.1, a questionnaire survey, has identified in each member state the main national organization representing older (through the AGE-Platform Europe) and disabled persons (through the European Disability Forum - EDF). This survey aims to clarify how well different user-groups’ needs are met in reality by public transport.

Specifically, the question is if and how the policies, legal frameworks and regulations appear to take these needs into account, as perceived by the users. The outcome reflects the scope of WP1, aiming at describing the state of the art of accessibility in the member states from a governmental policy perspective.
1.5.2. Task 2.2 Mobility planning

While synthesizing the previous results and conclusions, a framework for mobility planning for disabled people has been developed. In a short-term perspective, it will serve as a platform for further project activities (WP3 and WP4). However, in a long-term perspective, it aims at providing a tool for both policy makers, planners and other stakeholders in the process of taking further steps towards a fully inclusive European society.

1.6. The present document

The present deliverable document, “User needs and expectations relative to accessible transport - framework for mobility planning” (D2), is the final outcome of WP2. As such, it will also serve as control point and input to the coming phases of the whole Euro Access project, in particular WP3 (Best practices/innovation and related cost benefit analysis) and WP4 (Recommendations for EU policies).

The following chapters will describe the methods used, the results, the discussions of the results (by a framework draft), and some final conclusions and recommendations. Also provided, as appendices, are more detailed method descriptions.
2. Methods

2.1. Task 2.1 – User needs

2.1.1. Task 2.1.1 - Literature search strategy

The aim of WP2 is to present comprehensive data on the issue of user needs and accessible transportation. This should be done partly through a literature review and partly through an interview survey (questionnaire to user groups throughout Europe).

In order to achieve high quality while reviewing the existing body of knowledge, the review has to cover as much as possible of the work that has been done and documented. The search algorithms used are depicted in Appendix 1.

The following databases were employed: TRANSPORT (combining TRIS, ITRD and TRANSDOC), CORDIS, IBSS, PsycINFO, PubMed, CSA, ISI Web of Science, and CINAHL. The results were collapsed in an Endnote® library. To date, this database consists of 1334 references (April 21st 2008). The overall intention is that this database library should become a “living document” with recurrent updates throughout the project.

2.1.2. Task 2.1.2 – Questionnaire

An extensive questionnaire was designed in co-operation with all partners in the project. It aimed to clarify how well different user-groups’ needs are met in reality by public transport, and specifically if and how the legal frameworks and regulations appear to take these needs into account. The results reflected those from WP1, aiming at describing the level of accessibility in the member states from a governmental, policy perspective.

The target groups were disability and senior organisations in Europe. In order to get a wide coverage, the sample of organisations was derived from members of EDF (the European Disability Forum)² and the AGE Platform Europe³.

The organisations were contacted via e-mail with the assistance of both EDF and AGE Platform. All organisations were asked to complete the questionnaire and send it back electronically. Two reminders were sent out, due to non-response and sudden changes of e-mail recipients and addresses. These reminders were followed by a third one, and shortly thereafter, the organisations were contacted by phone. They were urged to reply by mail, but were also offered the possibility to respond over the phone, by making use of the questionnaire as a questioning route.

Forty-one disability organisations in 28 countries were sent questionnaires, and 13 organisations ultimately responded (32%), covering 13 countries. Fifty-one senior organisations in 28 countries were contacted, and 15 organisations responded (29%),

² http://www.edf-feph.org/. The European Disability Forum (EDF) is an independent European non-governmental organisation (ENGO) that represents the interests of 50 million disabled people in the European Union and stands for their rights. For responding organisations, see Appendix 2.

³ http://www.age-platform.org/. AGE, the European Older People’s Platform, aims to voice and promote the interests of older people in the European Union and to raise awareness of the issues that concern them most. For responding organisations, see Appendix 4.
covering 13 countries. The list of respondent disabled and senior organisations is given in Appendices 2 and 4.

The questions were grouped according to:

- Background data
- Assessments of policies, action plans, individual position papers or recommendations
- Assessments of existing legal framework
- Assessments of (or need for improved) accessibility standard
- Assessments of or need for special transport services
- Assessments of (or need for improved) pricing strategies
- Assessments of or need for staff skills and training
- Questions about links to employment and education
- Assessments of present status

Different modes/items specified were: taxis, buses, coaches, trams, trains, metro, pavements/crossings, bus/ tram stops, terminals/other buildings, Info systems etc. Similar questions were sent to both disability and senior organisations, with slight adaptations: see Appendices 3 (disability organisations questionnaire) and 5 (senior organisations questionnaire).

2.2. Task 2.2 – Mobility planning

Based on analyses of user needs’ aspects, existing planning models and frameworks, a project-specific framework for mobility planning was developed. The framework scope was set to public transportation and patronage with functional limitations needing accessibility improvements. The framework points out crucial steps and linkages for attaining a travel chain perspective. In doing so, a holistic view for policy implementation into sound practice is emphasized, characterized by Universal Design Features. The framework goal is to facilitate Universal Design processes in mobility planning.
3. Results and presentations – literature review

This section will start with an overview of theories and concepts relevant for accessible transportation. It is followed by a system and design perspective regarding user needs. Finally, the needs are reviewed in terms of specific user groups.

3.1. On theories and concepts

3.1.1. Two models – two perspectives

One current definition of disability is that it can be “understood as the result of the interaction between the individual’s impairment and the barriers created by society (be [they] social, environmental [or] attitudinal)” (EDF, 2007b). However, the concept of disability has long been associated with “flawed” minds and bodies: crippled people, suffering from blindness or mental illness (Barnes & Mercer, 2003). Some 30 years ago, disabled people started to advocate policy changes, civil rights, independent living, and immediate attention to physical and social barriers. Since then, the disability discourse has undergone significant changes (ibid.). The changes - eventually resulting in definitions like the one at the beginning of this paragraph - involved several steps in sociology; from disability as a personal tragedy, associated with sickness, to disability and social deviance, to stigma (Goffmann, 1963), and into a more socio-political model (Oliver, 1983).

Another example of this discursive change is the various established definitions, terms and language. E.g., some use the phrase “handicapped people”, others “people with disabilities” or “people with impairments” or “people with functional limitations”. It is probably fair to say that the vocabulary at least partially would disclose the origins of these different choices. However, since the vocabulary item is often the source of endless debates, the authors here have chosen the phrase “disabled people” rather than “people with disabilities⁴. The reason is threefold: firstly, this is a non-medical document. Secondly, its use signals the ways in which social and physical barriers act. Thirdly, this choice is consistent with the vocabulary used by EDF - The European Disability Forum (EDF, 2007a).

The social model was developed by disabled people in contrast to what came to be known as the individual (or medical) model of disability (Oliver, 1996). In the social model a distinction is drawn between impairment and disability:

- Impairment is the functional limitation within the individual caused by physical, mental or sensory impairment.
- Disability is the loss or limitation of opportunities to take part in the normal life of the community on an equal level with others due to physical and social barriers.

The key difference between the two models is the location of the “problem” and the causal link between impairment and disability present in the individual model and absent in the social model (ibid.). In the individual model, disabled people are unable to participate in

⁴ When disability issues are mentioned and discussed generally. However, when the particular functional limitations are important in the context, phrasing like “persons with hearing impairment” are more relevant.
society as a direct result of their impairment. Impairment causes disability. Disability must be “cured” by addressing the deficiencies in the individual disabled person. In contrast, within a social model framework, disability is caused by social oppression, and can be “cured” through changing social structures, accommodating the needs of disabled people (ibid.).

On one side of the debate, Oliver has argued that disability has “…nothing to do with the body. It’s a consequence of social oppression…” (Oliver, 1996, p. 35). On another, arguments pointing at specific experiences of groups of disabled people need to be taken into account. By simply ignoring the physical (body) issues, one might end up with changes in the environment that help some but still disable others (Thomas, 2004). However, each of the current disability positions in medical and social sciences today acknowledges the importance of social factors to a lesser or greater extent.

The importance of the context and the social factors was earlier less important or even ignored. A prime reason for this was the dominance of the “medical model”. That concept not only refers to a view of disability, but to “the conception of disease established in the late 19th and early 20th centuries, based on an anatomo-pathological view of the individual body” (Bury, 2004). By the association of diseases and deviation from the “normal”, impairments were primarily regarded as subject to medical treatment and various cures.

3.1.2. An integrated perspective

In response to criticisms from sociologists, disability advocates and activists in particular, regarding the overly medical perspective of disability, the WHO produced the ICIDH (WHO, 1980). However, this definition was still dismissed by disablist critics, since the “impairment” was identified as the cause of both “disability” and “handicap”. Thus ICIDH was revised, resulting in ICIDH-2 (WHO, 1999), a more bio-psychosocial (WHO, 2001), multi-purpose approach (Barnes & Mercer, 2003). The WHO’s revision of ICIDH, eventually called the International Classification of Functioning, Disability and Health (ICF), was finalised in 2001. It increased the openness of the original framework. In particular, the term “disability” was no longer defined within the scheme; instead, the whole picture relating to the wide concept of disability was captured by looking at three dimensions: impairments of body structures and body functions, activities and participation (Bolderson, Mabbett, & Hvinden, 2002). Below, a more thorough description of ICF is given.

3.1.3. The ICF model

The production of ICIDH (International Classification of Impairments, Disability and Handicaps, WHO 1980) was clearly a step forwards from a traditional disease or abnormality paradigm. However, since impairment was identified as the cause of disability and handicap, and the environment was considered to be neutral, it still focused on medical issues (Barnes and Mercer, 2003). Therefore, the revision of ICIDH named ICF (International Classification of Functioning, Disability and Health) was based on an integration of the medical and social models. ICF attempts to synthesize the biological, individual and social perspectives, and has moved away from “disease” to “health” (WHO, 2001). However, it still uses the phrase “people with disabilities”, unlike advocates of the social model within “disablist sociology” (Oliver, 1996).
3.1.3.1. **Functioning and disability**

The ICF (WHO, 2001) has two parts: Functioning and Disability, and Contextual Factors. The first part contains the three components in the horizontal middle of Figure 1 below. *Body functions* are the physiological functions including psychological functions, and *body structures* are anatomical parts. Impairments are problems in body function or structure. *Activity* is the execution of a task or action by an individual. *Participation* is involvement in a life situation. Activity limitations are difficulties an individual may have in executing activities. Participation restrictions are problems an individual may experience in involvement in life situations (ibid.). Activity limitations could be difficulties while boarding a bus. If this turns out to be impossible, the person cannot use the services and so cannot be involved in certain societal situations: participation would then be restricted.

![Figure 1. Interactions between the components of ICF (WHO, 2001, p. 18)](image)

3.1.3.2. **Contextual Factors**

The second part of ICF contains the two boxes in Figure 1. Contextual Factors represent the surrounding reality and background of an individual.

*Environmental factors* are constituted by the physical and social environment. They could be either individual (the immediate environment) or societal (social structures, services and systems). This level includes, for example, communication and transportation services, laws, regulations, formal and informal rules, attitudes and ideologies.

*Personal factors* are the background of an individual apart from pure health issues. They could be gender, age, coping styles, social background, life story, and overall behaviour pattern. They are not subject to classification, but are inherent in the model due to more or less obvious impacts.
Thus, “Disability is characterized as the outcome or result of a complex relationship between an individual’s health condition and personal factors, and of the external factors that represent the circumstances in which the individual lives” (p. 16), often referred to as the so-called Person-Environment relationship.

### 3.1.4. Grouping or categorization of disability

The ICF is crucial when it comes to a comprehensive and updated understanding of disability issues. However, for planning issues and also for research survey issues, it is slightly difficult to use. There are various reasons for this.

In order to achieve enhanced accessibility by planning and design efforts, a user’s perspective is required. Therefore, the users from various groups have to contribute or participate in the development or evaluation process. The individual participants are usually recruited from specific disability organisations, in order to assess, e.g., tactile surfaces, wheelchair comfort, vehicle boarding or ICT tasks. The results have to be presented in an interpretive manner: the results regarding people with mobility impairments, visual impairments etc.

To give an example: a research study performed by DPTAC5 (The Disabled Persons Transport Advisory Committee) chose the following way of grouping the target passengers:

- ambulant disability
- wheelchair users
- visually impaired
- hearing impaired
- learning disability

Another way of categorizing the target groups could be (focusing “the body”):

- mobility impairment, meaning reduced function of legs and feet
- dexterity impairment, meaning reduced function of arms and hands
- hearing impairment
- visual impairment
- speech and language impairment
- cognitive impairment

Within the activities of Euro Access, the consortium has decided to use the following categorization, namely
- mobility impairments (MI)
- sensory impairments
  - visual impairments (VI)
  - hearing impairments (HI)
- cognitive impairments (CI)
- mental health problems (MHP)
- environmental sensitivities and allergies (ESA)

However, it is important to bear in mind that neither sub-groups of disabled or older people should be treated as homogenous when it comes to actual usability of public transport and the built environment.

3.1.5. **Grouping by age**

As mentioned earlier, populations of post-industrial nations are aging. A large number of studies have addressed this issue, e.g. mobility needs and travel patterns of individuals over 64, distinguishing between the "young" older people (aged 65-75 years) and the "old" older people (over 75 years). This distinction (Alsnih & Hensher, 2003) is particularly useful in recognising the threshold of health change that impacts on mobility needs.

Others have chosen the intervals 65-74, 75-84, 85-, whereas some researchers stress that "age" is not necessarily a figure. Instead, the concepts of “third and fourth age” have been introduced. Neugarten (1974), for example, describes those in the third age (young old) as retirees from the workforce, active and in relatively good health. On the other hand, the fourth age (oldest old) comprises all negative old age stereotypes. Other researchers (psychologists, gerontologists) have proposed more psychological (instead of medical or sociological) related models: functioning in the third age may be primarily "age-related", whereas functioning in the fourth age becomes more "death-related" (Baltes, 1997).

Within the activities of Euro Access, the consortium has not explicitly addressed older people and their needs and expectations from certain criteria or age groups.

3.1.6. **Concept of competence**

In social gerontology, an important concept called “the environmental docility hypothesis” suggests that the environment is a more potent determinant of behavioural outcome as personal competence decreases. However, this also means that a person may seek, choose, or create an environment in order to satisfy his or her needs and preferences. As an extension, “the environmental pro-activity hypothesis” thus suggests that as personal competence increases, the variety of environmental resources that can be used in satisfaction of the individual's needs increases. This may seem complicated, but put simply, the hypotheses state that individuals with low competence are much more dependent on the environment than those with high competence (Lawton, 1980, 1990).

The use of the concept of competence has been quite fruitful regarding older people, mobility and accessibility. As such, but with caution, it could also be applied in general disability research.
3.1.7. Concepts of mobility, accessibility and usability

Mobility has several definitions ranging from “moving by changing position or location, or by transferring from one place to another” (WHO, 2002), to a more holistic view: “also taking movement and degree of independence during such a movement in consideration” (Peel et al., 2005). Social relationships and activities are important elements in the quality of life of everyone – able-bodied, disabled, younger and older people. With increasing age, and with increased marginalization, these elements are, for various reasons, made more difficult. Therefore, mobility becomes fundamental regarding participation in social relations and activities for older people (Mollenkopf et al., 1997) and disabled people.

“Outdoor mobility” is often referred to as the ability to move about - either ambulant, using an assistive device, or by means of transportation – sufficiently to carry out activities outside the home. Such outdoor mobility could be seen as a prerequisite, not only to be able to consume services and products, but also to participate in society generally (Mollenkopf, Marcellini, Ruoppila, Széman, & Tacken, 2005). Here the ICF link between activity and participation becomes evident. Outdoor mobility frames the capacity to carry out activities outside the home, e.g. get to the bus stop a few blocks away in order to participate in any given social context or situation that requires individual transportation.

Regarding the concept of accessibility, there are many dimensions and perspectives. Some definitions used in environmental (especially environmental gerontology) discourse, planning and architecture refer to if and how activities in society can be reached, the possibility to take part in something desirable and the geographic proximity in terms of distances and time (Iwarsson & Ståhl, 2003). However, accessibility is also a relative concept, implying that it should be expressed as a person-environment (P-E) relationship. In other words, “accessibility is the encounter between the person’s or the group’s functional capacity and the design and demands of the physical environment”, and as such, it “refers to compliance with official norms and standards” (ibid. p. 61).

Quite recently, the concept of accessibility often goes together with other concepts such as “Design for all”\(^6\), which then should be part and parcel of accessibility planning and implementation. References could also be made to “Usability” and “Universal design”\(^7\). However, usability is not only based on compliance with official norms and standards, but also takes “into account user evaluations and subjective expressions of the degree of usability”. Therefore, usability could be regarded as “a measure of effectiveness, efficiency, and satisfaction. Most important, there is a third component distinguishing usability from accessibility: the activity component [P-E-A]” (Iwarsson & Ståhl, 2003, p. 62). To conclude, a “sweeping” definition might be to describe accessibility as mostly objective in nature, and usability as mostly subjective.

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\(^6\) Intervention in environments, products and services with the aim that everybody, including future generations, and without regard to age, capabilities or cultural origin, can enjoy participating in our societies (EIDD, 2007).

\(^7\) The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (CUD, 2007).
3.1.8.  The concept of capability

Mobility and transport are related to opportunities of being able to live well. Amartya Sen (1995) pointed out the problem associated with evaluating well-being only from the viewpoint of “goods” and “utility”. He argued that well-being also should be evaluated by broader aspects of ways of life, introducing the concept of “capability”. Capability and functioning mean freedom in people’s various states: levels of health or wealth, eating, walking and so on. People combine several kinds of functioning from the sets of functions from which they can choose when they spend their time living. Capability means these sets of functions from which they can choose (Nitta, Inoi, & Nakamura, 2004). Thus, capability is quite closely related to the reasoning above, i.e. the relations between person, environment and activity.

3.1.9.  Language in practice

In the document “Improving Access to Public Transport – Guidelines for Transport Personnel” (ECMT, 2006a), a useful list of expressions to avoid when referring to disabled people, along with suggestions for alternative terms, is presented (in a lay perspective). These suggested expressions “embody the dignity and respect that should characterise your interactions with people with disabilities. Terminology evolves over time, so this list may evolve as well.” Some excerpts are presented in Table 1.

<table>
<thead>
<tr>
<th>Do not use</th>
<th>Use instead</th>
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<tr>
<td>Aged (the), elderly (the)</td>
<td>Older people (adjectives like frail, senile, feeble should not be used)</td>
</tr>
<tr>
<td>Blind (the)</td>
<td>Blind people</td>
</tr>
<tr>
<td>Confined to a wheelchair</td>
<td>Wheelchair-user, wheelchair passenger</td>
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<tr>
<td>Crippled, lame</td>
<td>Has a mobility impairment</td>
</tr>
<tr>
<td>Deaf and dumb</td>
<td>Without hearing and speech</td>
</tr>
<tr>
<td>Epileptic (the)</td>
<td>Has epilepsy</td>
</tr>
<tr>
<td>Handicapped (the)</td>
<td>Disabled people (“handicapped by” could be appropriate)</td>
</tr>
<tr>
<td>Insane</td>
<td>Has a mental health problem</td>
</tr>
<tr>
<td>Invalid</td>
<td>Has a disability (the literal sense of the word “invalid” is not valid)</td>
</tr>
<tr>
<td>Mentally-retarded</td>
<td>Has an intellectual disability</td>
</tr>
<tr>
<td>Normal</td>
<td>Able-bodied or non-disabled</td>
</tr>
<tr>
<td>Spastic</td>
<td>Has cerebral palsy</td>
</tr>
<tr>
<td>Suffers from, victim of etc.</td>
<td>Has a disability (having a disability is not synonymous with suffering)</td>
</tr>
</tbody>
</table>

Table 1.  Examples of expressions recommended to PT staff.
3.2. Mobility and accessibility for all people – general issues

3.2.1. Equity

In order for countries to achieve equity through accessible mainstream public transport, no single approach, whether based on disability rights legislation or relying on the commercial judgement of the transport market, will produce a satisfactory outcome. What is required is a combination of legislative action coupled with financial incentives. The latter should be based upon an acceptance that there are real benefits from improved mobility and accessibility for the national community (government) as well as for the individual (Oxley & Short, 1995).

Concepts of equity, fairness and justice frequently appear in writing on transport provision for older and disabled people, but it could be argued that several distinct concepts underlie this usage: procedural fairness, legitimate expectations, formal equality, substantive equality, equal choice, rights, and needs (Hay, 1995).

Equity means that everyone has the right and possibility to use public transportation. The provision of an equitable mode of transportation must be the fundamental concept towards the future (Kose, 2004). This “one mode” should meet a variety of needs, which is quite challenging as we shall see later in the present document.

3.2.2. Policy and practice

Although public transportation authorities (PTA) have to a large extent accepted the underpinning theoretical arguments for policies that call for full and equal access, the reality is that for a variety of reasons the theory is often not turned into practice (Byrne & Holt, 1995). True mobility can only be achieved by addressing many different areas in parallel. E.g., accessible public transport can only be effective if it is operating within an accessible pedestrian environment and if all the other factors such as information, training, traffic management and financial support are also in place (Oxley & Frye, 1995).

The concerns of creating access to transport systems for older and disabled people have been stated comprehensively by The European Conference of Ministers of Transport (ECMT). Some ECMT guidelines are worth noting (Aurbach, 2001):

- the specific needs must be routinely taken into account whenever there is new investment
- new transport facilities must comply with regulations governing access
- the specific needs must be the object of special training for planners, architects and engineers on the one hand and for the operating personnel concerned on the other
- many measures are of a low cost character, and their benefits extend beyond disabled people
- special transportation services are best regarded as supplements to and not replacements for accessible mainstream PT
- further research and exchanges of information and experience are needed, avoiding repetition of mistakes made elsewhere
Key factors for linking policy and practice in order to improve access are grouped in four categories (Oxley, 2004):

- **Role of national governments**
  - national legislation requiring the provision of fully accessible public transport over a period of time provides a framework for local activities
  - provide incentives and producing guidance on standards of good practice

- **Co-operation between local authorities and public transport operators**
  - close, continuing and frequent co-operation between local authorities, local transport authorities and transport operators is essential
  - where operators are independent, authorities should stipulate clearly the accessibility level required in agreements that are contractually enforceable

- **Training**
  - disability awareness training

- **Costs and benefits**
  - financial benefits from increased use of the public transport services
  - incorporate additional investments and financing costs into long-term transport development plans
  - better enforcement of existing traffic laws (e.g. fines for illegal parking)

As an example of training, guidelines for staff involved have been drafted (see section 3.1.9 above). The approach taken is based on the social model of disability. The main fears of passengers who identify passengers who may need assistance, assisting passengers who are blind or partially sighted, deaf / hard of hearing, who have intellectual disabilities, speech disabilities, mobility impairments, facial disfigurements or epilepsy are covered. (ECMT, 2006a)

### 3.2.3. Accessibility

In order to address the concept of accessibility, several studies have been conducted. Often, the approach used is a geographical one. Better planning of PT, compressed journey analysis, demand responsive transport (DRT), the potential of new information technology, and rethinking the scheduling of time-space interaction are key issues (Hine & Grieco, 2003). For instance, fruitful conclusions could be reached by analyzing space-time accessibility in terms of activity and participation under space-time constraints in daily life as one of the measures for evaluation of mobility-related social exclusion (Ohmori & Harata, 2004).

Many accessibility indicators, however, are not suitable for older people as they do not reflect the types and characteristics of journeys older people actually make and aspire to make. The missing element is the importance of mobility and independence for this group – the ability to just get out and about, the ability to meet people, to partake in social interactions (Titheridge & Solomon, 2007). Psycho-physiological data may be able to provide objective assessments of accessibility. The capability model below (also mentioned in the earlier theory sections) may be a framework for improved analysis, pointing out the Person, the Activity and the Environment as key framework elements (Tyler, Fujiyama, & Childs, 2007).
3.2.4. The travel chain

In a UK survey (DPTAC, 2002), a holistic approach combining both qualitative and quantitative research techniques was used. The main outcome was:

- The importance of transport and mobility
  - a main concern for disabled people
  - these differ little from those of the population as a whole
  - pavement and road maintenance essential
  - access design crucial
- Usage
  - disabled people travel a third less often and they drive far less often
  - private cars (as passengers) most important
- Information
  - ICT technology is the future
  - with better information, people would use PT services more
- Priorities
  - same as the general population
  - more comfortable and lower cost services with improved access
  - “softer” aspects – attitudes etc
  - most convenient and ease of use: taxis and minicabs
- Improved mobility has a positive impact on people’s lives
  o frequency and access
  o lowering of fares
  o better walking conditions
  o information

The difficulties experienced by users could be eliminated, or at least significantly reduced, if the planning of public transport considered the needs and demands of older and disabled people from the outset. By underscoring the importance of considering the entire chain of events – the travel chain – the attempt to offer accessible public transportation to all travellers could be facilitated. While moving oneself from origin to destination, everything involved in this travel chain must function. If so, public transport could have a chance to gain the position of superiority for travelling and represent a realistic alternative. The appraisal, experiences and perspectives of older and disabled people regarding public transportation can be represented in the way shown in Figure 3 (Ståhl, 1997).

![Figure 3. Accessible public transport - the perspective of the user (Ståhl, 1997).](image)

Another accessibility framework example is the “Comprehensive Mobility Options Framework”, emphasising the salient factors that must be considered in the provision of accessible transport services for local trips. The framework consists of three facets: the Ability Matrix, the Geographical Location Matrix and the Service Providers Matrix. As argued by the authors (Ling Suen & Sen, 2001), it could serve as a useful tool for planners and service providers to understand and define user needs, and to design and select the most appropriate transport options.

To conclude, the travel chain and other integrated perspectives underscore the importance of realizing the complexity of accessibility: reduction of hard barriers (vehicles, infrastructures) as well as soft barriers (social and cultural environment), together with the provision of supportive systems and structures.
3.2.5. Gender issues

Transport studies addressing gender aspects are relatively scarce, and often limited to car driving. However, it is generally agreed that transport patterns and choices vary with person characteristics such as age, gender and disability, with household characteristics such as income, location and transport availability, and with journey purpose. The majority of older persons is female, yet gender aspects are often neglected in older persons’ transportation issues.

Older women, older persons living singly, persons with impaired health and low economic resources, and the rural elderly tend to be particularly at risk of losing their abilities to move about (Mollénkopf et al., 2004).

In another study among community-dwelling seniors, of those subjects categorized as having problems with transportation, 88 per cent were women. In addition to being predominantly women, those who reported problems with transportation were older, in poorer health, and had lower income and income satisfaction. The study concluded, that problems with transportation are an important issue facing seniors; women, in particular. The results highlighted the differences in aging as experienced by women and men with respect to social effects, needs, and the significance attached to the experience (Dupuis, Weiss and Wolfson, 2007).

Sirén (2007) showed that that there are clear gender-related differences in mobility in old age. Older women differ significantly from older men in their travel patterns and mobility options by trip frequency, access to a car, and unfulfilled mobility needs. Also, their modal choices are typically such kinds that require moderate physical fitness and/or regular help from others. Certain socio-cultural mechanisms tend to shape women’s travel and modal choices throughout their life course, resulting into disadvantage in the old age.

Older women’s demographic and physical characteristics, combined with distinctive travel patterns, result often in serious mobility problems. However, behind the travel patterns that are typical to older women (and women in general), there are certain socio-cultural mechanisms. This, according to Sirén, means that the women’s disadvantage in travel and mobility is constructed rather than given. This perspective indicates also a possibility for change; as older women’s mobility problems and obstacles are mostly constructed by social and cultural conventions, throughout the life course, they can also be preventable. If the aim is to enhance the mobility of older persons, it is important to apply gender sensitive approach into both research and policy making.

Because the life expectancy of women is greater than that of men, all of the gender effects are likely to be related to whether or not an elderly person is living alone or with spouse or partner. This has implications in a travel chain perspective, because it is more common among women to have never held a driver’s license (compared with those who will be in their eighties in the future), and the loss of the male partner has immediate impacts on the modal options (Hensher, 2007). Therefore, an existing accessible PT system will have significant mobility effects particularly for today’s older women.
3.3. Systems

3.3.1. Overall system

Several systems analyses of the transport provisions for older and disabled people have been performed, in particular in the UK, Netherlands, Sweden and of course in the USA. These often show that the measures taken so far have reduced the problems experienced by the passengers. However, the level of activity has seldom increased significantly, and large problems remain to be solved. One particular evaluation also indicates that much more than technical solutions are required. It is shown that several small difficulties, which in themselves are manageable, may rise to insurmountable obstacles when repeated several times (Ståhl & Brundell Freij, 1995). While many solutions leading to improved adaptation of public transport benefit all passengers, they are a prerequisite for disabled and older people being able to use the transport in the first place (Petzäll, 1997).

There are additional features of the PT system’s dependability and predictability that are especially important for these groups, particularly to make it possible to travel on the spur of the moment. Research results show that the fear of such apparently minor changes as the unannounced cancellation of one scheduled run, a relocated bus stop or the exchange of a type of vehicle can mean that a person does not travel at all. Therefore, the information available about the possibilities and quality of public transport, and the information one can access prior to making a trip, are extremely important (Ståhl, 1997).

In a further paper by Ståhl (2000), two basic assumptions are made:
- no community can be fully served with a single transportation mode
- different public transit services must be responsive to individual needs

This is contrary to other researchers and policy makers, stating that “one mode” could serve all. Ståhl’s assumptions point towards a mix of services, e.g.
- Fixed Route Services with low floor buses (mainstream)
- Service Routes served with minibuses along fixed lines or on demand (FlexRoute concept) – so-called “intermediate solutions”
- Special Transportation Services for people with very low walking capacity or wheelchair users, requiring door-to-door transport

Based on a holistic approach, these systems together comprise the various needs of patrons. However, the overarching philosophy should be integration. Therefore, and to control cost, it was decided that existing PT in Holland, especially the national railway system, should constitute the backbone of the system. The institution is called “the chain manager”, which implies that a national coordinator organises multimodal trips (with support of DRT solutions) (de Boer, 2001).

3.3.2. Built environment

Disabled people’s needs are poorly articulated and represented in the design and development of the built environment. Disabled people perceive discomfort and oppression from many facets of the built environment. A number of ways could be suggested of interconnecting the design and implementation of public policy towards the built environment with the daily living experiences of disabled people (Imrie & Kumar,
1998). For example, by incorporating the physical measurements of station and terminal features and facilities with importance weightings assigned by different representative groups of disabled people, overall improved accessibility could be achieved. The ability to define and quantify the accessibility of existing infrastructure from the disabled persons' perspective could enable transport planners and operators to identify, prioritise and implement improvements in a cost effective manner (Lavery & Knox, 1998).

In order to make street areas more attractive for walking, there remains a need to identify which features affect the accessibility, safety and attractiveness of walking environments for all pedestrian groups. Unfortunately, the needs of more “vulnerable pedestrian groups” are not fully understood, and consequently rarely assessed beyond their most immediate, ergonomic requirements (Carreno, Stradling, Cooper, & Willis, 2004). These ergonomic requirements, though not providing full access, are nonetheless important as starting points.

Giving some concrete examples, there is a reasonable consensus that steps should be 140mm high with 300mm treads, with vertical solid risers, rounded noses without overhang, contrasting edge marking, width 1200–1800mm, handrails each side with a well-established design and location. Ramps should wherever possible have a maximum slope of 5%, with a maximum length 6–10 metres between landings; for short ramps, a maximum slope of 8%, and for ramps no longer than 0.6 metres, a maximum slope of 10% if unavoidable. Width and design of handrails and edge kerbs are well established.

Paths and sidewalks need to be 2m wide, but in several countries planners may resist this in residential areas, to avoid an urban appearance. There is no consensus yet on the minimum width allowed at pinches and obstacles, though at least 1m may be becoming accepted. The need for hard surfacing, drainage, lighting and oversight for personal security are well recognized.

Ramped kerbs are very important, and should have a maximum slope of about 8% and no lip at the road surface. There is a conflict with the requirements of visually impaired people, who need a kerb to indicate that they are moving from a pedestrian pathway into a road. (Mitchell, 2004)

Another infrastructure example could be found in COST 349 (Accessibility of coaches and long distance buses for people with reduced mobility – Part: Infrastructure). Some recommendations are:

- Facilities at the stop should be proportionate to the level of expected use but should, as a minimum, provide an identifiable stop and a suitable boarding area.
- Many disabled people are older and therefore shelter and seating should be considered.
- At larger stops and terminuses a range of facilities should be provided including lavatories and refreshments.
- The interaction of vehicles and disabled passengers should be minimised to provide a safe and accessible environment.
- Improvements should be considered when stops and terminals are refurbished or replaced. (EC, 2005)

### 3.3.3. System and information

The trip via public transit often begins at home. For older or disabled persons, who have perhaps not dared or been able to use PT for years, having access to clear and reliable
information already at home is a requirement. This applies both to “static information” (details about times, route layouts, etc.) and to “dynamic information”. The latter are facts about the vehicle standard on certain, current runs, whether the escalators are working, deviation, short-term changes etc. (Ståhl, 1997).

Information and communication technology (ICT) affords an excellent opportunity to offer older and impaired people easy access to pre-trip information. Older and disabled people express a need for more detailed pre-trip travel information (Waara & Ståhl, 2001). In the future, ICT technology could support this process. Several studies have targeted and tested various supportive systems: hand-held terminals (Galinier, Marin Lamellet, & Canoz, 1998), ICT ergonomics (Ling Suen, Mitchell, & Henderson, 1998), contactless smart cards and design guidelines. The TELSCAN project (Naniopoulos, Nicolle, Burnett, et al., 1999) was designed to emphasize the needs and requirements of older and disabled people. The strategy applied by TELSCAN has resulted in a number of useful outcomes, such as

- Design guidelines of ICT systems presented in the form of an Internet-based database and a printed handbook
- Evaluation methodology of ICT systems from a user’s perspective

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<td>complete chain of info</td>
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<td>all media access</td>
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<td>two-sense principle - must target at least two human senses</td>
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<td>at central places and easy to find</td>
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<td>symbols for certain standard levels</td>
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<td>accessible and easy to operate controls</td>
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<td>repeatedly announced or self-activated</td>
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<tr>
<td>use of clarity, colour and contrast standards</td>
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<td>adapted to background noise and situation</td>
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<td>adapted to changing conditions: dirtiness, dazing, sunlight and darkness</td>
</tr>
<tr>
<td>simple, easy understandable and memorable provision of info</td>
</tr>
<tr>
<td>clear presentation by pictures or pictograms</td>
</tr>
</tbody>
</table>

Table 2. Information parts, quality requirements (IbGM, 2003).
Regarding travel information, the so-called “two-sense” principle is important, allowing for users to compensate for one impairment (e.g. by the provision of simultaneous visual and audible information). It is also important to recognize that all travel information and reservation systems must be available in alternate formats and media for disabled people who do not have access to web based systems (Hunter-Zaworski, Zaworski, & Rutenberg, 2004). It is clearly the responsibility of the service provider to make sure information is presented in a way that is most helpful to passengers. The information generally consists of two parts, the “content” and the “form”; see Table 2 above. The items are discussed in sections below.

### 3.3.4. Rail

Rail accessibility refers to matters of train design, platform interface, information (before, during, after), and supportive staff. The COST 335 Action (Passengers' Accessibility of Heavy Rail Systems) is a collaborative European project in which experts from seventeen countries and four international organisations took part. With regard to access to the train and to the facilities and services provided on the train, the key issues are:

- Boarding/alighting through the doorway and the interface between platform and train floors
- Circulation within the trains
- Seating and/or sleeping accommodation
- Access to the facilities and services on the train
- Provision of information

Railway operators and rolling stock manufacturers must ensure that the train and the facilities and services provided on the train are accessible to all. According to COST 335, this can only be achieved by basing rolling stock design on design-for-all criteria. Rail industry staff also needs training – from the board to the train cleaning crew. The training should in particular cover:

- Senior and middle management
- Design and development staff
- Front-line staff.

Making public transport accessible to disabled people requires much more than just providing boarding equipment for wheelchair users to get on a train. A two-fold strategy is required (EC, 1997):

- The removal of all barriers to travel by rail, for all members of society
- Positive marketing plans to promote rail travel, particularly targeted at individuals and groups who are inhibited by their disability from considering rail travel

Users’ needs, split into three groups, are depicted in Table 3 below.
### Table 3. User difficulties when boarding and getting off the train, the SAS VH Project (Grange Faivre et al., 2007)

<table>
<thead>
<tr>
<th>MI, wheelchair users</th>
<th>MI, ambulant people</th>
<th>VI people</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Steps</td>
<td>• Steps</td>
<td>• The variability of the layout</td>
</tr>
<tr>
<td>• Height/width of the gap</td>
<td>• Height/width of the gap</td>
<td></td>
</tr>
<tr>
<td>• The button height to act on the different functionalities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The lack of knowledge about available assistance</td>
<td>• The lack of information about available assistance</td>
<td>• The lack of information concerning the gap and the steps</td>
</tr>
<tr>
<td>• Stress</td>
<td>• The other passengers’ perception of MI people</td>
<td>• Stress</td>
</tr>
<tr>
<td>• Insecurity</td>
<td></td>
<td>• Insecurity</td>
</tr>
<tr>
<td>• The flow of passengers</td>
<td>• The flow of passengers</td>
<td>• The flow of passengers</td>
</tr>
</tbody>
</table>

Steps and gaps at the entrance doors are barriers to people in wheelchairs and to people with walking difficulties. Because of the difference between platform and car floor heights, level access is not available, and boarding aid devices are necessary for disabled passengers to bridge steps or gaps. The way in which entrance to trains is to be organised imposes the greatest technical demands on the vehicles. Floor height is therefore the decisive question (Heinz & Kottenhoff, 2001). A useful source is also DRC’s “A Practical Guide for Rail services” (DRC, 2007), and Dejeammes (2000) has suggested improvements for near-term enhancements. Research targeting these issues is ongoing; see example in Table 2 above.

#### 3.3.5. Metro

Regarding metro systems, user needs are similar to rail issues. In a very detailed German study (Burmeister, 1995) on access, information and signage, metro recommendations referred to:

- Orientation/warning lines
- Distance to platform edge dimensions
- Steps and stairs: dimensions and markings
- Handrails, materials and profile
- Escalators, elevators, inclined lifts (width / length / entrance width)
- Wheelchair passage for different types
- Ticketing machine positions

A further important issue is of course that metro systems are applied in metropolitan areas with high or extremely high passenger flows.
3.3.6. **Bus**

Urban bus transit in Europe is often referred to as being accessible, at least where bus fleet mean age is low. Low floor buses have been implemented in Europe since the beginning of the 90s. The low floor bus system (LFB) system can contribute to an accessible and sustainable PT solution because of the perceived benefits of better accessibility and improved operational efficiency from faster boarding and alighting. Commonly available vehicle technologies involve an initial step of 320 mm from road level. By the use of appropriate infrastructure or a kneeling system (lowering the suspension), the step height for passengers boarding and alighting can be reduced to 270 mm from road level. Taking the bus stop as a further component of the LFB system, it is possible to raise the kerb by 160-180 mm and thus achieve virtually level access. A ramp deployed additionally to bridge the gap between the bus and the pavement makes boarding and alighting easy for wheelchair users. Other vehicle design features related to gangways, handrails and other on-board facilities, which are now clearly established, optimise accessibility, safety, comfort and operational features (EC, 1995). Later on, the COST 322 action has had a major impact on the European Bus Directive (2001), in order to unify fleets and thus lower the costs.

It has been discussed where to provide the space for wheelchairs in the bus and if a special restraint system for wheelchairs would be necessary. The best space for wheelchairs inside the bus seems to be directly opposite the second door. It can easily be reached and left by wheelchairs boarding and alighting at this door. The position of the wheelchair should be backwards (facing the rear of the bus), resting against the bulkhead (Blennemann, 1995; EC 2001).

Buses in Service Route Traffic (route based) or FlexRoute Traffic (demand responsive) are smaller low-floor buses, suitable for manoeuvring in smaller housing areas. The idea of FlexRoutes is to reduce public funding for specialized travel service for disabled people and to improve mobility for the large group of older people not eligible for such exclusive service, normally provided by shared-ride taxi or specially equipped minibuses/vans (Westerlund & Ståhl, 1998).

In a Swedish study, the public transport preferences of older people using different kinds of systems were analysed. Results showed that the physical capacity of the traveller groups differed, with DRT travellers having least physical capacity. The valuations of the standard factors varied between the groups, and the overall pattern was that those with low physical capacity had higher valuations for most of the factors. Walking distances turned out to be of very great importance for groups with low physical capacity, while avoiding booking was important among those with more physical capacity. Other factors like getting seated before the bus starts, and type of vehicle (for some groups), were also shown to be important (Svensson, 2004).

Buses do not only operate in urban settings. The COST 349 Action - Accessibility of coaches and long distance buses for people with reduced mobility - examined the issues involved in making coach and long distance bus travel more useable for disabled and older people. The report showed that there are many simple features that could be included, at low cost, in vehicle designs to make them more accessible – improved step dimensions, better seating and on-board audible and visual announcements. It also gave considerable guidance on how to accommodate wheelchair users who travel while remaining seated in their own wheelchair (EC, 2005).
To conclude this bus section, Mitchell has provided a good overview of user needs and bus design (generally conforming to the EC bus directive). Key factors are (Mitchell, 2007a):

- **Steps:**
  - Descending steps is more difficult than climbing steps and well-designed handrails make both tasks easier.
  - A step height of around 200mm is the point at which an increasing percentage of people are unable to use the stairs.

- **Handrails:**
  - The rail should be a bright colour, preferably yellow, that contrasts with its surroundings. It should have a surface texture that is easy to grip.
  - Passengers descending stairs are helped by handrails that extend outside the bus, beyond the edge of the last step.

- **Aisles and stanchions**
  - A clear width and height.
  - Narrow stanchion spacing: below 1200mm.
  - Stanchions should be a bright colour, preferably yellow, that contrasts with its surroundings.

- **Seats**
  - Enough “standing space” and seat clearance. Seat depth and height must be limited.

- **Colour contrast and information display**
  - Black against white, yellow or beige provides a good contrast, red and yellow are preferred to blue and green, which become difficult to distinguish with increasing age.

### 3.3.7. **DRT**

Specialised services will continue to be needed by some of the most severely disabled people, as well as to provide connecting services for those otherwise unable to reach public transport. This should not, however, be regarded as an acceptable substitute for accessible public transport, but rather as a complement to it (Oxley, 2004). If not, the development of accessible mainstream PT will probably be delayed.

Demand Responsive Transport (DRT), Special Transportation Services (STS), dial-a-ride, or Paratransit and concessionary travel services are special transport solutions bringing the service closer to both origin and destination, providing individual support. DRT solutions vary from country to country and from region to region.

Owing to limited resources, the solutions must have the lowest macroeconomic cost. By improving access to PT, the need for DRT for the disabled is reduced. DRT services are not only expensive, but also quite difficult to organize efficiently without affecting travel quality.
It is common that disabled people experience friction in regard to DRT services due to (Knutsson, 1997):
- Political targets for provision of service
- Co-ordination by service centres of times and vehicles for journeys
- Payment procedures

Qualitative aspects relating to wheelchair-bound travellers are
- actual safety
- perceived safety
- comfort in dignified surroundings
- information regarding the journey

Three types of vehicle are generally used for DRT transportation: standard passenger cars, minivans and vans. The most common type of vehicle used as a taxi is a standard passenger car manufactured for private use. This type of car is also used for transporting disabled and older people, as well as people with walking impairments and other mobility difficulties.

The problems experienced with passenger cars by both passengers and drivers are mainly due to the narrow entrance. A general conclusion is therefore that standard passenger cars are clearly unsuitable for taxi transport of many disabled people.

Minivans are relatively large and spacious cars that are being increasingly used as taxis. However, the floor of the mini van is relatively high, which makes entering and exiting problematic, especially for older people and people with mobility difficulties. Some minivans have been adapted to be better suited to transportation of disabled and older people, through the floor having been lowered or the ceiling elevated. Further technical development of this vehicle type for easier entering and exiting is desirable.

Vans, which are often called special vehicles or dial-a-ride buses, are common within the special transport service. They are modified standard vehicles that have been fitted with a lifting device or ramp. These vehicles can accommodate several wheelchairs and have several seats. However, they are too large to attract single passengers and are therefore not suitable for combined taxi and special transport service. It would be desirable to continue the technical development of this type of vehicle to make boarding/alighting easier and to increase passenger comfort. In the longer term, it would also be desirable to develop a low-floor vehicle of the same size as a van to be used within the transport service (Petzäll, 1997).

Improvements in the provision of accessible taxis can only be achieved through a partnership approach between regulators, vehicle manufacturers and vehicle converters. Taxi services are commercial enterprises and certainly do not operate services at a loss to accommodate disabled people. However, if design differences and costs can be minimized, there is a real prospect that the range and quality of accessible taxis will improve in the coming years (Frye & Macdonald, 2007).
The ECMT-IRU recommendations for taxi vehicle accessibility are based on two design levels (Oxley, 2007):

- Wheelchair Accessible Taxis: accessible vehicles capable of carrying the majority of passengers travelling seated in their wheelchair as well as ambulant passengers
- Standard Accessible Taxis: vehicles with features designed to make use by disabled people easier, while wheelchair users have to transfer to a regular seat

The two levels of accessibility should result in much improved travel opportunities for disabled people. A mainstream taxi fleet composed of both types would meet the requirements of the great majority of disabled people, including a substantial proportion of wheelchair users.

In order to facilitate such a fleet development, national governments should promote the introduction, over time, of requirements for taxis to meet the accessibility recommendations. Vehicle manufacturers and converters, on the other hand, should take account of the design parameters set out in the ECMT-IRU recommendations when planning and developing new vehicles.

3.3.8. Summing up

Section 3.3 has brought up issues of accessible public transport from a system and planning perspective. Important elements are vehicle design, stops and platforms, terminals and other built environments, the system links, and finally that there could be no single PT mode designed to fully meet the needs of all passengers.

The following sections contain the perspectives of users, namely each of the disability groups according to the Euro Access classification.
3.4. Mobility impairment

Mobility refers to motion in time and space. There are numerous definitions. Spatial mobility traditionally refers to geographic displacement. Adjacent to mobility, “motility” can be defined as the capacity of persons to be mobile in geographic space (Kaufmann et al., 2004). Sometimes, the concept of “people or persons with reduced mobility” (PRM) is used. This could of course be applied to all persons with any kind of functional limitations. However, this section primarily deals with issues relevant for people with locomotor limitations. This includes people who use wheelchairs and those who can walk but only with difficulty, often using some form of aid such as a cane or walker. Almost 70% of disabled people have locomotor difficulties: those with walking difficulties outnumber wheelchair users by about 10:1.

3.4.1. Mobility impairment - inability to walk

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Communication system outside</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Doors and compartment width according to standard ISO wheelchair size</td>
</tr>
<tr>
<td></td>
<td>Low floor entrance/exit without gaps, minimal level drop, with or without ramps</td>
</tr>
<tr>
<td></td>
<td>Adapted ticketing system (size, place)</td>
</tr>
<tr>
<td></td>
<td>Even compartment floor and sufficient manoeuvring space</td>
</tr>
<tr>
<td></td>
<td>Designated wheelchair space according to the EC bus directive</td>
</tr>
<tr>
<td></td>
<td>Operating controls and communication systems within reach of sitting persons</td>
</tr>
<tr>
<td></td>
<td>Fully automatic exit doors</td>
</tr>
</tbody>
</table>

| Stops   | Access/egress without level barriers |
|---------| Information, plans and timetables at low positions |
|         | Shelter without level barriers and with sufficient manoeuvring space |
|         | Sufficient parking space, and within short distances |

| Terminals | Access/egress without level barriers |
|-----------| Doors operated fully automatically and be of sufficient width |
|           | Pavements/footways, restrooms, lavatories with sufficient manoeuvring space |
|           | Sufficient manoeuvring space in front of ticketing machines and service counters |
|           | Information, plans and timetables at low positions |
|           | Operating controls and communication systems within reach of sitting persons |
|           | Sufficient parking space, and within short distances |

| Transit system | Reliable intervals, if possible with real time information |
|----------------| Provision of compensation, in case of failure to meet the vehicle requirements |

Table 4. Requirements: mobility impairment - inability to walk

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8 http://www.dft.gov.uk/transportforyou/access/tipws/inclusivemobility?page=2#a1002
People who are unable to walk may use manual or powered wheelchairs. Body functions, structures and individual living situations that make the use of a wheelchair necessary, correspond with the multitude of wheelchair designs in use.

Wheelchair users are not able to negotiate high kerbs, steps, or stairs. A low threshold is normally negotiable by users, but depends upon type, manoeuvrability and stability of the wheelchair as well as the functional limitations of the user. Steep ramps and long road gradients can often only be negotiated with assistance. Powered wheelchairs could allow for increased range.

### 3.4.2. Mobility impairment – ability to walk

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Inability to walk requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrasted-marked stanchions, handholds and other gripping aids</td>
<td></td>
</tr>
<tr>
<td>Seating next to the entrance doors</td>
<td></td>
</tr>
<tr>
<td>Operating controls placed at the level of and proximate to the trunk</td>
<td></td>
</tr>
<tr>
<td><strong>Stops</strong></td>
<td>Inability to walk requirements</td>
</tr>
<tr>
<td><strong>Proximity</strong></td>
<td></td>
</tr>
<tr>
<td>Seating arrangements, handrails and armrests</td>
<td></td>
</tr>
<tr>
<td><strong>Terminals</strong></td>
<td>Inability to walk requirements</td>
</tr>
<tr>
<td><strong>Proximity</strong></td>
<td></td>
</tr>
<tr>
<td>Seating arrangements, handrails and armrests at all staff counters</td>
<td></td>
</tr>
<tr>
<td>Operating controls placed at the level of and proximate to the trunk</td>
<td></td>
</tr>
<tr>
<td><strong>Transit system</strong></td>
<td>Inability to walk requirements</td>
</tr>
</tbody>
</table>

**Table 5. Requirements: mobility impairment - ability to walk**

People with reduced walking capacity do not generally need a wheelchair. However, they often need walking aids such as crutches, canes and walkers. Just as for wheelchair users, kerbs, stairs and steep ramps could be difficult to negotiate. Without handrails or grips, these barriers could be insurmountable. Therefore, these groups of people also benefit from wheelchair access standards. They can, however, make use of escalators, which facilitate vertical transfer. People with reduced functions of upper extremities may have limited physical strength, limited movement capability, and poor coordination. Therefore, they have problems to operate controls and communication systems of all kinds, because of difficulties in gripping and pushing.

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9 It should be noted that there is a conflict between wheelchair manoeuvrability and sufficient provision of seating in fronts of buses. Seats have to be removed in order to provide sufficient space for wheelchair users, given the current standard bus compartment design.
3.4.3. **Specific issues**

Mobility impairment applies to all modes, covering both PT and the built environment. The most important aspects of the road and pedestrian environment are footpaths and footways, junctions and road crossings, pedestrianised areas, tactile surfaces, car parking, and longer road journeys. Important aspects of infrastructure include entering and moving within a building, and boarding a vehicle (ECMT, 1999).

This group of people often uses mobility aids. Mobility aids are usually classified into walking aids, such as canes, crutch canes, crutches, walkers, and wheelchairs. Users may be capable of moving around indoors, possibly with the use of a walking aid, but are dependent upon wheelchairs when out-of-doors, especially for longer distances. It is common for people to use manual wheelchairs indoors and electrically powered ones out-of-doors. Experience shows that most people using a manual wheelchair need assistance for outdoor transportation. Electrically powered wheelchairs are capable of negotiating ordinary pavement kerbs. So-called transport chairs are used to enable wheelchair users to utilise means of transport where the doorway does not give access to an ordinary wheelchair. When a transport chair is used, the wheelchair-seated individual has to transfer him or herself from the wheelchair to the transport chair. It is common for users to complain both feeling uncomfortable and experiencing pain during the transfer to the transport chair and whilst being carried in it (Petzäll, 1997).

3.4.3.1. **Older people**

A large proportion of mobility impaired people are aged 65 and older. Their sustained mobility is a key issue. Out-of-home mobility is a crucial prerequisite for autonomy and well-being. Older persons living singly, women, persons with impaired health and few economic resources, and rural older people tend to be particularly at risk of losing their abilities to move about. Further support and stimulation for enhancing out-of-home mobility in later life must focus as much on transport policy measures as on appropriate social policy measures (Mollenkopf et al., 2004).

Older people worry more about their safety because they are likely to be more severely injured, take longer to recover and suffer greater psychological impact than a younger person in a similar incident. In PT for example, isolated stops, badly lit waiting areas and an intimidating atmosphere on-board can generate feelings of insecurity. Moving off before passengers are seated, insufficient handrails, overcrowding and erratic driving practices can increase both actual and perceived accident risk. Customer care training and other measures to promote greater confidence in using a transport system will greatly improve comfort and safety levels and enhance the experience of travelling (DETR, 2001).

The safe infrastructure is important for PT access, and policies and provision for pedestrians in urban areas should include:

- Pedestrian priority
- Built-out sidewalks at pedestrian crossings
- Central pedestrian refuges on two-way roads (Mitchell, 2007b)
Other countermeasures consist of:

- Safer roads, through design improvements and reductions in vehicle speeds
- Safer vehicles, through the promotion of crashworthiness as a critical feature and discouragement of large, aggressive vehicles in the vehicle fleet
- Safer road users, through programs that promote adoption of safe driving and walking practices (Oxley, Charlton, & Fildes, 2007)

Many pavements and pathways have poor design, due to unevenness, obstacles etc., and

- It is women and particularly the oldest women who experience most problems, also when it comes to walking.
- Factors connected to the surface of the pavement or pathway cause most difficulties, except for the outstanding difficulty that cyclists on the pavement cause. The fear of falling over, due to a bad pedestrian environment, is greater than the fear of traffic accidents. Both experienced difficulties, feelings of being insecure and fear of accidents to some degree influence how much a person is out walking. Especially the “older” older people feel restricted (Svensson & Towliat, 2007).

3.4.3.2. Wheelchair safety

A prerequisite for achieving improved safety and comfort for wheelchair-seated passengers and their assistants, as well as the driver and co-passengers, is that the equipment used meets specified requirements and that it is used correctly. Recognition of the specific safety needs of wheelchair users has resulted in the development of International Standards Organisation (ISO) Standards, technical provisions being included in European Commission (EC) Directives and the ongoing development of UNECE Regulations (Macdonald, 2004).

Wheelchair-seated passengers on European urban transit buses can travel rearwards, resting against a bulkhead, without the use of tie-down equipment. The European Bus Directive provides detailed information on wheelchair access on buses. Other national sources provide additional information. Buses must be equipped with some kind of device to enable wheelchair users to board and alight, for example a boarding ramp with enough width, slip resistant surface, and a slope with low inclination (DfT, 2003).
3.5. **Visual impairment**

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Mobility impairment requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entrance and exit orientation through markings: colour contrasts and differences in brightness</td>
</tr>
<tr>
<td></td>
<td>Distinction of equipment, interior elements, all operating controls and communication systems by a clearly colour contrasted design, supported by light sources</td>
</tr>
<tr>
<td></td>
<td>All operating controls and communication systems similarly designed, and with raised, tactile, illuminated elements</td>
</tr>
<tr>
<td></td>
<td>Visual information, proximate, with a good level of contrast, dazzle-free and with a sufficient letter height as well as easily understandable audible announcements</td>
</tr>
<tr>
<td></td>
<td>Standardized design for easy recognition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stops</th>
<th>Outdoor crossings with audible or tactile signals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Colour contrasted glass screen partitions on shelters</td>
</tr>
<tr>
<td></td>
<td>Visual information, proximate, with a good level of contrast, dazzle-free, a sufficient letter height as well as easily understandable audible announcements from vehicles</td>
</tr>
<tr>
<td></td>
<td>Standardized design for easy recognition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Clearly contrasted tactile surfaces guiding towards vertical transfer, restrooms and lavatories, service counters, information centres and vehicle entrances</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outdoor crossings with audible or tactile signals and warnings</td>
</tr>
<tr>
<td></td>
<td>Indoor crossings with tactile signals and warnings</td>
</tr>
<tr>
<td></td>
<td>Operating controls of machines and elevators by illumination, colour contrasting and differences in brightness and tactile buttons</td>
</tr>
<tr>
<td></td>
<td>Avoidance of obstacles as well as clearly contrasted and tactile warning surfaces at dangerous spots</td>
</tr>
<tr>
<td></td>
<td>Colour contrasted glass screen partitions and doors</td>
</tr>
<tr>
<td></td>
<td>Visual information, proximate, with a good level of contrast, dazzle-free and with a sufficient letter height as well as easily understandable audible announcements</td>
</tr>
<tr>
<td></td>
<td>Standardized design for easy recognition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transit system</th>
<th>MI requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Easily understandable announcements, additional solutions in case of breakdowns</td>
</tr>
</tbody>
</table>

**Table 6. Requirements: visual impairment**

Visual impairment or vision impairment is vision loss that constitutes a significant limitation of visual capability resulting from disease, trauma, or a congenital or degenerative
condition that cannot be corrected by conventional means, including refractive correction, medication, or surgery.

Visual impairment is the consequence of a functional loss of vision, rather than the eye disorder itself. Eye disorders that can lead to visual impairments include retinal degeneration, albinism, cataracts, glaucoma, muscular problems that result in visual disturbances, corneal disorders, diabetic retinopathy, congenital disorders, and infection. Visual impairment can also be caused by brain and nerve disorders, in which case it is usually termed cortical visual impairment (CVI)\(^{10}\).

Blindness is the inability to see. The leading causes of chronic blindness include cataract, glaucoma, age-related macular degeneration, corneal opacities, diabetic retinopathy, trachoma, and eye conditions in children (e.g. caused by vitamin A deficiency). Age-related blindness is increasing throughout the world, as is blindness due to uncontrolled diabetes. On the other hand, blindness caused by infection is decreasing as a result of public health action. Three-quarters of all blindness can be prevented or treated\(^{11}\).

Despite of the use of glasses, visual acuity among VI people is reduced to 1/3 – 1/50 of normal values. Furthermore, the field of vision is limited and some also have high glare sensitivity. In areas with poor contrast and lighting, this results in orientation difficulties. Low obstacles and objects in peripheral areas “disappear”. A relatively large group is affected by colour weakness or colour blindness, thus being unable to distinguish certain colours (commonly green-red) or any colours at all. The overarching design ideas targeting VI needs should enable patrons to orientate themselves.

### 3.5.1. Specific issues

Persons with visual impairments or blindness can face significant restrictions on their efficient travel, especially when attempting transit transfers and using a large, multi-modal terminal. Empirical data have shown that different types of transit tasks and locations have a wide range of difficulty and inherent time penalties. Some tasks like crossing a difficult street, finding unmarked entrances, exits, gates and inconsistently placed amenities are quite time consuming and sometimes impossible to accomplish (Marston, 2005).

A major concern is how well a person who is visually impaired is able to interpret traffic sounds to cross a street safely in both residential and business areas. Blind people must depend almost entirely on traffic sounds to make accurate and safe crossings. Low vision people often hear an approaching car before they see it and therefore also depend heavily on the sound of traffic. Therefore, individuals who have both visual and hearing impairments are at a double disadvantage when determining when to make street crossings (Wiener & Lawson, 1997).

Roundabouts are becoming increasingly popular. Certain features of roundabouts inherently limit access to pedestrians with visual impairments. The most significant of these is the purpose of roundabouts to create an uninterrupted traffic flow. Without right angles and without consistent breaks in the traffic flow, crossings are made more difficult. (Ashmead, Guth & Long, 2005).

\(^{10}\) [http://www.nichcy.org/](http://www.nichcy.org/)

\(^{11}\) WHO, Fact Sheet N°282, [www.who.int](http://www.who.int)
3.5.1.1. Colour, luminance, contrasts

For individuals with some remaining vision, high-contrast design in public areas can greatly increase mobility. This kind of design is especially important for all kinds of PT, e.g. railways and urban PT. Markings must be easily seen by citizens with reduced vision, but must also be aesthetically and architecturally compatible with the surrounding space (Lehning-Fricke, 1998). Use of specific design guide tables enables designers to achieve either so-called monochromatic, hue contrasting or adjacent harmony schemes. These will help to improve the orientation of VI people in the built environment, easing access to PT and expanding travel opportunities (Lewis, 2005).

3.5.2. Tactile surfaces

Severely visually impaired people are completely dependent on movement sensors in their hands and on their own ability to perceive structures and changes in tactile surfaces. They do this by using a long white cane. "Tactile perception" involves physical contact with objects or surfaces at the same time as cognitive processes are involved. The ability of orientation among persons with visual impairments is a very complex issue, since this is in no way a homogeneous group (Silverstone et al., 2000). The challenge is to find tactile surfaces that are useful for severely visually impaired and blind people who use white canes but that are also attractive to people with normal sight. DETR (1998) has provided guidance on the use of tactile paving surfaces. Some key design principles are:

- Layouts simple, logical and consistent
- Contrasts in colour and tone should be used as accents

Tactile information principles are:

- Visually impaired people will actively seek and make use of tactile information underfoot, particularly detectable contrasts in surface texture.
- The ability to detect contrasts in texture underfoot varies from one individual to another.
- The different tactile surfaces are:
  - Warning Surfaces
  - Blister Surface For Pedestrian Crossing Points
  - Corduroy Hazard Warning Surface
  - Platform Edge (Off-Street) Warning Surface
  - Platform Edge (On-Street) Warning Surface
  - Segregated Shared Cycle Track/Footway Surface and Central Delineator Strip
  - Guidance Path Surfaces
  - Information Surfaces

However, the difference between guidance path surfaces and hazard warning surfaces may be hard to recognise. The surrounding material’s evenness is extremely important for providing secure guidance. Certain materials do not match properly, and could lead to a
Visually impaired people are restricted in their ability to participate in public life because of lack of labels and signs in the environment. Instead, many people can accept the information through speech - that is, having printed or displayed text read aloud. ICT systems could be even more supportive in the future for VI people. For example, remote infrared audible signage could provide effective wayfinding information for using PT terminals and pedestrian intersections, thereby enhancing independence (Bentzen, Crandall, & Myers, 1999). Other trials with audible signals - ESOT (Kulikowsky, 2001), FSK (Radecki, Lukaszewicz, & Kulikowski, 2004), (Fujii, Nakamura, Ohsugi, & Tauchi, 2007) - have shown promising results, supporting guidance and navigation. Lately, the implementation of GPS technology could also be used in everyday life and make a real and lasting difference in blind peoples’ life situation. Various tasks that could be facilitated by supportive technology include:

- How to browse an area off-line and memorize a route before leaving
- How to find commercial places, services, PT stops and vehicle location
- How to navigate inside terminals
- How to navigate in more complex and open environments such as parks
- How to share information with other people

3.5.3. ICT devices

loss of orientation (Ståhl, Almen, & Wemme, 2004). Other small but important details are that blister paving with flat-topped blisters are more easily detectable than slabs with rounded domes, and soft, sinusoidal tiles provide particularly useful guidance (Jansson, Ståhl, Iwarsson, Dahlin Ivanoff, & Almén, 2007).
3.6. Hearing impairment

<table>
<thead>
<tr>
<th>Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual display: external displays (front, side of the entrance and on the rear) showing bus, tram, metro and train route and final destination</td>
</tr>
<tr>
<td>Visual display: internal displays showing time, next stop and time to next stop, and possible connections</td>
</tr>
<tr>
<td>Internal audible information (simultaneous and equivalent to visual info)</td>
</tr>
<tr>
<td>For speech impaired, the use and requests should be possible without verbal communication</td>
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<table>
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<th>Stops</th>
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<tbody>
<tr>
<td>Audible information (simultaneous and equivalent to visual info)</td>
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<tr>
<td>General benefit from visual impairment requirements</td>
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<tr>
<th>Terminals</th>
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<tbody>
<tr>
<td>Audible information (simultaneous and equivalent to visual info)</td>
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<tr>
<td>General benefit from VI design</td>
</tr>
<tr>
<td>Text phones and screen information interaction</td>
</tr>
<tr>
<td>For speech impaired, the use and requests should be possible without verbal communication</td>
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<th>Transit system</th>
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<tr>
<td>Mobility impairment requirements</td>
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<tr>
<td>Easily understandable announcements, additional aids in case of breakdowns</td>
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</table>

Table 7. Requirements: hearing impairment

This group includes people with mild and moderate hearing loss, the hard of hearing, late-deafened and deaf people (before language acquisition). Hearing impairment is a communicative disability that partly affects speaking ability, and always hearing ability. Sound levels and ranges are reduced, and the sound is often distorted. For people with hearing impairment, visual perception is crucial. Hearing impairment is a broad term used to describe the loss of hearing in one or both ears. There are different levels of hearing impairment12:
- Hearing impairment refers to complete or partial loss of the ability to hear from one or both ears. The level of impairment can be mild, moderate, severe or profound.
- Deafness refers to the complete loss of ability to hear from one or both ears.

12 WHO Fact sheet N°300, Deafness and hearing impairment, www.who.int
There are two types of hearing impairment, defined according to where the problem occurs:

- “Conductive” hearing impairment, which is a problem in the outer or middle ear. This type of hearing problem is often medically or surgically treatable, if there is access to the necessary services; childhood middle ear infection is the most common example.

- “Sensorineural” hearing impairment, which is usually due to a problem with the inner ear, and occasionally with the hearing nerve going from there to the brain. This type of hearing problem is usually permanent and requires rehabilitation, such as with a hearing aid. Common causes are excessive noise and ageing.

3.6.1. **Specific issues**

Audible terminal, platform and in-vehicle messages are situated in a very “noisy” surrounding: passing trains, poor acoustics etc. Regardless of hearing capacity, these audible messages are difficult to interpret. Patrons often have to rely on text format, emphasizing the importance of information quality (form and content; see Table 2). Unfortunately, onboard buses, coaches, trams and trains only audible information is usually provided. For the safety of all passengers, but particularly those who are deaf or hard of hearing, there is a need to display all onboard audio announcements in text format, particularly in real time. This includes messages from onboard personnel concerning connections, emergency instructions, schedule changes, etc. (Rutenberg & Hunter-Zaworski, 2007). This parallel approach is fully in accordance with the second-sense principle.

In quoting RNID (The Royal National Institute for Deaf People in UK)\(^{13}\), producing text for a deaf person is similar as for other audiences: the information must be easy to understand. The best way to do this is to write in plain language, characterized by

- short sentences and paragraphs
- short instead of long words (“buy” not “purchase”)
- avoidance of jargon
- clear headings and bullet points
- diagrams replacing long written descriptions
- explanatory images and photographs (real people, not models, in action)

\(^{13}\) [http://www.rnid.org.uk/](http://www.rnid.org.uk/)
### 3.7. Cognitive impairment

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Visual and hearing impairment requirements</th>
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<tr>
<td></td>
<td>Simple and understandable displays</td>
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<td></td>
<td>Simple and understandable route maps</td>
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<td>Operating controls with clear and easily memorable pictograms</td>
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<td>Equipment reducing anxiety and promoting comfort and safety</td>
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<td>Stops</td>
<td>VI and HI requirements</td>
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<td>Simple and understandable displays</td>
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<td>Equipment reducing anxiety and promoting comfort and safety</td>
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<tr>
<td>Transit system</td>
<td>Mobility impairment requirements</td>
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</table>

**Table 8. Requirements: cognitive impairment**

This section deals with issues relevant for people with cognitive functional limitations. These groups of people have difficulties in understanding complicated information or in using complex structures. The prevalence is difficult to estimate. People with a cognitive impairment learn and develop under difficult circumstances, permanently being confronted with the complexity of the surrounding system. This is particularly evident in unknown environments. Adaptation takes time, and often reaction times are extended. Feeling comfortable and secure is crucial for coping with familiar tasks and being able to learn new ones. Constantly facing the unknown creates insurmountable environmental pressure.
Sometimes these groups are referred to as people with learning disabilities (particularly children and adolescents). A learning disability is a lifelong condition that affects a person's intellectual, social and emotional development. It may take many forms and have many effects. Learning disability may be caused by damage to the brain before, during or shortly after birth. It can be the result of genetic changes, or it can be inherited. Often the cause is not known. Learning disability is not an illness, and thus is not “treated or cured”. However, many effects of the disability can be overcome with the right education and supportive elements, environments and structures.14

### Specific issues

The prevalence of cognitive impairment varies in the published literature, due to the fact that definitions and study designs differ. It is difficult to point out exact figures, but since CI can have many causes, the proportion of persons with these functional limitations is considerable.

Research about cognitive impairment and transportation is scarce. As there is a lack of knowledge in common when it comes to the use of public transport, there is no research available that determines whether any particular cognitive domain is of more importance than another in this matter. Research about ability to participate in society is also lacking. Existing guidelines tend to focus on people with “common impairments”, such as MI, VI and HI. Very little work has been done to produce guidelines that can be applied when designing a transport system that is also accessible for people with cognitive disabilities. Nevertheless, there are some examples, particularly from other areas (for example indoor design for people with dementia), that can be applied on a public transport system. How people with cognitive disabilities can contribute to a design process is an area that still needs to be investigated (Rosenkvist, Wallergård & Wendel, 2005).

It has also been suggested that the rights of people with cognitive impairments, such as dementia, have been less strongly advocated than those of MI, VI or HI people. This is particularly the case with environmental planning and design. The needs of these people are now informing the design of residential homes and day centres, but the issue of accessibility to public spaces has been almost completely neglected (Blackman et al., 2003). Hence, this also affects the use of PT services.

The mobility of cognitively impaired people is influenced by “external” as well as “internal” factors, and various strategies are used within the group in order to enhance mobility. External factors influencing mobility can be the design and character of the environment, for example the fact that the traffic environment creates complex situations that are hard for the target group to handle. Internal factors that influence mobility can be self-confidence, self-esteem and the wish to feel like a "normal" member of society. Strategies are used in order to overcome difficulties, for example when finding one’s way, feeling confident or being able to manage mobility every day even though stamina varies over time (Rosenkvist, Wendel, Ståhl, Risser, & Iwarsson, 2007).

Very little work has been done to find out how signs and sign systems could be made better for people with cognitive impairments or learning disabilities. Also, very little work has been done to improve their mobility generally, in terms both of identifying the problems

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14 www.mencap.info
and in developing solutions. People with cognitive impairments or learning disabilities do use signs, as well as other things to help them find their way, such as (DRC, 2004):
- learning journeys and places by going with another person
- looking out for familiar landmarks
- using simple maps or written directions
- using photographs of different parts of journeys to assist memory

The basic principles of sign systems are the same as for everyone else:
- clear (easy to see and understand)
- concise (simple, short and to the point)
- consistent (signs meaning the same thing should always appear the same).

Good signs and sign systems will help people stop feeling worried or confused. People with cognitive impairments or learning disabilities could benefit from an increased use of pictures on signs. This might include:
- pictograms, such as those used for male and female toilet signs
- symbols, such as a coat hanger to indicate a cloakroom
- “story-board” style pictures depicting people doing things

Colour can be extremely beneficial when used for directional signs. For example, in a hospital, different colours can be used to indicate different departments. These colours can then be used throughout the sign system, from the directory sign, through the directional signs and then within the relevant departments (ibid.).

The linkage to the previously mentioned ICT development and navigation is obvious (see the preceding VI section). The ability to navigate cities with a degree of independence is a crucial step towards achieving self-reliance. One example is the DAISY system (Dynamic Assistive Information SYstem), which can be used in any situation where there is a pre-known fixed route. Apart from journeys undertaken regularly by the user, it could also be used to provide support for tourist walks, routes around local areas, and so on. The system offers the potential to provide route guidance within the hospital environment – e.g. to help people find their way from one department to another or to find particular facilities (Wainstein & Tyler, 2007). It should be possible to extend such a system to other areas, viz. public transport terminals.
3.8. Mental health problems

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<th>Vehicle</th>
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<td>Visual and hearing impairment requirements</td>
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<td>Simple and understandable route maps</td>
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<td>Operating controls with clear and easily memorable pictograms</td>
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<td>Equipment reducing anxiety and promoting comfort and safety</td>
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<td>Simple and understandable route maps</td>
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<td>Equipment reducing anxiety and promoting comfort and safety</td>
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<td>VI and HI requirements</td>
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<td>Simple and understandable route maps</td>
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<td>Operating controls with clear and easily memorable pictograms</td>
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<tr>
<td></td>
<td>Equipment reducing anxiety and promoting comfort and safety</td>
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</tbody>
</table>

| Transit system               | Mobility impairment requirements                                 |

Table 9. Requirements: mental health problems

The previous section dealt with cognitive impairment issues and learning disabilities. Mental health problems by comparison are somewhat different. They are not usually evident in the early years of a person's life. Unlike a learning disability, mental illness is not usually thought of as a result of damage to the brain, and does not usually result in a permanent cognitive functional limitation.

People with mental health problems may suffer from relationship, experience, recognition, orientation, concentration, attention or memory disorders. Internal or external processes may cause anxiety and panic attacks, resulting in loss of control and avoidance behaviour as for example nervous hart, perspiration, dizziness or hyperventilation.
The causes of MHP may vary, but some factors might increase the likelihood of developing mental health problems, such as genetic predisposition, difficult family background, childhood abuse, stressful life events, and other social causes. MHP can occur in episodes, and complete recovery is possible. Although MHP, cognitive and learning disabilities are separate things, people in the latter states can experience a full range of MHP. In general, they actually have a higher rate of mental health problems than people without cognitive or learning impairments.\textsuperscript{15}

3.8.1. Specific issues

Very little information is found that explicitly targets these user groups, and is even more scarce among cognitively impaired people. This was explicitly stated by DPTAC (2001): “In any future report we would hope to expand the scope of the research, …[in order to] cover additional disabilities, such as mental health problems, where knowledge of relevant issues is less well understood.” (p. 8)

One project has examined a provision of appropriate transport for people suffering from mental illness in rural Kent, UK. Of particular interest was the way in which poor availability of transport could be affecting the delivery of care to service users. Included in this project was a study of transport assessments, and the way in which they could play a more important role within the design of care plans.

Results showed that ill people clearly have several problems with transport, and that some of these have effects on their treatment. Some of these problems relate to the way in which mainstream and DRT transportation was organised and operated. Others related to the way in which people deal with transport when feeling unwell. A number of options for resolving this were proposed, in particular the possibility of introducing “travel mentors” to help people use the transport system.\textsuperscript{16}

Another crucial undertaking was the MAPLE Project\textsuperscript{17} (Improving Mobility and Accessibility for People with Learning Disabilities in Europe). Seven provisions were suggested to give people with cognitive disabilities, learning disabilities or mental health problems the skills for travelling by Public Transport:

- Special Transport Services, accommodating individual needs
- Travel awareness training - training people to travel independently
- Travelling companions – involving companions to enable PT journeys
- Devices for travellers – technical aids used for helping people find their way
- Staff training - to assist people on modal interchanges
- Journey planning - the way journey planning information should be presented
- Information during a journey - providing details of good practice

\textsuperscript{15} www.mencap.info
\textsuperscript{16} http://www2.cege.ucl.ac.uk/arg/Research/Projects/kent/
\textsuperscript{17} http://www.maple-eu.com/Index.htm
In the Finnish accessibility programme ELSA\textsuperscript{18}, a section of the report is dedicated to so-called “timid passenger groups”. Mental health problems could make people shy and timid, across all age groups. The following guidelines are expressed (excerpts):

“Mental health problems may cause anxiety, restlessness and even panic attacks. Medication may cause drowsiness and slower action. In customer service situations passengers who have mental problems appreciate kindness and consideration, maybe even a hint of encouragement. Peaceful and convincing behaviour makes the passenger feel safe. Remember to give the passenger breathing space. Too friendly and enthusiastic service may seem aggressive.”

Some other studies have targeted particular disorders. One project studied attention fixation training, aiming at training people to form cognitive maps in order to helping control symptoms of panic disorder with agoraphobia. Subjects received three elements of Attentional Fixation Training (AFT): directed attention to the external environment, directed topographical synthesis, and directed orientation in space-time to control characteristics of panic. A model was developed, suggesting that attentional deficit, which produces a spatial disorientation disorder that involves both panic and agoraphobia, can efficiently be overcome by means of all three training tools (Kallai, Kosztolanyi, Osvath, & Jacobs, 1999).

Finally, ECMT has undertaken an examination of cognitive impairment, mental health problems and transport. The study explores the transport experience of individuals with cognitive impairment and mental health problems, and what transport policy makers, operators and authorities can do to address the needs of individuals with these disabilities and problems. The report will be published in 2008.

\textsuperscript{18} \url{http://www.elsa.fi/English/index_english.htm}
### 3.9. Environmental sensitivities and allergies

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Monitoring the substances that cause the most allergic reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cleaning procedures with approved technology</td>
</tr>
<tr>
<td></td>
<td>Replacement/renewal of the seat covers, floor coverings with approved materials</td>
</tr>
<tr>
<td></td>
<td>Designated spaces</td>
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<td></td>
<td>Climate control</td>
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<td></td>
<td>Smoking prohibited</td>
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<tr>
<td>Stops</td>
<td>Smoking prohibited</td>
</tr>
<tr>
<td>Terminals</td>
<td>Monitoring the substances that cause the most allergic reactions</td>
</tr>
<tr>
<td></td>
<td>Cleaning procedures with approved technology</td>
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<td>Replacement/renewal of the seat covers, floor coverings with approved materials</td>
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<td>Designated spaces</td>
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<tr>
<td></td>
<td>Climate control</td>
</tr>
<tr>
<td></td>
<td>Smoking prohibited</td>
</tr>
<tr>
<td>Transit system</td>
<td>Animals prohibited, or only in well-marked areas/compartment, except guide dogs</td>
</tr>
<tr>
<td></td>
<td>Uniformed employees: use of approved materials</td>
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</tbody>
</table>

**Table 10. Requirements: environmental sensitivities and allergies**

A large proportion of the population, up to 30%, suffers from minor to severe allergies and environmental sensitivities. These groups are normally not mobility impaired. However, allergic reactions in public transport vehicles, in the outdoor environment or inside buildings, could impose functional limitations and activity restrictions. The range of substances causing allergic reactions is very broad.

The concept of *environmental sensitivity* is related to exposure to low levels of various environmental chemicals, causing a disease with numerous symptoms. The condition lacks a clear definition. Many theories that have been offered to explain the condition encompass immunotoxic, allergic, autoimmune, neurotoxic, cytotoxic, metabolic,
behavioural, psychiatric, iatrogenic, and sociologic mechanisms. Scientists attribute the symptoms to exposure to multiple environmental chemicals, and the condition typically causes significant functional limitations (Terr, 2003).

Allergy, or allergic hypersensitivity, is an acquired, abnormal immune response to a substance that can cause a broad range of inflammatory reactions. It is a reaction to allergens in our environment, normally harmless to non-allergic persons. Only a small proportion of the population exposed to an allergen will develop an allergic reaction.

Asthma allergy is perhaps one of the leading causes of respiratory illness among children and young adults, although this condition may last a lifetime. It is a chronic lung disease characterized by difficulty of breathing, wheezing, coughing, and increased mucus production during recurrent attacks.

To conclude, not only the environment itself (pollution, material, climate, organic emissions) could trigger reactions, but also personal encounters (with staff, other passengers, animals/pets). Some improvements could be made by PT planners and staff, but some environmental effects cannot be avoided.

3.9.1. Specific issues

There is little research done in this area. Some practices have however been found. One particular conflict of interest is the presence of guide dogs in buses and compartments. This could affect persons with fur allergy, and will require clear guidelines, such as the ones outlined by the Ministry of Transport and Communications in Finland19.

Estimations have been made, stating that on transport buses, trams, and underground trains, 0.13% travel with a pet. Of a sample of interviewed passengers, 14% complained about inconvenience caused by pets, usually health problems. Among adult passengers with allergy or asthma, 53% had experienced symptoms in public transport. Measured allergen levels were lower in vehicles where pets were not allowed than in vehicles where pets were allowed, lower in dust from uncovered seats than in dust from seats with a covering, and lower after cleaning vehicle floors and seats than before cleaning. This study concluded that dog and cat allergens are present in public transport vehicles (Helsinki, Finland) at levels that cause symptoms in sensitive persons. Prohibiting pets would probably bring only a modest reduction in levels, as few pets are carried, and much allergen contamination comes from passengers’ clothes (Partti-Pellinen, Marttila, Makinen-Kiljunen & Haahhtela, 2000).

While examining situations in northern Swedish cities, the inventory did not reveal any serious deficiencies along the selected routes outdoor, indoor and onboard PT. However, the municipality could improve the situation by, for example, prohibiting smoking at bus stops and not allowing fur-bearing animals (except for assistance animals) at e.g. station areas and similar places. The indoor spaces are most frequented during the cold and rainy season.

A large number of trees and plants could also affect allergy-sufferers in a negative way even in autumn and winter. Another factor that could seriously affect people with allergies and hypersensitivity during the winter months is inversion. Inversion is the term given to

19 www.mintc.fi
the natural phenomenon where a lid is created between warm and cold air that prevents the air from rising. Unfortunately, this lid also closes in exhaust fumes that worsen the quality of the air (Pudas & Fjellström, 2007). It should be noted that winter seasons also are high seasons for public transportation use. Of course, inversion is also more common in regions with dense traffic and with emissions from highly industrialized areas.
3.10. Employment, education and training

<table>
<thead>
<tr>
<th>Vehicles</th>
<th>Space requirements, peak hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>Universal design</td>
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<tr>
<td></td>
<td>Real time information</td>
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<tr>
<td></td>
<td>Sufficient parking space, and within short distances</td>
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<td>Identification of priority stops</td>
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<tr>
<td>Terminals</td>
<td>Universal design</td>
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<td>Real time information</td>
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<td>Sufficient parking space, and within short distances</td>
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<td>Transit system</td>
<td>Mobility training</td>
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<td>Seamless interchange</td>
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<td>Travel time aspects</td>
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<td>Provision of compensation, in case of failure to meet the vehicle requirements</td>
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<tr>
<td></td>
<td>Easily understandable announcements, additional aids in case of breakdowns</td>
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<tr>
<td></td>
<td>Smart card identification of individual needs</td>
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<tr>
<td></td>
<td>Funding schemes available</td>
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</tbody>
</table>

Table 11. Work, training and education requirements: supportive PT items

3.10.1. Employment – general issues

Analysis of the most recent statistics shows that disabled people continue to be disproportionately excluded from the labour market. Also, the situation of women is worse than that of men. Moreover, people with cognitive impairments (learning disabilities) and mental health problems are even less likely to be employed than those with mobility, visual and hearing impairments. From an inclusion perspective, this is a serious concern. However, there is also an economic dimension to this problem: as mentioned earlier,
Europe faces a shrinking workforce resulting from demographic change. Disabled people could therefore be seen as key priority groups. This, together with the correlation between ageing and disability, creates a strong demand for accessibility. It can make the difference between a disabled person being active in the labour market and being dependent on social welfare.

The 2006-2007 Disability Action Plan focused on four areas to promote independent living: encouraging (economic) activity, quality support and care services, accessibility of mainstream goods and services, and increasing the EU's analytical capacity. The upcoming DAP 2008-2009 will focus on the areas below:20:

- Actions for inclusive participation through accessibility
- Fostering the accessibility of the labour market
- Boosting accessibility of goods, services and infrastructures
- Consolidating the EC's analytical capacity (e.g. better statistics)
- Actions towards full enjoyment of fundamental rights
- Facilitating the implementation of the UN Convention
- Complementing the Community legislative framework of protection against discrimination

The Disability Action Plan acknowledges the basic principle that society has a duty towards all citizens to ensure that the effects of disability are minimised by actively supporting healthy lifestyles, safer environments, adequate health care, rehabilitation and supportive communities.

Employment, education and training are key factors for social inclusion and economic independence. A mainstream approach can contribute to non-disabled people’s awareness and understanding of human diversity.

3.10.2. Universal design

By applying Universal Design principles, an environment that is accessible to disabled people can be established and the creation of new barriers can be avoided. The result could be a notable improvement for all disabled people - a prerequisite for achieving independence, full participation in the labour market and active participation in the community.

It is stated that Universal Design principles, quality, training and mainstreaming are vital elements of the implementation strategy of the Disability Action Plan. Universal Design principles are of paramount importance for improving the accessibility of the environment and the usability of products. A mainstream approach in policy development and service delivery also plays an important role in promoting a more inclusive society.21

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3.10.3. **Mainstreaming**

Some important vocational aspects have been provided by IPWH (Workability International - a body representing providers of work and employment services to people with disabilities, operating in some 35 countries). The concepts *mainstreaming* and *social inclusion* are now fundamental for the formulation and development of EU policy on disability. However, mainstreaming (unlike mainstream PT) is not so easily understood. Generally speaking, mainstreaming is a socio-economic condition in which each sector of society takes responsibility for making that sector accessible to those who traditionally have been excluded. EC documents express the concept in the following:

“People with disabilities should have equal access to mainstream services that serve the whole population, while ensuring that these services are delivered in a way which recognises and accommodates the specific needs of disabled people. This approach is the way towards the elimination of segregation in the labour market, better access to labour market measures including training, better involvement in decision-making and the strengthening of the conditions in which equal rights can be exercised.”

But, as IPWH Europe point out, mainstreaming requires supported employment organisations to provide a wide range of employment opportunities, training, and other measures for people with different kinds and severity of disabilities. This also applies for PT. For some passenger groups, supportive structures are needed, not necessarily solved by mainstreaming solely.22

Regarding both employers’ and employees’ perspectives, Stevens (2002) has showed that:

- The percentage of companies having at least some disabled employees is roughly in line with the percentage of disabled people nationally, but the actual number of disabled employees is very small.
- The specific impairment seen as the most important obstacle to employment is limited keyboard/writing ability. It will be of the utmost importance for advisors of disabled people to give prominence to improvement of keyboard skills.
- The next most important obstacles perceived were impairments of speech and vision, roughly equally on average. Physical mobility and strength were not thought to be very important.
- The personal skills seen as most important for successful work performance were interpersonal “social” skills, followed closely by the general ability to handle information.

An article by Barnes and Mercer (2005) has engaged with debates relating to social policy and disabled people’s exclusion from the British labour market. Drawing on recent developments from within the disabled people’s movement, in particular the concept of independent living and the social model of disability, and the associated disability studies literature, a critical evaluation of orthodox sociological theories of work, unemployment, and under-employment in relation to disabled people’s exclusion from the workplace is provided. It is argued that hitherto, analyses of work and disability have failed to address the various social and environmental barriers that confront disabled people. It is therefore

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22 Realising the value - New thinking and methods on employing disabled people. EC and IPWH European group.
suggested that a reconfiguration of the meaning of work for disabled people (according to the philosophy of independent living) and a social model analysis of their oppression is needed. Hence, the social model perspective could be particularly useful while approaching and analyzing access to employment and education.

3.10.4. Employment – specific issues

The work environment and work tasks should be adapted to make work possible for MI people. As described earlier, their functional limitations complicate the journey to and from work and the physical demands at work. In a Finnish study, results showed that symptoms of depression and anxiety were more common among the subjects with physical disabilities than among the population in general. Nevertheless, most of the subjects were satisfied with the atmosphere and supervision at work, and overall they regarded their work as a very important part of their life.

More than two out of three subjects considered their journey to and from work to be light or rather light both physically and mentally. About one-third of the subjects considered the journey at least somewhat strenuous physically. The perceived physical strain during the journey to and from work was associated with their socioeconomic status. Weather, traffic jams, and hurrying were the most typical factors that caused physical or mental strain during the journey to and from work. Other factors that caused physical or mental strain were walking uphill, crossing the road, delay of a taxi, pain of moving, shift work, economic factors, cleaning snow from the car, and getting into the car (Nevala-Puranen, Seuri, Simola, & Elo, 1999).

Like all disabled people, people with visual impairments continue to be under-represented in the labour market. This under-representation demonstrates the need for research to identify and address barriers to employment. In a study by Crudden and McBroom (1999), a comprehensive assessment of barriers to employment was made. Some resulting issues below point out the need for further exploration (somewhat beyond the scope of PT planners, but necessary to understand in terms of barriers facing disabled people):

- Potential impact of policies and services directed toward improving transportation services for disabled people
- Development of stronger formal and informal peer support and mentoring programs for both young people and people of working age
- Identification and dissemination of the strategies and techniques of rehabilitation professionals who are successful in serving as advocates for consumers and who are effective in educating employers about the abilities of disabled people
- Identification and use of techniques for assessing the motivation to work and methods to increase such motivation

Other studies have shown that there is a failure to understand mobility needs and provide appropriate training and support access to work for visually impaired people. Mobility training has a crucial bearing on a person's ability to gain and retain employment (Chatterton, 2005). Also, if specific employment policy proposals are developed by disability organisations, and if these policies are taken up in Europe, disabled people who cannot yet participate in mainstream labour markets will also benefit from European initiatives (Roberts, Simkiss, 2005).
3.10.5. **Summing up**

This section concludes the users’ perspective of needs regarding different functional limitations, and the links to employment, education and training.

The following sections address users’ expectations concerning the actual levels of policies, legal frameworks and implementation status.
4. Results and presentations – survey

4.1. Background

The EU has developed and is continuing to work on an action plan called Equal opportunities for people with disabilities: A European Action Plan (Commission of the European Communities 2003). The plan states that contributing to shaping society in a fully inclusive way is the overall EU objective. Elimination of discrimination and promotion of the participation of people with disabilities in the economy and society is crucial in a European perspective. Since the millennium, the EU has implemented and developed several directives and regulations aiming at making public transport systems more accessible and useful for all. These include specific directives as well as regulations concerning various modes of transport, and more general directives.

On a national level, policies, strategies and action plans demonstrate countries’ will to change the status quo. Most European countries have, or are in the process of making, policies aimed specifically at accessibility of public transport systems, as well as action plans to support and implement the policies. Translating this will to change into a legal framework is an important means to achieve real improvements. Therefore, the European countries have incorporated requirements for accessibility of public transport for disabled people in various areas. Most of them have general regulatory texts on accessibility. They also have planning and building acts that incorporate the needs of disabled people to access buildings. About half of the countries in Europe also have a transport or a public transport act that recognizes accessibility for disabled people. In addition, most countries have or are in the process of developing detailed guidelines connected to their planning and building legislation, which are important for accessibility to and in terminals and other buildings, and which require accessibility to be assessed when planning and building large constructions. Guidelines describing accessible vehicles are widespread. Many countries have or are in progress of developing some kind of guidelines for planning and design of roads and streets.

The actual outcome or status of the work in the different countries has been extensively described in another Euro Access report23. The report concludes that, even though no countries label their work as completed, a small majority state that their country has come a long way towards inclusion and accessibility for all. A few state that they are in a state of rapid improvement, and the rest that they are improving, but slowly. Thus, the situation varies throughout Europe, depending on historical, structural and financial development.

Also, such assessment could be affected by how long such a development has been going on in any particular country. Countries with a longer “accessibility history” have been struggling with the difficult gap between policy and practice. Others may have had separate systems for older and disabled people, acting as “integration barriers” and slowing down the process of making mainstream systems more accessible for all passengers.

There is a notable policy shift going on, from focusing on disabled people and especially mobility impairments, towards accessibility for all people. A large majority of the European

countries find that policies as well as legal frameworks in their countries are directed
towards most disabilities (MI, VI, HI etc.) or towards all people (using terms such as
universal design or design for all). The official perspective is that the user groups (such as
EDF or AGE-Platform members) and the EU are the groups that are seen as having a high
degree of influence on development of the legal framework.

4.2. User perceptions and expectations
The work described in the present report contains a review of user needs and
expectations. One part has been made by asking user organisations throughout Europe
about their views of the state of policy, legal framework and specific action plans.
Furthermore, certain aspects of public transport accessibility have been addressed. Below,
some of the results are presented. The reader should bear some important facts in mind.
Firstly, that the response rate has been quite limited. This will not allow for a true
“statistical description” of the state of European accessibility. The numbers presented will
only serve as descriptive data, in order to present the response in a “grouped manner”,
without pointing out particular countries as poorly developed or others as ideal.
Secondly, each respondent bases their appraisals on what could be expected, viz. the
“perceived state of accessibility”. Thus, the implementation of new low-floor vehicles in a
relatively short period of time could result in high scores. In other cases, given that a
country has had a large percentage of low-floor vehicles for some time, the understanding
of the travel chain perspective may seem more evident, underscoring each part of the
system as important links. Accessible buses are highly important, but are not the sole
solution for providing seamless travel or participation for all.
The user organisations have been grouped in different ways. A division has been made
between EDF organisations (European Disability Forum) and AGE-Platform organisations
(the European Older People’s Platform).
Disability groups have also been divided into the following categories (as far as the
organisations explicitly have made assessments for these groups):
- MI mobility impaired people
- VI visually impaired people
- HI hearing impaired people
- CI cognitive impaired people
- MHP people with mental health problems
- ESA people with environmental sensitivities and allergies

AGE-Platform organisations are referred to as:
- SENIOR total group of each senior organisation

Thirteen complete responses were received from EDF organisations and 15 from AGE-
Platform organisations. This calls for careful interpretation of the data (numbers) on the
following pages. Nevertheless, some conclusions can be drawn.

4.2.1. Assessment of documents
Respondents were asked to assess the value of the content of existing documents:
policies, strategies, legal framework and action plans for accessibility. Figure 4 depicts the
resulting rating. A five-grade scale was used, ranging from “very poor” (1) to “very good” (5)\(^\text{24}\). Mean scores are presented for each category, and the thin bars indicate variation of the mean value. As seen, the valuations are quite moderate. There are some indications that senior and mobility impaired groups get slightly higher scores. This seems logical, since most documents deal with reduction of physical barriers, primarily meeting the needs of mobility impaired people.

As described in a previous section, there is a policy shift towards accessibility for all people. Since a large majority of the European policies and legal frameworks are directed towards most disabilities or towards all people, the respondents were asked to verify such statements. According to them, the proportions seem to match (see Figure 5 below). However, the difference between policy and legal framework should be noted. It is primarily the group of mobility-impaired people that seems to be addressed by legislative action. The response also corresponds with the results in Figure 4 above.

\(^{24}\) In the original version of the questionnaire, the numbers were reversed: “very good” (1) to “very poor” (5). The following bar charts have also been reversed, due to graphical reasons.
**Perceived direction/intention of documents**

<table>
<thead>
<tr>
<th>Policies</th>
<th>Legal framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towards MI</td>
<td>Towards most disability groups</td>
</tr>
</tbody>
</table>

Target group, assessed by AGE-Platform (n=15) and EDF members (n=13)

Figure 5. Perceived intention (target group) of existing national documents.

**Perceived influence - policy and legal framework**

Item, n_{SENIOR}=15, n_{MI}=13, n_{VI, HI}=11, n_{CI}=8, n_{MHP, ESA}=5

Figure 6. Perceived influence from users on national documents.
As stated by governmental officials, the official perspective is that the user groups have had a high degree of influence on development of the legal framework. Therefore, the respondents were asked the same question, in order to reflect their own perspective (see Figure 6). Again, a five-grade scale was used, ranging from “no influence” (1) to “full influence” (5). Mean scores are presented for the senior and mobility impaired categories, and the thin bars indicate variation of the mean value (only for seniors and mobility impaired – the “major” groups). Items are sorted, with highest mean values to the left and lowest to the right.

Bus transit gets higher scores, as much focus has been on accessible urban transit. Taxi gets lower scores, since rather limited efforts have been put into this sector. Only recently has the issue of accessible taxis been highlighted, and due to industry structure, accessibility development proceeds slowly. It should be noted that the senior organisations perceive themselves to be left out of the policy and legal framework development. Again, issues concerning MI people seem to have had larger influence, whereas other groups produce lower scores.

### 4.2.2. Assessment of development

**Perceived influence - design and implementation**

![Bar chart showing perceived influence from users on design and implementation processes.](image)

*Figure 7. Perceived influence from users on design and implementation processes.*

What counts from the perspective of the users is the outcome: systems and vehicle design, implementation of services, and removal of environmental barriers. Figure 7 depicts the influence that the various groups perceive themselves to have had in the implementation phase. The results seem similar to Figure 6. However, it should be noted that vehicles (the bars to the right) get somewhat lower scores. Many countries have implemented building legislation covering all new buildings and terminals. This work has
often been done using national disability organisations as reference groups. Vehicle manufacturers, however, adapt to the market regulations as defined by EU directives. Even if these directives are based on extensive research, involving users in different countries, not every national organisation has been involved in the testing and evaluation of new vehicles. This fact may be reflected in the responses.

Perceived accessibility

![Figure 8. Perceived state of accessibility by users - various facilities (items).](image)

In addition, the users were asked to assess the perceived accessibility of each mode and item (Figure 8). Again, a five-grade scale was used, ranging from “very difficult, inaccessible” (1) to “very easy, fully accessible” (5). Mean scores are presented for the senior and mobility impaired categories, and the thin bars indicate variation of the mean value. Items are sorted, with highest mean values to the left and lowest to the right. The results indicate a somewhat poor state or level of accessibility, with mean values mostly below three (3) (“neither easy nor difficult”). However, the senior organisations lie generally above this rating level. The reasons for this slight difference, if reliable and significant, could be of various origins. For instance, senior organisation members include "younger old" people in their sixties, with few functional limitations. They have also experienced the change of public transport design towards increased accessibility, e.g. by rolling stock renewal and low-floor vehicles and improved information systems. Disability organisations, on the other hand, might perceive the implementation process as being too slow, and that the needs of groups with severe functional limitations are still to be met in a more holistic manner. These groups also focus on specific measurements, crucial for certain people, e.g. those with extremely low or no vision and wheelchair users. For them, a fully accessible public transport system requires high quality in all links and parts. Yet it should
be noted that the ratings range from poor to high level of accessibility. Some answers reflect that accessibility measurements are acknowledged, hence at least in theory having a positive mobility effect.

In order to present a more qualitative perspective of the results in Figure 8, the responses from some open-ended questions are presented below. The organisations were asked to mention reasons for rating choice of each item in terms of perceived accessibility. The answers are grouped in “obstacle” and “facilitator” paragraphs.

### 4.2.2.1. Taxis

**Obstacles**

Criticisms are directed at taxi services. Some perceive taxis as too expensive. The services are also scarce in rural areas. In some countries, the services are deregulated. Therefore, according to users, the incentives for increased accessibility and high degree of service are low.

The drivers have poor training and knowledge of user needs. The vehicles themselves are also perceived as obstacles. They are inaccessible, and often guide dogs are not allowed in the compartment. Far too few of the vehicles are wheelchair accessible.

**Facilitators**

Taxis in all countries provide enhanced mobility for people without private cars. Given that the services are widely available and that fares are reasonable for both short and long journeys, taxi services provide excellent door-to-door options. Access to vehicles for ambulant passengers could be quite easy, as taxi drivers usually help out. During the ride, communication with the driver is possible and valuable for patrons.

It is considered convenient to use taxis, particularly for VI, CI and MHP persons, as route decisions and crowds can be avoided. Orientation assistance can also be obtained at the site of arrival.

If available, special transport vehicles designed for older and disabled people could be booked, e.g. vans, minivans and taxis with a designated wheelchair space (with seat belts and tie-down equipment). These larger vehicles can also accommodate the increasing number of “scootmobiles”.

### 4.2.2.2. Buses

**Obstacles**

Bus fares are perceived to be too high, particularly by senior organisations and in Northern and Western European regions. It is also stressed by some organisations that the standard varies throughout the country. In large cities, the bus accessibility standard is reasonably high, but is much lower in rural areas. It is noted that the fleet is being renewed, but that this process is proceeding far too slowly.

High floor buses are still very common, and these can be difficult to use, particularly when bus stop platforms are too low (or even non-existent). The percentage of vehicles that are wheelchair accessible is far too low. Existing accessible buses, equipped with boarding devices for wheelchair users, require assistance of drivers, but they seldom have time to serve disabled passengers during peak hours. Once on board, it is perceived as difficult to access the designated wheelchair space, or to store other walking aids.
Drivers are key to bus access, and certain groups, such as persons with mental health problems, are singled out as particularly sensitive to (lack of) driver training. Other individuals are accompanied by their own assistants in order to manage the travel chain. Since the assistants often have to pay (more) for the trip, the fare structure could also be an obstacle.

Facilitators
Some argue instead that the bus transit systems are comparably cheap and usable modes for older and disabled people. The organisations point out that the bus serves as the main mode of transport for older people. Increasingly throughout Europe, the vehicle park is being renewed and the low floor concept provides substantial accessibility improvements - in the interest of disabled people.

On board (at least during off-peak hours), there is place for manoeuvring and positioning regular wheelchairs for passengers who wish to remain seated in their wheelchair during the ride. Many low floor buses have ramps that are operated by the driver.
In certain urban areas, particularly in Western and Northern Europe as pointed out by the organisations, there are the so-called Service Routes: user-friendly smaller buses designed with higher accessibility for disabled people.

4.2.2.3. Coaches

Obstacles
Many obstacle issues relevant for bus transit above are also hallmarks of coach transportation, e.g., high floor entrance, wheelchair inaccessibility, and difficulties for rollator users. Aisles are too narrow for some user groups. Although many modern facilities are at hand, lavatories are often difficult to access.

Often the coach stop distance is far away, and stops in rural areas seldom have platforms, which further increases step height. Renewal of coach fleets is slow, except for tourist coaches.

Facilitators
The coach could be an easy and reasonably cheap mode of transport, according to the organisations. Particularly emphasised by organisations from “tourist countries”, these are also usually modern and have good facilities (lavatories and in some cases wheelchair lifts on long-distance coaches). As for bus transit, communication with the driver is possible.

4.2.2.4. Trams

Obstacles
The use of trams allows for independence, but at the same time requires large functional capacity without driver support. New trams are often accessible, but old ones can be very inaccessible, with narrow doors and high steps. Once aboard, accommodation of wheelchairs on old cars is perceived as very difficult.

Facilitators
Positive comments on tram systems often refer to new or renewed vehicles. These new trams are low-floor cars, and the route direction is predictable. Trams also stop at each
station, making them more reliable than buses. As pointed out by some, it is possible to board the tram from many entrances, reducing the crowding at the tram stop.

4.2.2.5. Trains

Obstacles
As for trams, new trains are accessible, as well as some new stations, but old ones are perceived as very inaccessible. There can be very high differences of level between platforms and train steps/entrances. The gap is particularly difficult for mobility and visually impaired passengers. It can be difficult to know which standard to expect. Even if boarding devices like platform lifts are at hand, they often do not allow for spontaneous travel (due to the need to book in advance).

Also, even if some persons in some countries are allowed to bring along an accompanying person without paying, this is not an option for all disabled passengers needing assistance.

Facilitators
Organisations from some countries point out that their train network is rather good, and with frequent timetables. Rolling stock is being improved, both regarding regional and intercity services.

Staff are on board and, if needed, can assist and provide help to and from seats and other services. Increasingly, trains are provided with lifts and have wheelchair-accessible lavatories. Inquiries can be made on board regarding connections and sometimes also terminal design and accommodation.

4.2.2.6. Metro, underground

Obstacles
In order to use metro service systems, infrastructural barriers have to be managed, which can be more or less difficult. Not all stations are equipped with elevators, and escalators are often out of service. The metro can be quite crowded at peak hours, putting pressure on persons who require extra time and space for ticketing, locating the right platform or exit and boarding/alighting.

Furthermore, the lack of staff presence and personal assistance may cause feelings of insecurity, which can be regarded as barriers for older people and people with mental health problems.

Facilitators
The positive comments on metro design often refer to new systems. Although some networks only cover parts of the city, the metro cars are quite new, and ascending and descending have been thought of also from a disabled person’s perspective. Elevators and escalators are installed, and connection between platform and entrances is almost level (meeting the needs of independent living for wheelchair users, although still creating problems among other groups).
4.2.2.7. Pavements, crossings

Obstacles
Particular barriers mentioned are poor pavement surface (slopes, friction, unevenness, continuity, contrasts) and road signs lacking/difficult to read. Organisations emphasise difficulties for visually impaired people, who have to navigate without any, or with poor, tactile guidance. This is particularly difficult in areas with high speed and high flow car traffic. On the other hand, infrastructure in calm residential areas can also be difficult, due to narrow pavements, mixed bicycle traffic or so-called shared spaces.

City centre pedestrian zones are often crowded by people, by “street furniture” and by temporary obstacles. In particular, crossings could be designed and perceived as insurmountable obstacles to MI, VI and wheelchair users, especially if not reinforced with audible signals and sectionised with separate turning phases for car traffic.

Facilitators
Facilities appreciated by organisations include traffic signals with audible support for VI people. The proper design of pavements and kerbs helps all user groups (contrasts, zebra crossings, tactile pavement). Separate bicycle lanes could also reduce risks for ambulant persons. One organisation lauds speed reduction as an important measure that has increased mobility for ambulant seniors.

4.2.2.8. Bus or tram stops

Obstacles
The bus or tram stop standard varies, even if improvements are noted. Sparsely populated areas have generally lower standards. As for the vehicles, far too low a percentage of the stops are wheelchair accessible. Some organisations mention that bus stops are often constructed as an enclosed space closed off by high kerbs without any proper provision to meet the needs of VI and wheelchair users.

Facilitators
Improvements have been acknowledged. In particular, Northern European organisations mention that authorities are proceeding with accessibility measurements, e.g. having most of the stations and stops made accessible to all by a certain date (e.g. 2010, 2015 etc). The measures include elevated stops to fit vehicle entrances, tactile tiles, shelters, handrails and seats with armrests. Stops have been equipped with electronic information and better timetables (see “information”). Some organisations point to the connection between stops and surrounding pavement systems, where improvements have also been made.

4.2.2.9. Terminals and other buildings

Obstacles
Most of the comments about buildings refer to (lack of) information. Frequent comments are also made about lack of tactile surfaces, which assist VI people in particular and all passengers in general by identifying directions to stairs, escalators and elevators. For MI people, terminals have many supportive elements, but at the same time are challenging since the interior distances can be quite substantial. Also, it is difficult to find appropriate
staff, since many actors from different organisations are involved. Restrooms, if available, are often located far away.

**Facilitators**

Under this section, many organisations refer to national building regulations and authority action plans, ensuring access to all patrons. No particular items are mentioned as being intended to contribute to this “universal design principle”. Thus, it seems that legislation could be in place – but the implementation remains to be seen. It could be assumed that national legislation takes into account most well-known physical barriers.

### 4.2.2.10. Information systems, ICT

**Obstacles**

Timetables can be difficult to understand and read, and so can route maps. Even though the introduction of web-based pre-trip information has facilitated access for many groups, this is not readily accessible for all patrons (difficult to use internet, high costs for computer and computer access). Many comments were made on information system design and location on site. Some display systems could be very difficult to read, due to colour, contrast, letter heights or simply being placed too near intense light sources. The information is often present on large terminals, but not adequately implemented. Pictograms, which are particularly supportive for CI and MHP people, are not always properly designed or placed. Often the large information tables are centrally placed, but since transport to platforms or stops takes time, changes can be difficult to monitor, if not updated properly both visually and audibly. Once at the stop or platform, it can be difficult to find and choose bus route departure or train car/compartment due to a lack of updated information. Braille, or other supportive signage for VI people, is often lacking at bus stops. Also, the audible information from arriving buses is poor or often non-existent.

**Facilitators**

New buses (as well as trams and trains) have good built-in visual and audible information systems, and older vehicles are retrofitted with ICT-technology (Information and Communication Technology). Tram stops, bus stops and particularly terminals are equipped with large screens with system, departure and arrival information. The screens more or less accommodate the needs of people with poor vision, depending on system choice. Mentioned as best practice, some terminals have well-structured tactile paths and guidance systems with pictograms, enabling use by VI and CI people.

### 4.2.2.11. Other comments

Other comments relate to soft barriers, such as dismissive attitudes of staff and drivers, and difficulties in understanding links between different modes. Perceived anxiety among certain user groups creates obstacles for transit use, mobility and participation.

In some countries, government and authority policy documents as well as organisation policy papers underscore the slowness of implementation, despite existing legal frameworks and standards. One common general comment refers to budget restrictions and economic reasons for lack of public transportation accessibility, and that accessibility investments have low priority.

Further important obstacles, particularly singled out by senior organisations, are the issues of fare structures and pricing schemes. Several European countries have some kind of
fare reduction for seniors and disabled passengers. This ranges from general fare reduction or free off-peak rides (or free mainstream PT use) to subsidised special transport services or free community buses for older people. The organisations were asked to rate their schemes. Their response revealed dissatisfaction: 47% of the disability organisations were satisfied, whereas only 36% of the senior organisations were satisfied with the existing pricing strategies, subsidies or solutions aimed at reducing economic barriers for their members.

Few other comments were made explicitly stating issues facilitating PT access. One comment points out that there seems to be a lot of information and instructions about facilities at hand. The problem however is two-fold: how to reach out to users with this information and to what extent this information can actually contribute to the increase of older and disabled peoples’ mobility.

4.2.3. Development status

Finally, the organisations were asked to assess accessibility status in their respective countries (Figure 9). The responses are divided between EDF and AGE-Platform organisations and also geographical regions. There seem to be some differences between user groups in the graph, but average results and the “small number effect” reveal no different tendencies. However, while comparing different regions, there are tendencies indicating that Eastern and Southern Europe lag behind, according to the user organisations. Compared with the results from Euro Access Deliverable 1 (governmental responses), the user organisations are more moderate in their appraisal. The reason might be that their emphasis is on actual implementation rather than extensive policies, directives, legislation and action plans.

![Perceived accessibility development status](image_url)

**Figure 9.** Perceived national PT accessibility development status, regionally grouped.
5. Discussion

5.1. The sources

The applied literature search method, together with heuristic strategies to extract the most important sources, has been successful. The literature review has proceeded as expected, albeit with some delay due to the very extensive areas that were covered.

Research and development, both in Europe as well as on other continents, have been considered and evaluated. It has become obvious that, over the years, there has been major progress and improvement in technology and systems design of accessible public transit. Applied research, transfer of best practice, joint European projects, international conferences such as TRANSED, and COST actions are some examples that have led to enhanced accessibility. However, in some areas there is still some lack of evidence-based research that acknowledges the fact that disability and accessibility are complex issues. The latter fact sends a clear message for future work in various research areas.

5.2. Towards a framework

It has been recognised recently that improving accessibility provides economic benefits to transport operators as well as to the 20-30% of people with mobility difficulties (Oxley, 2004). The importance of the road and the pedestrian environment as the starting point of most journeys should be emphasised. Specifications are given for footways, junctions and road crossings, pedestrian areas, safety at road works, tactile surfaces, parking and emergency telephones. The design of transport infrastructure including railway stations, bus stations, escalators and travelators is vital for PT access. Methods of orientation and wayfinding within buildings will be increasingly important for both older and disabled people as well as “new” PT users, such as audible systems for visually impaired people and graphical interfaces for cognitively impaired people.

The issue of PT information is crucial. To be able to navigate door-to-door, a travel chain perspective will point out when and where information and signage is needed. Surfaces, especially tactile ones, serve as supportive environments, not only to visually impaired people. Other examples are the design and access of ticket offices and ticket machines. Provision of seating in waiting areas, accessible refreshment facilities and lavatories, and the design of bus stops and shelters is crucial. Particular attention should be paid to bridging gaps when boarding vehicles. The designs of entrances, pavement slopes and wheelchair ramps are crucial to mobility-impaired groups. Many of these listed items are mentioned in a recent ECMT document that, together with other similar publications, serves as a valuable source (ECMT, 2006b).

Examples of these other sources are for instance the “Improving access to public transport” guideline book. It states the following points regarding planning for accessibility:

- Forward planning, with a time horizon of approximately ten years, is necessary. More detailed plans should cover a period of five years, and should be updated on an annual basis
- There should be regular monitoring of progress towards achieving forward plan objectives. Monitoring should cover improvements to PT infrastructure, introduction of fully accessible vehicles (buses, trams, trains) and the use made of accessible services and systems
- Co-operation with disabled people in defining and developing better accessibility to transport
- Collaboration and consultation with disability associations on all aspects of accessible transport is essential. This should cover vehicles, infrastructure and information. The public transport authority should have a focal point specifically charged with addressing all disability issues. Care should be taken to ensure that consultation covers the whole range of functional limitations (Oxley, 2004).

Some tentative frameworks have already been presented, e.g. by Ling Suen, Tyler et al., Ståhl and Aurbach. The framework by Ståhl (Figure 3) seems quite “sustainable”, considering that it was drafted at a time when intermediate solutions were not particularly developed (e.g. FlexRoute Traffic). In fact, it served as a starting point for these new service solutions.

The present framework development (Figure 10) is also based on the travel chain perspective, though not so explicitly. Instead, it further tries to address the gap between policy and practice. This gap has been a recurrent theme throughout the report, not least through the results from the user organisation survey.

Furthermore, as a novel aspect, it incorporates the essence of mobility and the discrepancy between accessibility and usability, the latter more or less inherent in the “gap theme”. An example of this is the emphasis on intermediate solutions, which particularly aim to fill the gap between mainstream and individual options.

If public transport is to be able to contribute to equity, independence and freedom of choice, the planning and implementation process must be characterized by a feedback circuit, as depicted in the framework. Without this conceptualization, accessibility measurements will remain as “add-ons”, in spite of taking the issue of Universal Design seriously.
5.3. Framework for mobility planning

![Framework diagram]

**Figure 10. Framework for mobility planning**

5.3.1. Framework parts

5.3.1.1. Framing the process

The two vertical bars are “ideas”. POLICY contains the political and societal direction of social inclusion and mobility for all. UNIVERSAL DESIGN consists of key principles for how the artefacts, the built environment and the public transport system should be designed and perceived. The direction goes from policy towards design. As will be argued, this is an iterative process.

5.3.1.2. Two perspectives

The upper part, in blue, consists of the PLANNING PERSPECTIVE. The policies are being transformed into legislation, norms and regulations. Planners and practitioners implement these into practice, creating a transportation ENVIRONMENT.

In green below, the USER PERSPECTIVE faces a DESIGN, which offers various available transportation options. The options include different infrastructure, a variety of public transport systems, and systems information.
5.3.1.3. Creating accessibility

Given the fact that the legal framework is influenced by current knowledge on user needs in order to improve accessibility, the infrastructure improves towards barrier-free design. The transportation system is characterized by proximity, in order to meet general needs among older and disabled passengers. The provision of appropriate, clear and concise information is an important and supportive link throughout the whole travel chain. Whether the content in the paragraph above could establish a so-called balanced P-E fit or not, remains to be seen. A crucial task for planners and practitioners is therefore the monitoring of the actual person in the system. Since the concept of accessibility can be seen as rather objective, accessibility assessment procedures (with inventory features) are required to monitor the design status and the impact of measures that have been implemented. The information from such inventories provides input both backward, towards the local environmental design phase, and forward, towards “global” policy adjustments.

5.3.1.4. Towards Universal Design - creating usability

If the design and implementation of measures is to be able to reach its goal in terms of mobility for all, the infrastructure, system and information should not just be accessible, but usable. Only by creating true usability will the policy objectives of integration, participation and freedom of choice be perceived and experienced by users. Mobility planning is characterized by this three-step approach. The last step takes into account the user perspective, which by nature is subjective. Co-operation with relevant groups enhances user involvement. In order to get valid and reliable appraisals, usability studies are necessary measurements at this stage. A negative outcome from such studies further highlights the iterative process needed to remove remaining gaps and to achieve seamless transit options. Eventually, the design process could develop towards mobility planning, designated with the hallmarks of Universal Design.
6. Conclusions

The present deliverable D2 (User needs and expectations relative to accessible transport: Framework for mobility planning) is part of Work Package 2. The three main objectives of WP2 were firstly to review existing literature on the needs of disabled people regarding accessible transport. Secondly, the aim was to survey how well different user groups’ needs are met in reality by public transport. Finally, based on the previous steps, the aim was to develop a framework for mobility planning for disabled people. The main methods have been a literature review and a questionnaire survey sent to user organisations throughout Europe. Disability organisations were reached by co-operation with EDF (The European Disability Forum), and senior citizen organisations were accessed through co-operation with AGE-Platform Europe.

In order to understand the basic features of both user prerequisites and accessibility concerns, a thorough review of theories and concepts revealed some interesting and important features. Different aspects of disability are encompassed by the ICF model of WHO:

- The model consists of functioning and disability:
  - Aspects of the body, the activities of an individual, and individual possibilities of participation
- The disability context is determined by:
  - Environmental and personal factors

However, the social model of disability is equally important in a mobility and transport context. That approach emphasises how disability is created by society, and also constantly recreated, even in documents such as this (labelling, grouping, separating an individual from a “normal state”). Therefore, both the ICF and the social model provide valuable input into transportation accessibility analysis, since transportation is framed in a social and cultural context.

Mobility and accessibility for all people cannot be achieved without a holistic approach, e.g. by employing the travel chain. The chain must be solid, due to the dynamic forces involved. Important elements of the travel chain are:

- Accurate, clear and concise information
- Barrier-free built environment
- Universal design
- High operational standards, intermediate solutions between individual and mainstream transport options
- Appropriate, effective and accessible vehicle design
- High levels of perceived comfort and safety
- Trained personnel

If these elements were to be realised, the transport system would also meet usability requirements, viz. highly apparent accessibility for all.
Reversing the perspective from the system to the different user groups, it becomes evident that different groups have different needs. Nevertheless, they all have in common the necessity of high disability awareness among stakeholders, planners and field staff.

- Mobility impaired people have stringent requirements on physical design. Vehicles must be accessible, systems must be reliable, and stops and terminal facilities must be proximate and user-oriented.

- People with sensory impairments (sight and hearing), cognitively impaired people, and people with mental health problems have, in many cases, the same requirements as mobility impaired MI people. However, increased emphasis must be placed on information and orientation. For some, trained and supportive staff is essential.

- People with environmental sensitivities and allergies constitute a large group of users. Their main concerns target climate, surfaces and passenger/staff encounters.

Some system aspects need to be stressed, regarding links to employment, education and training:

- The integration of disabled people into the labour market, into supportive training and into higher education requires seamless public transport with a focus on commuter problems.

- Mainstream public transport and individual transport solutions meet the needs of some, but not all. Intermediate transport solutions are necessary transit forms for closing systems gaps, particularly regarding the large population of ageing users.

The work also contained a survey of how well different user groups’ needs are met in reality by public transport. The response from different user groups in different European regions concludes that:

- User groups are aware of existing policies, legislation, action plans and other local documents.

- According to users, the policies contain clear directions “towards all people”. However, the legal framework and the implementation tend to focus more on “traditional” physical aspects, thus neglecting “soft barriers”.

- Contrary to the position of governments, the user groups hesitate to label their influence as important, particularly senior organisations.

- On a five-grade scale, the perceived accessibility state lies below average (neither accessible nor inaccessible).

- Users emphasise that current pricing strategies fail to meet their needs.

- Policy work lies far ahead of the implementation processes.

Based on the findings from the literature review and the survey results, a framework for mobility planning for disabled people was developed. Using the travel chain perspective, addressing the gap between policy and practice, and incorporating the essence of mobility and the discrepancy between accessibility and usability, the framework was drafted as a conceptual model for the mobility planning procedure.
As policies today often mention Universal Design and mainstream efforts, three phases were identified (from each perspective):

- Planning perspective
  - Environment phase, with input from
    - Legislation
    - Norms
    - Standard
  - Person phase, with input from
    - Objective analysis
    - Inventory procedures
    - Expert assessments
  - Mobility phase
    - Subjective analysis
    - User involvement in planning and implementation
    - Usability studies: field and lab tests

- User perspective
  - Design phase, affected by
    - Infrastructure
    - System
    - Information
  - Accessibility phase, affected by
    - Barrier-free design
    - Proximity – within or out of reach
    - Supportive structures and information
  - Usability phase, creating
    - Societal integration
    - Participation in human activities – the reason for transportation
    - Freedom of choice – the choice of modes and activities

The developed framework underscores an iterative planning process towards successful implantation of universal design. The feed-back for planners and stakeholders is necessary for reaching the policy goals.

Successful implementation of measures today is characterised by many, if not all, of these issues. Much progress has been made toward improving accessibility to public transport, albeit the implementation has often proven difficult and slow. Some examples (Oxley, 2004) have all in common that improved co-operation between PT service providers and local authorities can ensure better accessibility. However, the extent to which improvements to accessibility actually have resulted in increased mobility is often difficult to assess. Best practise examples often lack of passenger and/or financial data. The cases (Gothenburg, Grenoble, Prague and Liverpool) in the ECMT report however imply that fleet renewal (low-floor buses and trams), accessible bus and tram stops can in fact increase ridership; not only for disabled but for all passengers. Another Swedish example
(Wretstrand et al., 2007) showed that fleet integration increased ridership and reduced overall costs.

The cost-effectiveness of measures is often context-dependent. On one hand, it is of little use to remove all environmental barriers, if the bus fleet is still inaccessible. On another hand, passengers will never use the low-floor buses, if the streets are dangerous and over-crowded. This once again underscores the importance of improved co-operation between PT service providers and local authorities, so that measures match and support each other. It is suggested to start out with fleet renewal, together with urban planning focusing on vulnerable road users (pavements, crossings, bicycle lanes). If transport planning has a focus on public transport and aims at reducing congestion, this will be of benefit for society as a whole, particularly for vulnerable, older and disabled road users in urban communities.

It should be emphasized that no community can be fully served with a single transportation mode, and that different PT services must be responsive to individual needs. A focus on supportive structures, proximity, and accessible information about the system has proven to be crucial mobility factors. For example, Service Routes and FlexRoutes are intermediate transit solutions that have improved the mobility of older and disabled people in operating areas.

While reviewing the existing literature, it was easier to find studies on barrier effects rather than on evidence-based facilitator effects. For example, the Mobilate project (Mollenkopf et al., 2004) emphasised two types of environmental barriers:

- spatial and technological barriers
- impediments caused by a lack of mutual consideration, heavy traffic flow and perceived fear in public spaces

The Mobilate study concluded that there is a need for integrating transport policy, urban and societal planning in order to remove or reduce these barriers.

Moreover, some issues for further work and analysis should be mentioned. The needs of mobility-impaired people are quite well known. However, physical barriers still exist, and more emphasis must be given to barrier reduction and evidence-based studies.

For blind people and people with visual impairments, more research is needed for supportive tactile design.

The needs of people with cognitive impairments, learning disabilities or mental health problems are particularly neglected. More work is needed here, e.g. actively involving users in the process.

The information and communication technology (ICT) development could also serve sensory-impaired users (as well as people with cognitive impairments and mental health problems) more efficiently than today.

The gender aspect of mobility and accessibility has to be further addressed. Other areas worth pursuing are the development of the taxi industry and accessible taxis.

Finally, the work concludes that best practice of systems design needs to emphasize barriers to transferability. While the institutional and organisational prerequisites vary throughout Europe, it might be that unified policies fail due to inefficient implementation and organisational obstacles. Seamless public transportation, accessible for all users, requires work across sectors and across different authorities with different budgets.
7. References


## 8. Glossary

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<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Accessibility</td>
<td>The relationship between functional capacity and environmental demands</td>
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<tr>
<td>Activity</td>
<td>The execution of a task or action of an individual</td>
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<tr>
<td>AGE-Platform</td>
<td>The European Older People’s Platform</td>
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<tr>
<td>CI</td>
<td>Cognitive Impaired, Cognitive Impairment</td>
</tr>
<tr>
<td>COST</td>
<td>European Cooperation in the field of Scientific and Technical Research</td>
</tr>
<tr>
<td>CVI</td>
<td>Cortical Visual Impairment</td>
</tr>
<tr>
<td>DAR</td>
<td>Disability and Rehabilitation Team, WHO</td>
</tr>
<tr>
<td>Design</td>
<td>(The act of working out the) form and function of objects</td>
</tr>
<tr>
<td>Disability</td>
<td>Umbrella term for impairment, activity limitation and participation restriction</td>
</tr>
<tr>
<td>DRT</td>
<td>Demand-Responsive-Transport systems, such as STS</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>ECMT</td>
<td>European Conference of Ministers of Transport (CEMT)</td>
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<tr>
<td>EDF</td>
<td>The European Disability Forum</td>
</tr>
<tr>
<td>Environment</td>
<td>The complex of factors that act upon and interact with individuals, e.g. &quot;built&quot; environment (buildings, infrastructure)</td>
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<tr>
<td>Environmental press/demand</td>
<td>The claim of the environment to a person - positive or negative influence on performance.</td>
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<td>ESA</td>
<td>Environmental Sensitivities and Allergies</td>
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<td>EU</td>
<td>European Union</td>
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<tr>
<td>FRT</td>
<td>FlexRoute Traffic, a compatible DRT system designed to meet the specific needs of older and disabled people. Smaller buses, trained drivers, very short bus stop distance (close to door)</td>
</tr>
<tr>
<td>Functional limitation</td>
<td>Restriction in a person's ability to perform actions in daily life</td>
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<tr>
<td>HI</td>
<td>Hearing Impaired, Hearing Impairment</td>
</tr>
<tr>
<td>ICF</td>
<td>The International Classification of Functioning, Disability and Health</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>IRU</td>
<td>International Road Transport Union</td>
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<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<td>--------------</td>
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<tr>
<td>LFB</td>
<td>Low Floor Bus (system)</td>
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<tr>
<td>MHP</td>
<td>Mental Health Problem</td>
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<tr>
<td>MI</td>
<td>Mobility Impaired, Mobility Impairment</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>P-E</td>
<td>Person-Environment relationship</td>
</tr>
<tr>
<td>Policy</td>
<td>A set of guidelines designed and developed for a specific purpose</td>
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<tr>
<td>PRM</td>
<td>People/persons with Reduced Mobility</td>
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<tr>
<td>PT</td>
<td>Public Transport</td>
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<tr>
<td>PTA</td>
<td>Public Transport Authority</td>
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<tr>
<td>SENIOR</td>
<td>Variable name for AGE-Platform respondents</td>
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<tr>
<td>SI</td>
<td>Sensory Impaired, Sensory Impairment</td>
</tr>
<tr>
<td>SRT</td>
<td>Service Route Traffic, a compatible PT system designed to meet the specific needs of older and disabled people. Route based, smaller buses, trained drivers, short bus stop distances</td>
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<tr>
<td>STS</td>
<td>Special Transport Services, a door-to-door demand responsive transport service with smaller vehicles</td>
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<tr>
<td>TRANSED</td>
<td>International Conference on Mobility and Transport for Elderly and Disabled Persons</td>
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<tr>
<td>Travel chain</td>
<td>The actual chain of events that occurs while moving from origin to destination</td>
</tr>
<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
</tr>
<tr>
<td>Universal Design</td>
<td>A design approach that implies equity and social justice by design. The design of products and environments to be usable by all people, to the greatest extent possible, without &quot;adaptation&quot;</td>
</tr>
<tr>
<td>Usability</td>
<td>To be able to use, i.e. to move around, be in and use, the environment on equal terms. Usability analysis integrates information on functional capacity, environmental demands and activity. Usability is the extent to which human needs, based on individual or group preferences, can be fulfilled in terms of activity performance in the environment at target.</td>
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<tr>
<td>WHA</td>
<td>World Health Assembly</td>
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<tr>
<td>WHO</td>
<td>World Health Organisation</td>
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<tr>
<td>VI</td>
<td>Visually Impaired, Visual Impairment</td>
</tr>
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<td>WP</td>
<td>Work Package, part of the Euro Access project</td>
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Appendix 1: Literature search

Appendix 2: Disability organisations

Appendix 3: Questionnaire to disability organisations

Appendix 4: Senior organisations

Appendix 5: Questionnaire to senior organisations