



Mediate – Methodology for Describing the Accessibility of Transport in Europe

Project Number: 218684

Deliverable Number: **D2.2**

Deliverable Name: **Indicators describing the accessibility of urban public transport**

Due Date of Deliverable: M12
Completion Date of Deliverable: M16

Start Date of Project: 1 December, 2008
Duration: 24 Months

Deliverable Lead Partner: SINTEF
Deliverable Author(s): Liv Øvstedal, Tone Øderud, Phil Barham, Samantha Jones

Project co-funded by the European Commission within the Seventh Framework Program for Research and Technological Development (FP7)

Dissemination Level		
PU	Public	x
PP	Restricted to other program participants (including the Commission Services)	
CO	Confidential, only for members of the Consortium (including Commission Services)	

Document History

Version	Date	Description/Changes
1	2009-06-22	Draft Indicator Questionnaire prepared by TTR based on input from Mediate WG1.
2	2009-07-13	Draft Indicator Questionnaire revised by SINTEF.
3	2009-09-08	Draft Indicators Questionnaire revised by SINTEF based on input from end-user organisations, local authorities, experts and consortium members.
4	2009-11-02	Draft report by SINTEF based on input from Mediate WG2.
5	2009-11-29	Draft report revised by SINTEF based on input from consortium members.
6	2009-12-21	Draft report revised by SINTEF based on input from consortium members.
7	2010-01-13	Draft report revised by SINTEF based on input from consortium members.
8	2010-03-22	Final report, with revisions based on the input from reviewers. Language check by 2010-04-06

Document flow

Sent	Date
Mediate end-user platform, local authorities, experts and consortium members (version 2)	2009-07-13
Mediate end-user platform, local authorities, experts and consortium members (version 3)	2009-09-09
Mediate consortium members (version 4)	2009-11-02
Mediate consortium members (version 5)	2009-11-29
Mediate consortium members, end-user platform, local authorities (version 6)	2009-12-21
Reviewers / experts (version 7)	2010-01-13
Mediate consortium (version 8, final report)	2010-03-22

Approval

By	Approval date
Mediate consortium	2010-04-08

Preface

The Mediate project, Methodology for Describing the Accessibility of Transport in Europe, is funded as a Co-ordination and Support Action within the 7th European Commission Framework Program, Theme 7: Transport, under the Call FP7 - Sustainable Surface Transport (SST) – 2007 – RTD – 1, on the topic SST.2007.3.1.1 New Mobility Concepts for Passengers ensuring Accessibility for All. The Mediate project runs from December 2008 – November 2010.

The overall objective of Mediate is to contribute to the development of inclusive urban transport systems with better access for all citizens. The project objective is to establish a common European methodology for measuring accessibility to transport. This report on indicators for urban public transport accessibility is the first key deliverable. The following Mediate key deliverables are the self-assessment tool, the good practice guide, and the final report.

Key elements have been the establishment of an End-User Platform (http://www.age-platform.org/EN/IMG/pdf_EUP_composition.pdf) and the web portal on public transport accessibility www.aptie.eu (www.accessiblepublictransportineurope.eu). More information about the Mediate project can be found on the project's website www.mediate-project.eu.

The partners of the Mediate consortium:

- SINTEF (Norway, coordinator)
- Promotion of Operational Links with Integrated Services - POLIS, (Belgium)
- The European Older People's Platform – AGE (Belgium)
- Transport & Travel Research Ltd - TTR (United Kingdom)
- Transport for London - TfL (United Kingdom)
- IMOB Transportation Research Institute, Hasselt University (Belgium)
- TIS.pt (Portugal)
- TIMENCO (Belgium)

This report has been compiled by SINTEF with substantial contributions from the Mediate partners. Thanks also to the Mediate working group members, Mediate end user platform, Mediate experts and Access2All partners for valuable contributions to the review of the report.

Table of contents

Preface	3
Index of Tables	5
Index of Figures	5
Executive Summary	6
1 Introduction	8
1.1 Mediate project	8
1.2 How to read this report	10
2 Why and how to select urban public transport accessibility indicators?	12
2.1 Why urban public transport accessibility indicators?	12
2.2 What is an indicator?	13
2.3 Review of previous initiatives as a starting point	17
2.4 Different aspects of measuring accessibility	18
2.5 The process of identifying key accessibility themes in view of defining indicators	21
2.6 A spotlight on education, standardisation and harmonisation	22
3 Indicators describing the accessibility of urban public transport	23
3.1 The use of indicators: Who and why	23
3.2 Principles in forming the selection and presentation of indicators	24
3.3 Indicators describing urban public transport accessibility	31
3.4 The use of indicators: How to collect data and assess each indicator	39
4 Discussion and concluding remarks	45
4.1 A complex set of indicators	45
4.2 Quantitative or qualitative scales to access the indicators	46
4.3 Awareness crucial in meeting user needs	47
4.4 Innovation level	48
4.5 Further developments	48
4.6 Concluding remarks	50
Glossary and explanations	51
References	55
Appendix: List of relevant urban public transport accessibility themes	58

Index of Tables

Table 1: Key indicators for urban public transport accessibility	6
Table 2: Accessibility aspects related to person, environment and activity (Carlsson 2002: 39)	19
Table 3: Levels of development	28
Table 4: Quality levels for accessibility (adjusted version based on Tormans et al. 2009)	29
Table 5: Key indicators on urban public transport accessibility	32
Table 6: Looking at indicator themes from the customer perspective.....	33
Table 7: Looking at indicator themes from the service operator perspective.....	34
Table 8: Policy and investment indicators.....	35
Table 9: Service operations and standards indicators	36
Table 10: Information and ticketing indicators	37
Table 11: Vehicles and built environment indicators.....	38
Table 12: Seamless travel indicator.....	39
Table 13: An example of defining the transport system to be assessed.....	40
Table 14: An example of assessment procedure for the policy approach scale.....	43
Table 15: An example of assessment procedure for a qualitative scale.....	44

Index of Figures

Figure 1: Mediate knowledge coordination, work packages and stages.....	9
Figure 2: Indicators within the hierarchy of data presentation (Høyer 2009)	13
Figure 3: Some categories of indicators and connections between them.....	15
Figure 4: Provider and customer perspectives on public transport service quality (CEN 2002)	26
Figure 5: The policy cycle (own adaptation based on the BYPAD policy cycle)	27

Executive Summary

The overall aim of the Mediate project is to contribute to the development of inclusive urban transport systems with better access for all citizens (www.mediate-project.eu). The objective of Mediate is to develop a common methodology for measuring accessibility to transport; including accessibility indicators for urban public transport, a self-assessment tool, a good practice guide, a web-portal on public transport accessibility (www.aptie.eu) and a continuing European end-user platform.

This report presents accessibility indicators for urban public transport and the process of identifying and selecting them. The indicators are targeted for use by local authorities to assess the local public transport system, but may also be used by individual operators, end-user organisations etc. These indicators serve to highlight different aspects of accessibility within a city, pointing out strengths and weaknesses of the local public transport system, rather than a comparison between cities.

The indicators are based on the idea of Total Quality Management (TQM), recognising that the development and implementation of accessibility is a dynamic process of sequential stages that bring accessibility up to a higher level of development. A set of key indicators and detailed indicators (sub-indicators) are identified to reflect major areas for the provision of public transport accessibility, based on a literature review and substantial input from local authorities and operators running public transport systems, the users of the system, and accessibility experts.

Table 1: Key indicators for urban public transport accessibility

No	Key indicator	Measure / scale (most positive alternative first)
Policy indicators		
Policy and investment		
A1	Accessibility plan: Current plan at urban level.	Yes / no
A2	End-user involvement (of older and disabled people) in planning, implementation, monitoring and evaluation.	Qualitative description
A3	Integrated accessibility policy	Qualitative description
Service operations and standards		
B1	Meeting user needs (staff, personal security measures, complaint procedures, and feedback)	Qualitative description
B2	Accessibility maintenance: Plan, routines, and monitoring.	Qualitative description
B3	Fare policies & alternative services	Qualitative description
Performance indicators		
Information and ticketing systems		
C1	Accessible information	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
C2	Accessible ticketing (buying & validating)	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
Vehicles and built environment		
D1	Accessible vehicles and built environment (pedestrian environment, stops and stations, platforms and vehicles)	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
Seamless travel		
E1	Seamless travel (modal interoperability)	Policy approach: Integrated / system-oriented / isolated / ad hoc / none

Each indicator is presented with a label (name), explanation and a scale for assessment (see tables 6-10), and a subset of detailed indicators informs the assessment of the key indicator. Both quantitative (yes/no, numbers and percent) and qualitative scales (policy approach and qualitative descriptions) are applied for assessment, depending on the nature of the indicator theme and data availability. The policy approach scale (integrated-, system-oriented-, isolated-, ad hoc- or no approach) is closely related to TQM and the methodology of the self-assessment tool. While the indicators have a solid base, there is some discussion on the choice of qualitative scales. The next steps of the Mediate project will bring more knowledge about the practical aspects of this, and the set of indicators may remain intact even if assessment scales are adjusted.

The process of identifying important aspects and selecting indicators included a review of previous and on-going initiatives, standards and methods to describe and measure accessibility in public transport (Marques et al. 2009), as well as theoretical aspects of measuring accessibility, and the purpose and requirements of indicators. In addition, a holistic approach was used including:

- All elements of a travel chain; information before and on trip, travel to stop, ticketing, boarding/alighting and travelling by public transport, and the journey to destination.
- Quality elements from the point of view of customers, including usability aspects, and operators.
- All relevant end-user groups; potential public transport users, and all those involved in service delivery of public transport or the pedestrian environment.
- All phases of the planning process; identify needs, planning, actions, monitoring and evaluation.

A vital strategy has been to ensure relevant input from local authorities and operators running the public transport system and the users of the system. A core principle has been to involve disabled people and older people, represented by end-user platform, to get in-depth information on barriers experienced and important services needed when using public transport. Relevant themes, aspects, assessment scales, and how to collect and report data, were discussed with the end-user platform, local authorities and experts, and the most important issues were prioritized to select the list of key indicators. The need to clarify essential terms was identified, and a glossary is presented at the end of this document.

This dialogue also revealed important issues for the accessibility of urban public transport which cannot be solved entirely at local level. The need to standardise and make the travel environment compatible was mentioned repeatedly. Moreover, it became obvious that transport providers seek professionals with training in accessibility issues, highlighting the need for accessibility and universal design issues to be included in higher education.

Key indicators for urban public transport accessibility have been identified on the basis of a literature review and substantial input from relevant user groups. This may contribute to a more harmonious understanding of accessibility issues and the need for improvements throughout Europe. At the local level the indicators provide a tool for pointing out areas in need of improvement. The set of indicators identified provides a sound basis for the further work of Mediate; data collection and the development of a self-assessment tool.

1 Introduction

European transport systems play a key role in the transportation of people and goods, and are essential to Europe's prosperity, being closely linked to economic growth. Despite the progress made in recent years in improving accessibility for all, it is estimated that 10 to 20 percent of European citizens, including disabled people and older people, are still experiencing barriers and limited accessibility to public transport (EMCT 2006). These barriers limit the possibilities and opportunities for employment, social and leisure activities, and full participation in society.

The population of Europe is more than 700 million (UN 2007). There has been a rapid and unprecedented growth in the number and proportion of older people, and the majority of older people live in cities. The Mediate project targets the accessibility of urban public transport systems. This is in line with the European Commission Action Plan on Urban Mobility (2009) - Action 5: Improving accessibility for persons with reduced mobility. And it is a binding responsibility following the UN Convention on the rights of persons with disabilities (§ 9). Tools to increase the efficiency of the process of achieving accessible transport systems in Europe are more important than ever, and developing an inclusive European transport system accessible for all may increase the market potential for transport operators and the number of people travelling by public transport.

Chapter 1 is an introduction to the Mediate project and the task to identify and select indicators in order to measure accessibility in public urban transport in Europe. Section 1.3 gives an overview of the report.

1.1 Mediate project

The Mediate project, Methodology for Describing the Accessibility of Transport in Europe, is a coordination and support action within the 7th European Commission Framework Programme, running from December 2008 – November 2010. The overall objective of Mediate is to contribute to the development of inclusive urban transport systems with better access for all citizens. The main idea is to contribute to the efficiency of the process of achieving accessible transport systems in Europe, by developing a methodology for measuring accessibility to transport and a set of common tools: common European indicators for describing accessibility, a self-assessment tool, a good practice guide, a web portal on public transport accessibility (www.aptie.eu) and a European end-user platform. More information about the Mediate project can be found on the project's website www.mediate-project.eu. The partners of the Mediate consortium are:

- SINTEF (Norway, coordinator)
- Promotion of Operational Links with Integrated Services - POLIS, (Belgium)
- The European Older People's Platform – AGE (Belgium)
- Transport & Travel Research Ltd - TTR (United Kingdom)
- Transport for London - TfL (United Kingdom)
- IMOB Transportation Research Institute, Hasselt University (Belgium)
- TIS.pt (Portugal)
- TIMENCO (Belgium)

The overall project objective is translated into the following operational objectives:

- Establish an overview of relevant initiatives and methodologies that describe and measure accessibility to urban transport (review report; Marques et al. 2009).
- Identify a set of common European indicators for describing accessibility to urban transport.
- Collect examples of good practice from European cities and collect data supporting the European indicators.
- Develop a self-assessment tool for measuring accessibility to urban transport.
- Establish working groups involving European cities (local authorities and public transport operators) for exchange of information among stakeholders and provision of relevant input about indicators to the project.
- Create an End-user platform providing end-user experience and input from a broad range of passenger groups. Define a strategy plan for the long term viability of the End-user platform with the purpose of providing a resource for other EU activities to tap into and engage end-users with different abilities in R&D projects.

As figure 1 below illustrates, the end-user platform, local authorities working group and Mediate experts contribute to the process of developing a methodology and tools for assessing public transport accessibility. The process involves identifying indicators which in turn influence data collection and the collection of good practice, leading to the development of a self-assessment tool¹. Thorough guidance will be provided to public transport authorities involved in the collection of data, the next step of the Mediate project. The analysis of collected data may later serve to review the selected indicators. The results will be communicated to relevant standardisation bodies.

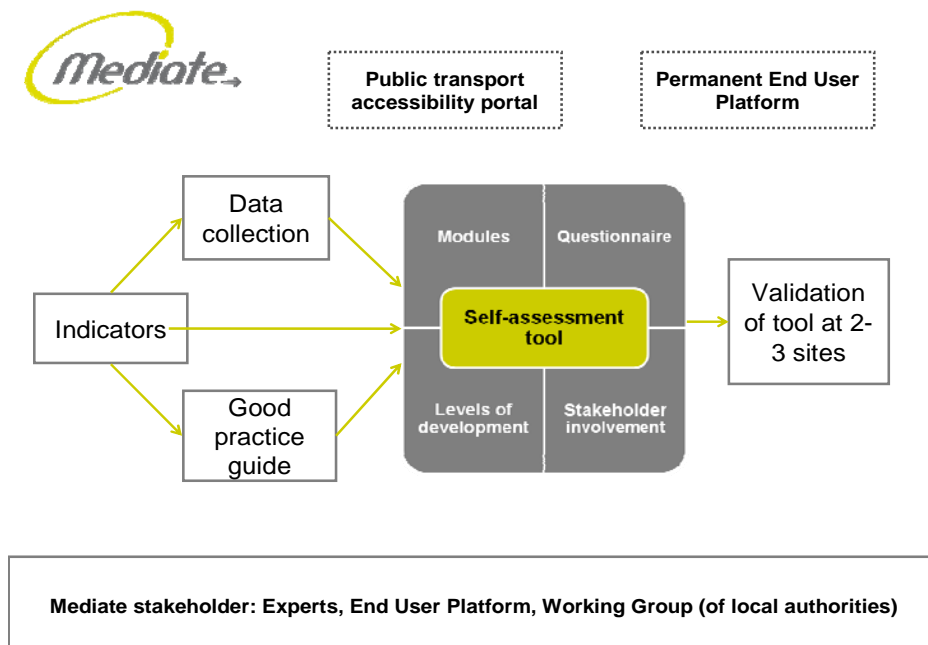


Figure 1: Mediate knowledge coordination, work packages and stages

¹ The analysis of quantitative and qualitative data from cities will provide input to the process of developing the self-assessment tool, while applying the self-assessment tool requires a different set of (qualitative) data.

1.1.1 This report cover the task to identify and select indicators

This report describes the task to identify and select indicators in order to measure accessibility in public urban transport in Europe (Mediate work package 2). This task builds on the results from existing research studies and the active engagement of the different Mediate stakeholders, with the following specific objectives:

The first step involved reviewing previous and on-going initiatives, standards and methods to describe and measure accessibility in public transport, reflecting current status (Marques et al. 2009).

The next step involved the identification of important issues and the definition of the indicators, with significant input from the different stakeholders. Realising that disabled people and older people are the experts in their own needs, their contribution is essential to ensure that the measurement tools developed are capable of defining what makes a public transport system accessible and easier to use for disabled people. The involvement of local authorities and transport providers helps to ensure that the indicators are in a usable format. Two working group meetings involving local authorities, Mediate experts and the end-user platform were arranged to ensure a collaborative process and relevant input (see chapter 2.5 for description of the process).

1.2 How to read this report

This report presents indicators for urban public transport accessibility and the process of identifying and selecting common indicators for describing accessibility to urban public transport. It provides a first introduction to key indicators and sub-indicators, and documents the process of selection and the rationale behind the indicators². This provides a basis for interpretation of data and indicators and further refinement of the indicators. The indicators are targeted for use by local authorities to assess the local public transport system, but may also be useful for others.

Chapter 1 briefly presents the Mediate project, objectives and partners. A common set of indicators describing the accessibility of urban public transport in Europe is one of several tools to be developed by the Mediate project.

Chapter 2 explains why it is necessary to develop indicators and how they can contribute to the efficiency of the process of achieving accessible transport in Europe. Next we present a definition of indicators, and findings from literature on what to look for to find indicators that represent the phenomena in question and communicate the pace and direction of development in a relevant way. Review of previous initiatives and academic studies further points out several dimensions regarding the measurement of transport accessibility. Subsequently the process followed to identify and select indicators is presented, the review of previous initiatives and the dialogue with different stakeholders. This dialogue also revealed important issues for the accessibility of urban public transport which cannot be solved entirely at local level.

² The scope for this report has not been to provide practical and comprehensive guidelines for data collection and measurement of the indicators, and practitioners may find some sections of less interest. Technical experts and scientists (including service and product developers) who want further details can consult the documents available at the project internet site (www.mediate-project.eu).

Chapter 3 presents the selected indicators for describing accessibility to urban public transport. Local authorities and transport operators are the main target groups, and we explain what cities and other parties can gain from this work. Then we present basic principles behind the selection and presentation of indicators, to serve as a background when interpreting the indicators and the data asked for. This also applies for the glossary at the back of the document. Ten key indicators with sub-indicators are defined, covering processes (policy indicators) and the resulting public transport system (performance indicators), with both quantitative (yes/no, numbers and percent) and qualitative scales. There are some suggestions on how local authorities may involve relevant actors to supply the data needed to describe the indicators, on the assessment of each indicator, and what the relevant parties may gain from this.

Chapter 4 provides discussions and concluding remarks. The complexity of the indicators in number and scale is discussed. To select indicators, the holistic approach to a complex issue needs to be balanced against simplicity in use and clear communication. And while New Public Management goal scoring boards ask for quantitative scales, the application of qualitative scales to the policy approach, based on Total Quality Management methodology, may provide a different kind of insight in the performance of the organisation. Suggestions for follow up and further development are presented before conclusions are drawn.

2 Why and how to select urban public transport accessibility indicators?

Chapter 2 starts with the reasons why accessibility indicators should be selected and presents some key features of indicators. Sections 2.3 and 2.4 briefly present literature and previous initiatives to describing accessibility, while section 2.5 presents the process followed in the Mediate project to identify and select indicators describing urban public transport accessibility. This process also revealed the importance of education and standardisation for improving public transport accessibility.

2.1 Why urban public transport accessibility indicators?

The EuroAccess project concluded that the development of a set of indicators would be a major step towards achieving some degree of common understanding on what should be the core objectives of accessibility initiatives (Marques 2009). To improve accessibility, EuroAccess considers it essential to learn from best practice, state-of-the art methodologies and other areas of the transport field, and that accessibility indicators may provide clues to identifying opportunities for improvement.

As well as presenting useful indicators, in the Mediate project the identification and selection of indicators is also a step in the process of developing a self-assessment tool. It provides a framework for data collection which in turn will inform the development of this tool. The work on indicators therefore has the following objectives:

- To define a set of common indicators covering core aspects of accessibility. This may contribute to a more harmonious understanding of accessibility issues and the need for improvement throughout Europe.
- To indicate areas in need of improvement. Providing and analysing data for the indicators will serve as a learning process for those involved, with better insight in the different aspects of accessibility. The idea is to learn about the strengths and weaknesses of the local public transport system. So although common indicators point out core aspects, the indicators will serve to direct attention to different aspects within a city rather than a (benchmarking) comparison between cities.
- To provide a basis for data collection; fact finding on the organisation and performance of the public transport system (Mediate work package 3). This data collection serves two purposes, to investigate and validate the selected set of indicators, and to inform the development of a tool for self-assessment. (To apply the self-assessment tool implies a different kind of data collection, where different actors are brought together to give their own assessment of the different aspects.)
- To provide a basis for the development of a self-assessment tool, based on the idea of Total Quality Management with step-by-step improvements considering the whole policy loop of planning, actions, evaluation etc. A basic concept of the self-assessment tool is that it is necessary to progress through one level of development in order to achieve the next level (Mediate work package 4). This outline for the tool also influences the framework and selection of indicators.

The function of each indicator is to provide a measure of important aspects of accessibility of the transport system of a city or urban region, and to indicate the direction of development, while a set of

indicators provide an overall assessment of the accessibility of the main aspects and which areas are in immediate need of improvement.

As pointed out by the Mediate description of work, this project is a coordinated action with a two year time horizon. The task is to identify appropriate themes and select indicators, while the refinement of data collection and methodology for measurement and presentation will continue through the next steps of data collection and self-assessment validation, and beyond this project.

2.2 What is an indicator?

An indicator³ is a simplified expression of complex phenomena and relationships, presenting a relationship between the indicator and basic (quantitative or qualitative) data. Individual indicators are designed to translate complex information in a concise and easily understood manner in order to represent a particular phenomenon, chosen between several measurable units because they are representative of the situation to be described.

2.2.1 Simplify, quantify and communicate

Indicators are used to gain, facilitate or promote communication about phenomena and relationships, in a way which ensures that important characteristics remain intact. Indicators may be descriptive, measurable or estimated (based either on local knowledge and experience, external knowledge or comparison with a preferred standard). The indicator may be an observable phenomenon which illustrates the state of other phenomena, which are not directly observable.

Indicators measure quality or quantity at a specific time, comparing with a preferred standard or accepted good practice. When the measurement is repeated at certain intervals, the change in that indicator also expresses the direction and tempo of development. To indicate the direction of the development, simple illustrations like arrows, colour scales e.g. “traffic lights” etc. may be applied.

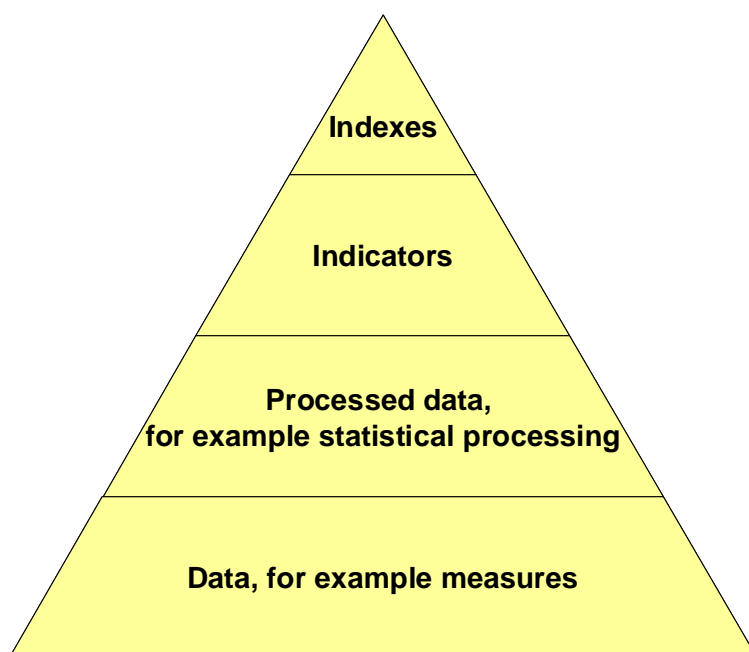


Figure 2: Indicators within the hierarchy of data presentation (Høyer 2009)

³ The word indicator originates from Latin, *indicere*, meaning to indicate, state, point out.

Indicator systems (or collections of indicators), when seen as a whole are meant to provide an assessment of the full domain or a major subset of it. General quality criteria for indicator sets may be (Norwegian Ministry of Finance 2005):

- Few indicators to maintain an overview and a clear message.
- Clear messages providing a quick thematic overview and message.
- Indicators should link with local or global political goals.
- Indicators should be comparable between different users and localities (regions).
- Indicators should have a good data base or relevant data may be collected in the near future at an acceptable cost.
- Indicators should be sensitive to small changes and suited for analyses and scenarios.

Indexes, on a higher hierarchical level, are quantitative expressions building on indicators (which in their turn build on basic data). An index presents a simplified and quantitative expression of a complex composition of indicators.

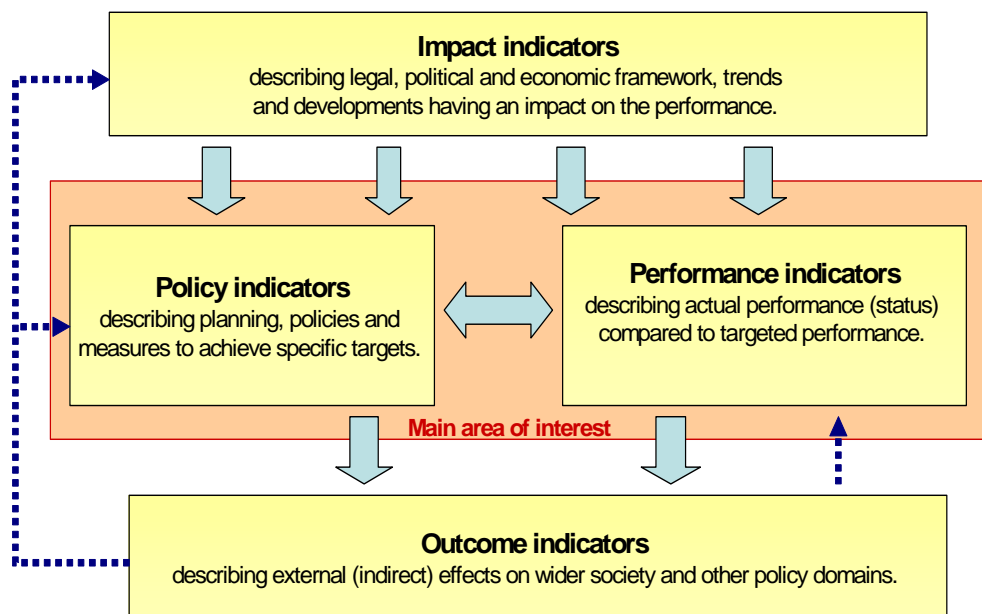
More about indicators: Existing data restrict the indicators that may be used, but on the other hand, the work on indicators may lead to the request for better data. There is quite a large body of different types of social indicators related to “New Public Management” and serving as an alternative to the domination of GNP (gross national product). Høyer (2009) points out a mismatch between the production of different indicator systems and the much smaller number actually implemented, and an even smaller number being maintained and used over time. There are many ways to classify indicators. Some categories of indicators may be of interest here⁴:

- **Impact indicators** (problem evolving processes, societal driving forces and external influences) describing legal, political and economic frameworks, trends and developments having an impact on the performance. For instance; these indicators describe societal developments outside the control of local authorities which have an influence on the level of accessibility in urban public transport.
- **Policy indicators** (response, problem solving processes) describing planning, policies and measures and how effective they are (when related to performance) in achieving specific targets; e.g. accessibility. Policy indicators answer the question: What do we do?
- **Performance indicators** describing performance; for instance the performance of the urban public transport system related to accessibility (observed and experienced accessibility status). Performance indicators answer the question: How (well) are we doing?

⁴ These categories are inspired by stress-response models, pressure-state-response models and the DPSIR-model (Drivers, Pressure, State, Impact, and Response) for environmental issues (Gabrielsen & Bosch 2003, Nenseth & Nielsen 2009). The idea is to measure the level of performance (of the studied phenomena). We also want to know if the specified policy works and how effective it is. The performance, however, is influenced by specific policy measures as well as external influence. External influence is mainly societal processes outside the control of the specific actor(s). But in some cases also policy measures this actor has on other domains indirectly influence the performance of the system.

- **Outcome indicators** describing external (indirect) effects of these specific policies and performances on other (policy, societal) domains.

Figure 3: Some categories of indicators and connections between them.



The figure illustrates the relationship between different groups of indicators; impact indicators reflecting external frameworks, policy indicators reflecting the policy in this area, performance indicators reflecting the status of this area, and outcome indicators reflecting external effects.

2.2.2 Different target groups for indicators

The type of indicators selected or developed should be based in part on who will be using the information from the indicators. There are generally three possible audiences to consider, each with different information needs (Høyer 2009):

Technical experts and scientists are interested in detailed and complex indicators. These indicators should have scientific validity, sensitivity, responsiveness and have data available on past situations.

Policy-makers, decision makers and resource managers will respond to indicators directly related to evaluating policies and objectives. Like the technical audience, they require their indicators to be sensitive, responsive and have historical data available, but they are also looking for indicators that are cost-effective and have meaning for public awareness.

The **general public and media** respond to indicators that have clear and simple messages that are meaningful to them.

2.2.3 Requirements for accessibility indicators

The review report (Marques et al. 2009) indicates that the development of a set of indicators for public transport accessibility may be a major step towards achieving some degree of common understanding on what might be future standards of accessibility. Indicators should be developed with involvement from key stakeholders; i.e. local authorities, public transport operators and infrastructure managers. Indicators should take into consideration the usability that is actually delivered by the system and experienced by the user, as well as organisational and procedural elements critical for success.

The Nordic initiative (Nordic Disability Council 2009a) lists the following requirements for indicators concerning the accessibility of public transport:

- The accessibility indicators enable us to consider the direction of development for all parts of the public transport travel chain, and especially the critical factors to enable disabled people to use public transport. Boarding the vehicle from the platform is an example of a critical trip element.
- The indicators correspond to the level of service for all passengers and should cover the needs of large groups of people with reduced mobility (for the Nordic initiative identified as persons with mobility, visual or hearing limitations).
- The accessibility indicators should be able to communicate the level of development to a wide set of target groups, and to compare the situation between countries.
- It is also expected that the indicators may be used to communicate the accessibility of the elements of the transport system to travellers in a consistent way.
- At a political level an overview is needed of the accessibility and the possibility for people with reduced mobility to travel on equal terms with all passengers, and especially the level of accessibility of parts of the network that are used by a high number of passengers.
- At a strategic level an overview is needed to ensure development proceeds according to plan, while detailed indicators are needed for planning, strategies, detailed instructions for procurement, construction, the level of transport service etc.

The Nordic indicators (Nordic Disability Council 2009b) are targeted at both local and national level and facilitate comparison between sites, targeting a wide set of target audiences. They focus on people with reduced mobility (see above) and aim at communicating the accessibility status of the transport system to travellers. The Nordic indicators⁵ focus on information (on terminals, stops and vehicles, and pre-trip accessibility information), infrastructure (stops and terminals; service facilities and the way to/from platforms), and vehicles accessible for all.

⁵ A draft report (Nordic Disability Council 2009a) presented a set of more detailed indicators and included the way to/from stops and terminals. The working group recommend the following Nordic indicators (Nordic Disability Council 2009b):

1. Percentage of information systems with accessibility information for pre-trip planning
2. Percentage of stops and terminals with information accessible for all
3. Percentage of vehicles with information accessible for all
4. Percentage of stops and terminals accessible for all
5. Percentage of vehicles accessible for all

Some differences from the scope of Mediate may be pointed out: The indicators selected by Mediate target a wider end-user group and are mainly for use by local authorities and actors to develop their policy. Comparison, and communication to travellers and a wide set of target audiences, are not main priorities, but might be followed up by future initiatives.

2.3 Review of previous initiatives as a starting point

The Mediate review report (Marques et al. 2009) summarises some 30 projects and initiatives undertaken at national, European and international level, addressing the approaches used in identifying and describing accessibility in public transport systems. These initiatives include standards and projects on intermodality, sustainable and efficient transport, cross sectional issues related to accessibility, Nordic accessibility indicators, mobility performance assessment and quality issues in mobility.

The review report points out that accessibility cannot be achieved or measured without a holistic approach, i.e. by addressing the different requirements of various groups of travellers for the whole travel chain. This requires the integration of multiple dimensions for accessibility measurements, ranging from the need for accurate, clear and concise information for travellers, a barrier-free environment, adoption of universal design principles, provision of high operational standards, intermediate solutions between individual and mainstream transport options, appropriate, effective and accessible vehicle design etc. A successful implementation of accessibility measures requires a cross-sectoral understanding of the underlying issues in order to match both planning and user perspectives. The review points out several dimensions concerning the measurement of transport accessibility:

- The variety of requirements within the population (physical, sensorial and cognitive abilities and allergens) (CEN/CENELEC workshop agreement 45546:1).
- Accessibility is a relative concept depending on the individual (traveller), the environment (public transport system), the activity to be performed and the purpose of the task (to buy a ticket, wait in line, board a vehicle, travel to job/school or as a tourist etc.).
- To measure not only physical accessibility, but the usability of the system as experienced by the user, and to measure what is critical to success and how actions may improve the overall experience of the transport system (EuroAccess project, Marques et al. 2009).
- Accessibility (and consistency) throughout the travel chain (information, pedestrian environment, access area, terminals, ticketing, boarding, vehicles):
 - The transport planning & operation dimension: Logical modal integration, physical modal integration, vehicle accessibility, on board security, on board safety & health issues, information, and assistance.
 - The infrastructure planning & management dimension: Accessibility of terminals and stops, safety and security of pedestrian areas, stops and terminals, information, and assistance (EuroAccess project).
- Cooperation between operational service providers, infrastructure managers and local authorities is essential, so that measures match and support each other (EuroAccess project).

- Accessibility depends on the transport delivery chain: staff training and competence, physical planning and design, procurements, tendering contracts, monitoring, operational procedures, maintenance procedures, etc.
- The quality circle: Addressing the gap between the planned and the actual delivered service quality from the service provider perspective (surveys, standards), and the expected and perceived service quality from the customers' perspective (questionnaires, guidelines), evaluating results and implementing actions (EN 13816).
- The quality standard defines eight quality criteria groups: Availability (network, operation time, reliability), access (interfaces, ticketing), information (travel information, regular and occasional), time (travel time, punctuality, regularity), customer service (availability of personal, competence, assistance), comfort (space, driving, environment), safety (personal security and avoidance of accidents, emergency), and environment (pollution, resources) (EN 13816).
- Indicators may be based on qualitative or quantitative data, may be compared to an ideal situation or a target, and may be descriptive, estimated or measurable. There may be different subsets of indicators illustrating the situation from the view of the operator, the customer, and the local authorities.

2.4 Different aspects of measuring accessibility

There are two distinct ways to assess the accessibility or usability of a travel chain; one is measuring the "objective" physical elements of that travel chain, another is assessment of the subjective experience of the trip. Accessibility and universal design may be described along a scale as degrees of a quality. For data on quality levels care should be taken in applying weights and total scores. The advice is to describe quality profiles or make a comparison with an ideal situation (Slagsvold 1995).

2.4.1 Measuring physical components of the travel chain (accessibility)

Iwarsson and Ståhl (2003) clarify the theoretical basis for the development of an objective instrument for the measurement of accessibility of the travel chain in urban public transport; the Travel Chain Enabler (Carlsson 2002, Iwarsson et al. 2003). They state that the foundation for physical planning should be objective evaluation from a group (population) perspective and seem to think that personal competence profiles can be aggregated to a population level. They define and delimit accessibility to be an objective correlation with norms and standards described as functional requirements. As they see it, accessibility can be reliably and relevantly measured by mapping the physical environment (compared with norms and standards and tested for validity and reliability), comparing with the personal component (with established tools like the Housing Enabler, ICF etc.), and describing the barriers caused by the mismatch.

A concern from a theoretical point of view is that norms and standards often reflect the perception of professionals, user groups and industry, with social ambitions varying between nations and over time. They are often not based on research and do not reflect the usability of users in a consistent manner (Iwarsson and Ståhl 2003).

The Travel Chain Enabler was developed to measure objectively the accessibility of the travel chain in urban public transport, as a check list comparing physical environment with norms etc. The Travel

Chain Enabler instrument consists of 255 items covering the personal component, public outdoor environment, bus stop and bus, based on norms, general advice, literature review and experiences. The instrument describes each barrier on a predefined scale 1-4. Applying the Travel Chain Enabler (Carlsson 2002) revealed some difficulties assessing urban structure and transport systems compared with a home or a building: An important issue is how to measure and assess the accessibility of vast areas and long distances, itineraries which may vary from day to day, with varying situations concerning climate, surface conditions, lighting, traffic, people and obstructions. For some barriers a lack of items was revealed. Other items lacked sufficient instructions or norms.

The following characteristics of environmental barriers (with examples) were identified (Carlsson 2002: 38):

- Absence of a specific environmental detail; e.g. no seat at bus stop.
- Presence of a specific environmental detail; e.g. obstacles on a footpath.
- Design of an environmental detail in itself; e.g. bus seat sloping backwards.
- Design of an environmental detail in relation to other environmental details; e.g. bus stop information which is impossible to see from a rear-facing seat in the bus.
- Dynamic barriers, the change of environmental demands from time to time; e.g. all seats in the bus occupied.

When comparing the results of mapping with the outcome of a method for evaluating the trip experience (based on the critical incident technique), some discrepancies were found. One conclusion was that the pilot instrument does not sufficiently reflect the cumulative effect of meeting several barriers or similar barriers again and again. Another main point is the need for an instrument which takes into account not only the person - environment relationship, but also the activity (and its purpose). The table below illustrate accessibility aspects related to person, environment and the actual activity.

Table 2: Accessibility aspects related to person, environment and activity (Carlsson 2002: 39)

Component	Static and dynamic aspects	Examples
Person	A specific impairment Combinations of impairments Walking aids as limitations	Serious vision impairment Unstable knees and a broken arm The long cane gets stuck between cobblestones
Environment	A specific environmental barrier Combinations of environmental barriers Repetition; approaching the same environmental barrier several times	Inability to walk up hills Narrow pavement descending towards traffic lane Approaching high kerbs several times
Activity	Travel activities, activities necessary to accomplish the trip Travel necessary to accomplish other activities	The change from one bus route to another Shopping

Other studies have looked into methodology to assess the relative influence of barriers. One example is the MAGUS project developing a GIS-tool to find the best itinerary for wheelchair users (Matthews et al. 2003). Some barriers are absolute, others are relative (having to spend more time or efforts, or presenting a lower comfort level), and some are dynamic – changing through the day and the year. Each barrier is given a relative value 0-1 (resistance factor) based on measurements and user experiences, another possibility is to estimate the use of time.

2.4.2 Assessing subjective travel chain experiences (usability)

Iwarsson & Ståhl (2003) describe usability as a person-environment relationship where the activity and subjective experience is focused. Analysing the personal component and the environment (as for accessibility), and the activity and its purpose, actual user problems can be identified and the usability for an individual or a group can be described. The personal experience is influenced by several factors like self-confidence, motivation, social expectations etc., and capabilities vary through the day and the year.

Some relevant approaches are surveys of user satisfaction of their own travel opportunities, analysis of travel data (travel diaries), and geographical mapping of potential travel opportunities, for example maps showing travel time for different groups. A priority tool based on user assessments of quality (performance) and importance is applied for pedestrian environments and travel modes. This includes a quality profile where user satisfaction may be compared between the quality elements and between sites (Øvstedal & Ryeng 2004, Carreno et al. 2004, Stradling et al. 2006). For low mobility groups revealed preference data may provide little information about barriers experienced. Applying Stated Preference Methods⁶ (Permain et al. 1991) may also be challenging, as it is difficult to give realistic answers in unfamiliar situations.

The Critical Incident Method (Flanagan 1954) has been applied to explore the level of accessibility throughout a travel chain (Carlsson 2002). The Participating Observation Method was used to observe older people on 26 journeys involving bus trips. These observations resulted in 96 noted critical incidents; meaning the traveller either cancelled the trip, was not able to continue (31 %) or continued the trip with great difficulty (69 %). Compared with accessibility mapping using the Travel Chain Enabler, about one third of the assessments did not match and about one fifth of the observed barriers were not included in the Travel Chain Enabler pilot instrument.

Participating observation is relatively time consuming, so a similar approach has been applied for telephone interviews. A number of wheelchair users were asked about which trips they had completed each day (for 28 days), which destinations they didn't reach that day, as well as the barriers they did and did not overcome (Meyers et al. 2002). They also found that asking about the trips last month would give data as valid as that obtained by calling each day.

⁶ Revealed preference methods are methods applied to survey the actual behaviour of people (e.g. travel surveys, counts, observations). Stated Preference Methods are specific survey methods to investigate how people are likely to behave in a new situation; what they state they will do in hypothetical situations.

2.5 The process of identifying key accessibility themes in view of defining indicators

2.5.1 Stakeholder involvement

Mediate relies heavily on the input of relevant stakeholders (local authorities, public transport operators, industry, end-users and experts) and these important stakeholder groups have complemented the Mediate consortium partners in the process of identifying themes and important aspects. The stakeholders involved are organised in three groups:

- An expert group of international experts within the field of accessibility to public transport representing different stakeholder groups; end-users, operators, designers, manufacturers, researchers, consultants, etc.
- A working group of 22 representatives of European city and regional authorities, public transport operators and consultants.
- An end-user platform with representatives from 10 European organisations representing people with disabilities, older people and other relevant user groups facing barriers using public transport.

From the Mediate consortium TIS.pt lead the review process, TTR initiated the process of identifying indicators, and SINTEF has steered the process of selecting indicators towards a set of common European indicators for measuring urban public transport accessibility.

2.5.2 Valuable responses and stepwise improvements

The main input to the priority-assignment has been the discussions at two working group meetings and comments from end-user platform, city representatives, Mediate experts and consortium members. Identifying and selecting a set of indicators has been an iterative process. The main criteria for selecting the indicators have been:

- To cover the most critical accessibility features to travelling by public transport.
- To cover critical elements for success; elements that need to be in place in order to improve accessibility features critical to travelling by public transport.
- To facilitate a scale to measure the level of the indicator, so that repeated assessments provide information on the progress or lack of progress in reducing the accessibility gap.

A preliminary framework and set of indicators was prepared, based on the review of previous initiatives for measuring accessibility to public transport (see previous sections), an outline for a self-assessment tool, and expected requirements for data collection. The first Mediate working group meeting in March 2009 discussed important themes and aspects under the four headings:

- Policy and investment
- Service operation and standards
- Information and ticketing systems
- Vehicles and built environment

Reports from the breakout groups were distributed for comments. A draft document was set up outlining the principles for the identification of common indicators, followed by suggested indicators grouped under the four broad headings listed above. In defining both the principles and the indicators, we were guided by the first working group meeting discussion including reports from breakout groups, as well as outcomes of internal discussions within the consortium. Through this process it also became clear that the Mediate consortium needed to clarify some central terms. Valuable contributions from the Mediate stakeholder groups (experts, local authorities and end-user platform) to a draft indicator questionnaire have guided the process of focusing and detailing each indicator (see Appendix).

Then a revised (internal) indicator questionnaire was presented to the Mediate experts, end-user platform, local authorities and consortium members, for discussion at the 2nd Mediate working group meeting. Further comments were welcomed before, during and after the meeting. The meeting focused on two tasks; improving the questionnaire to make it easier to collect and report the data needed for describing the indicators and to extract a shorter list of key indicators. The meeting recommended clarifying who is the target group to make use of the indicators, how to make use of them and why. Other recommendations for the indicator questionnaire were to provide boxes with descriptive and explanatory text, to make explanations and definitions explicit, to keep questions short and simple, and to add a glossary. Issues on how to present the indicators and which data is needed to assess them, were also discussed at a separate meeting with the Mediate experts. Some ideas have been refined as the project evolves, and this will continue after this report is finalised as both analysing collected data and validating the self-assessment tool will bring new insights as to how to refine the set of indicators (see 4.5). The final report has been reviewed by Mediate consortium members and experts.

2.6 A spotlight on education, standardisation and harmonisation

As an outcome of the discussion on important themes and aspects, some essential themes were brought into focus. These essential targets are judged to be outside the scope of local authorities and are not included in the set of indicators.

Accessibility and universal design in higher education is one such issue. There is a demand in the transport service sector for professionals with insight into accessibility issues for a range of professions, e.g. engineers, architects, public relations etc. Both introductory courses and more extensive courses are therefore required at a range of levels and professions, at vocational schools, colleges and universities.

Another theme that has come up again and again during the course of the Mediate project is the need to standardise and harmonise solutions and environments. To be confident, the traveller needs to know which solutions to expect and how to use them. In a travel chain perspective all elements of the trip need to involve only modest mental workload and be physically barrier-free. Standardisation and harmonisation is in line with the universal design principle of “simple and intuitive use”; to eliminate unnecessary complexity and to be consistent with user expectations and intuition. Universal design is also a strategy to keep improving the usability of the environment. Standardisation and harmonisation should be kept on a functional requirement basis and not be barriers to developing even better products. The basis of a shared set of indicators may lead to a more common understanding and facilitate efforts across organisations, sites and national borders. Standardisation and harmonisation provide information exchange on solutions that work and a quality check for the user of the public transport system, and ask for more international collaboration.

3 Indicators describing the accessibility of urban public transport

Chapter 3 clarifies what city authorities and other actors may gain from applying the indicators and gives some instructions on how to make use of them. Next some principles behind the indicators are presented, which may help interpreting the indicators and how to apply them. This is also the aim of the glossary (at the end of the document). The selected indicators describing the accessibility of urban public transport are presented in section 3.3.

3.1 The use of indicators: Who and why

The Mediate objective is to contribute to the development of inclusive urban transport systems with better access for all citizens, by developing methodology and tools for measuring accessibility to transport. One of the tools is the indicators presented here. Common indicators may lead to a shared understanding of what should be the core objectives of accessibility initiatives, at a local level, between sites, and at a national level.

The selected indicators are targeted at local authorities to enable them to investigate the accessibility of the public transport system at city level or regional level. The set of indicators may also be used by individual operators, user organisations or others. This provides an opportunity to gain insight to the accessibility situation of the urban public transport system, and an overview of the status of the different parts of the transport system. The purpose is not to provide a ranking between cities, but to provide cues at city level on which areas are in immediate need of improvement and where efforts should be focused to produce accessibility improvements for travellers. By repeating the procedure at certain intervals, the indicators will suggest whether the development is sustainable, investments are well spent and contracts followed up, and point out the next core areas to focus on. The process has several objectives:

- It gives the authority and transport providers awareness of the complexity of accessibility.
- It provides a framework of relevant aspects of accessibility; helping actors to look for relevant information and recognise situations where information is missing.
- It gives all parties involved an opportunity to gain insight to the accessibility situation. The indicators provide a framework for assessing whether people with reduced mobility have access to the same level of service and quality on the trip as their fellow passengers. It points out strengths and weaknesses and where efforts should be made. Repeating the procedure at certain intervals, the indicators will indicate status, direction and pace of development, and point out the next core areas to focus on.
- The indicators are instruments in target-oriented management in order to measure the effectiveness of budgets directed at accessibility.
- The more information is available, the better the chance that a good policy is in place or can be fruitfully developed.
- For the self-assessment tool the point is to highlight the perceptions of the different stakeholders. Filling in the data for the indicators may provide a systematic background for evaluating the responses by the different actors when applying the self-assessment tool, a check-and-balance against "group thinking".

3.2 Principles in forming the selection and presentation of indicators

The understanding of the following terms and basic principles forms the basis for the selected indicators:

Mediate objective

The overall objective of Mediate is to contribute to the development of inclusive urban transport systems with better access for all citizens.

Target groups

The **Mediate** target groups are national, regional and local (city level) public administration, politicians, public transport operators, infrastructure managers, and end-user organisations.

The main target group for the **indicators** describing the accessibility of urban public transport are local authorities and all actors involved in delivering the public transport service. The indicators may also be of interest for politicians, authorities at national level, individual stakeholders, and end-user organisations.

The **public transport** target group are all citizens; passengers and potential passengers with different ages and abilities. The Mediate project has a specific focus on accessibility for disabled people and older people. When it is necessary to prioritise between groups of travellers, disabled people and older people will be the “yardsticks” for measuring urban public transport accessibility.

Indicators

An indicator is a simplified expression of complex phenomena and relationships, which makes it possible to measure them. Indicators are used to gain, facilitate or promote communication about such phenomena and relationships, in a way which ensures that important characteristics remain intact.

A holistic approach

We have attempted to identify a set of useful, key indicators that are not unduly complicated, whilst taking a holistic approach to describing accessibility, i.e. considering the whole travel chain, the needs of all groups of people, and coordination between the different actors involved in public transport provision. We have used both qualitative and quantitative, and physical and non-physical, indicators.

Practicality of the different situations

Different European countries will have different circumstances e.g. relating to levels of data availability, legislation covering public transport, and how public transport is provided. Tolerance requirements may differ slightly between nations and over time. When relevant, requirements on a European level may be applied, but stronger national requirements and guidelines apply as well. The working group on Nordic indicators concluded that this will not hinder equality and comparability of results (Nordic Disability Council 2009a). Therefore we have tried to select indicators for which it will be relatively easy to collect data, in a form that will be comparable across countries.

Assessment at city level

The detailed indicators are aimed at local authorities and restricted to city level or urban conurbations. It is difficult to find a presentation form that fits all parties. Others may use the questionnaire as well, but may have to make some adjustments to make it work for their individual circumstances.

Public transport system

Public transport passenger services have the following characteristics (CEN 2002):

- Open to all; whether travelling singly or in groups
- Publicly advertised and have a published fare
- Provided on a continuing basis having fixed routes and stopping places, or defined origins and destinations, or a defined operating area

It is not limited by reference to mode of transport, vehicle and infrastructure ownership, journey length, any necessity for pre-booking, the method of payment for travel, or the legal status of the service providers.

The indicators are restricted to public transport which is intended for use by the public in general, with a focus on fixed routes. Only the availability of taxis is assessed, while the quality of the taxi services is not included. Although special services and door-to-door services are very important for many travellers, in this document these transport services are considered to be outside the scope of mainstream public transport.

Accessibility for all

Accessibility to built infrastructure includes the ability to enter public spaces, to move inside public spaces, to use the place where activities take place, and to leave. The aim is accessibility to all to venues and use of all their facilities, including emergency access and evacuation. To measure accessibility of the public transport system the whole travel chain from origin to destination has to be considered; with easy locomotion and orientation for all travellers, avoiding substances causing hypersensitive and allergic reactions (CWA 2004, Lid 2006, Ståhl & Wretstrand 2008).

The scope of accessibility and universal design⁷ is all people regardless of age, skills and abilities. The Mediate project focuses on accessibility for disabled people and older people (see "public transport target groups", on previous page).

The social model of disability

There have been different understandings of disability through the centuries and between cultures. The social model focuses on the consequences of not taking into account the full range of the population when planning the physical environment and social arrangements in society. The physical and other barriers created by society disable individuals, limiting their opportunities in life. A main challenge is to reduce the barriers and the mechanisms that create barriers to participation, and user

⁷ Universal design is an obligation for the nations which have ratified the UN Convention on the rights of persons with disabilities (2006): "Universal design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed."

involvement is essential in these tasks. A basic principle is that disabled people and older people are the experts in their own needs.

Service delivery and perceived quality

Recognising the gap between planned and performed service quality from the service provider perspective (surveys, standards) and the expected and perceived service quality from the customers' perspective (questionnaires, guidelines), indicators address both perspectives.

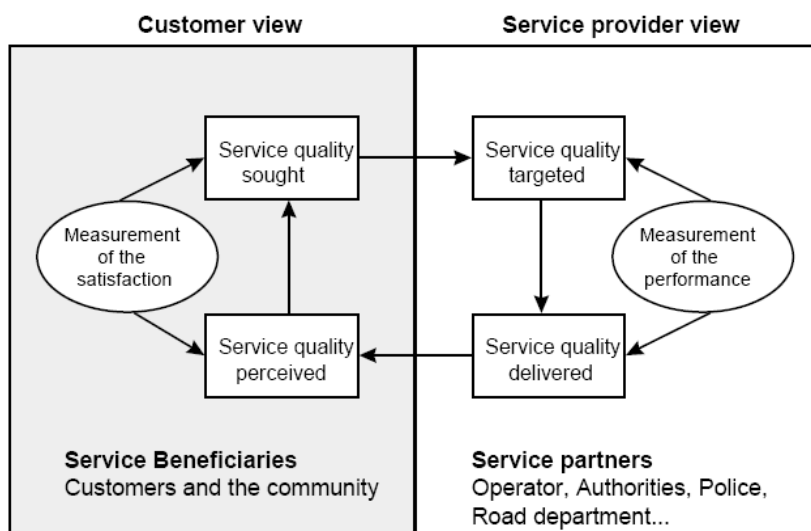


Figure 4: Service provider and customer perspectives on public transport service quality (CEN 2002)

3.2.2 The process of Total Quality Management (TQM)

Total Quality Management (Sweers 2009) recognises that the development and implementation of accessibility policy is a dynamic process through the continuous cycle of planning, actions and monitoring, producing learning moments that bring policy to a higher level of development (see **Figure 5**).

The starting point for developing good policy is "Understanding User Needs". This is the basis for developing actions and measures. A basic assumption is that a higher level can only be reached by going through sequential stages of development, improving the elements of the policy circle showing low performance. Defined levels of development are described in tables 3 and 4. Usually the process will be iterative, because the output of evaluation is input for new planning activities. On the integrated level of development User Needs are also the ongoing point of reference for all activities and evaluation.

The set of indicators will inform the development of a self-assessment tool for measuring the accessibility of public transport, which will be based on Total Quality Management (Sweers 2009), and the indicators will be associated with clusters of activities described as policy modules.

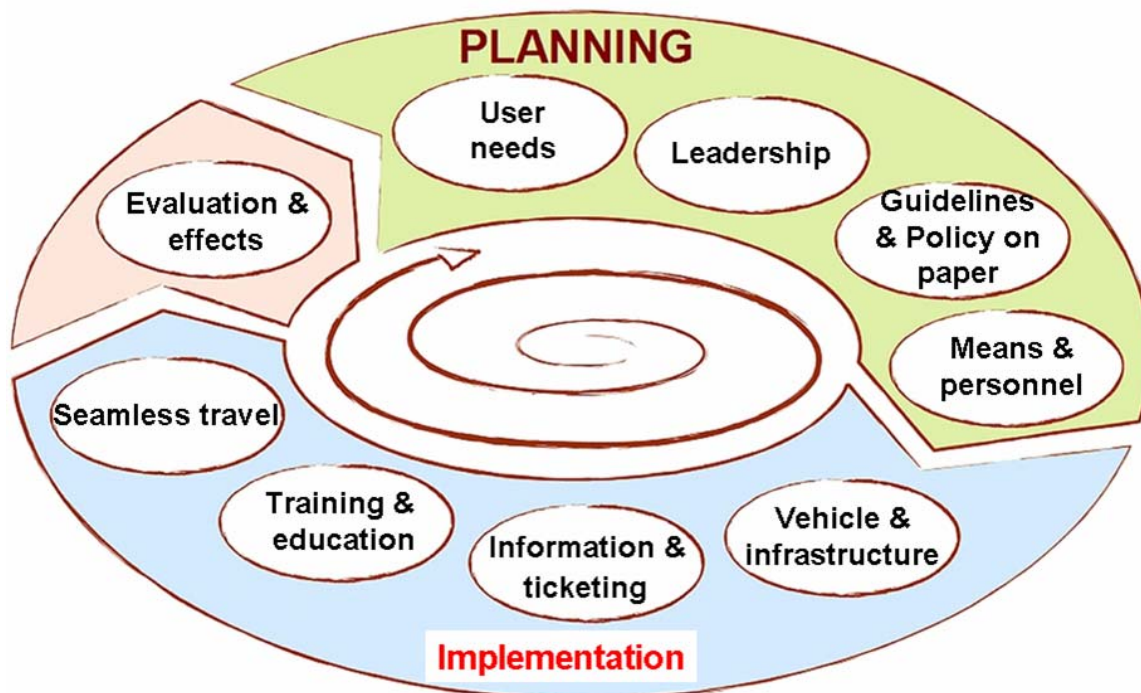


Figure 5: The policy cycle (own adaptation based on the BYPAD policy cycle)

The policy for accessibility of public transport is a dynamic and iterative process with three main components: planning, action (implementation) and monitoring. To improve and achieve a higher level of quality, the process has to go through several iterations where performance compared to user needs informs further planning and action. The idea is that it is crucial for further development to improve the weakest elements of performance. The planning modules presented are user needs, leadership, guidance and policy on paper, and means and personnel, representing “How they do it”. This is the basis for developing actions and measures. The implementation modules present important aspects of urban public transport accessibility: Vehicles and infrastructure, information and ticketing, training and education, and seamless travel, representing “What they do”.

Quality levels

An essential aspect of the TQM approach is the concept of continuous improvement or staged development. Four levels have been defined: Ad hoc, isolated, system-oriented, and integral policymaking. Some key characteristics for each level are summarised in the following tables:

Table 3: Levels of development

Levels of development	Principles as presented in the ByPad project (Sweers 2009)	Description concerning urban public transport accessibility
Ad hoc oriented approach	<p>Fire brigade principle:</p> <p>We get active if it's burning – as long as necessary, and only when necessary.</p>	Accessibility issues are sometimes included for specific projects in response to a particular need or initiative.
Isolated approach	<p>Robinson Crusoe principle:</p> <p>We do our job as good as we can – but without reference to what others are doing.</p>	Accessibility issues are systematically approached, but limited to specific population groups, elements of the travel chain or parts of the transport system.
System-oriented approach	<p>We are pulling together:</p> <p>We strive to optimise the transport system and co-operate with several partners to improve accessibility.</p>	Accessibility issues are included in initiatives considering population groups and/or travel chain elements in a systematic way through all policy stages: Planning, action, monitoring, and evaluation.
Integrated approach	<p>Winning team:</p> <p>Accessibility policy is a permanent and integrated task. We are continuously improving and we co-operate with strategic partners.</p>	Accessibility issues are considered for all population groups, all elements of the travel chain, and all stages of the policy circle: Planning, action, monitoring, and evaluation.

Table 4: Quality levels for accessibility (adjusted version based on Tormans et al. 2009)

Level	Ad hoc	Isolated	System-oriented	Integral
Scope	Ex post	Short term (1-2 years)	Medium term (5-10 years)	Long term (10-20 years)
Focus	Problem solving	Project realisation	Comply with higher policy	Integral policymaking
Approach	Individual projects	Disability domain	Mobility domain	Complete policy domain
Structure	Informal	Vaguely structured	Well structured	Well structured
Data use	--	-	+	++

Additional themes relevant to public transport accessibility indicators

Level	Ad hoc	Isolated	System-oriented	Integral
Political commitment	Little if any	General principles, but few binding decisions	Yes	Yes
Planning process	Accessibility issues are sporadically integrated in relevant procedures.	Some general principles, but few binding decisions. Accessibility issues are sometimes integrated in relevant procedures.	Accessibility issues are normally integrated in relevant procedures. Promotion of examples of accessible transport solutions.	Accessibility issues are integrated in all relevant procedures, thinking in networks covering the whole urban/regional area. Systematic evaluation and monitoring of strategies, programmes and projects. Agreed standards and inclusive design measures for each type of measure.
Action plan	Limited, focused on special aids for users with special needs.	Limited, focus on special mobility services, aids and facilities. Not coordinated with other initiatives.	Specific elements, modes or districts; inclusive measures, easy-to-use for everyone.	Holistic, inter-sectoral approach, coordinated actions with transport operators and local authorities, consistence through modes, districts, organisations.
End-user involvement	Sporadic, isolated, responsibility not clearly assigned.	Varying, steering groups established for each specific project.	Specific position, permanent unit or on-going steering group involved in all stages; planning, implementation, monitoring and evaluation.	Responsibility clearly assigned in all branches of organisation. Involvement integrated in all procedures relevant to service delivery.
Budget	Low and Irregular	Fixed but low, earmarked, restricted projects.	Fixed and designated (to specific mode, element, travel chain etc.). Increase in the number of special mobility services.	Substantial and regular, not earmarked (steady or increasing, all branches of service delivery). Decrease in use of special mobility services.
Staff (number)	Low	Low	Sufficient	Sufficient

Level	Ad hoc	Isolated	System-oriented	Integral
Staff (skills)	Low	<p>General knowledge. Qualifications on accessibility asked for, for some positions and specific cases.</p> <p>Some efforts at disability awareness training, but no procedures to check who has undergone training.</p>	<p>Specialised (by experience), qualifications on accessibility asked for, for specific groups of staff and engaged professionals.</p> <p>Specific categories of staff undergo disability awareness training, or training includes a specific set of user needs</p>	<p>Highly educated and specialised, deep knowledge of user needs. Qualifications on accessibility are asked for, for all staff to be employed and all engaged professionals, all branches and actors. All staff (categories, modes, parties) undergo disability awareness training, reflecting a wide range of travel barriers.</p>
Internal communication	Limited. Nobody is responsible and there is no formal internal communication	<p>Communication is often asking for attention to be paid to the issue, and limited to responsible people like the accessibility officer and his direct colleagues.</p>	<p>Multidirectional approach for the main players within the mobility field.</p>	<p>Multidirectional, inter-sectoral approach</p>
External communication (and data collection)	Limited	<p>Limited</p> <p>Customer satisfaction surveys and complaint procedures have been carried out, follow up is not communicated.</p>	<p>Partnerships and stakeholder contact integrated in procedures relevant to accessible service delivery.</p> <p>Customer satisfaction surveys and complaint procedures are employed to improve the transport system and the follow up plan is communicated.</p> <p>Growing number of complaints.</p>	<p>Intense external relations, systematic networking, strategic partnerships and contact with a broad spectrum of stakeholders in accessible service delivery.</p> <p>Customer satisfaction surveys at regular intervals to cover all aspects, users and non-users, with older people and disabled people involved in planning, interpretation and communication of results.</p> <p>Decline in number of complaints on accessibility problems.</p>

3.3 Indicators describing urban public transport accessibility

3.3.1 Selected key indicators

A wide range of indicator themes were identified based on the outcomes of previous initiatives and input from vital stakeholder groups (see Appendix). The main input to the priority-assignment has been discussions at two working group meetings involving end-user platform, city representatives, Mediate experts, and consortium members. Table 5 gives an overview of the key indicators grouped under five topics⁸:

- A. Policy and investments
- B. Service operations and standards
- C. Information and ticketing systems
- D. Vehicles and built environment
- E. Seamless travel (modal interoperability)

Topics A and B are policy indicators reflecting the planning modules of the policy circle in Figure 5 (How they do it). Topics C, D and E are performance indicators reflecting the implementation modules (What they do). Since these indicators target urban public transport and local authorities, indicators focus on their domains⁹.

Each topic incorporates a range of themes. Key indicators have been identified under each topic, and, where appropriate, more detailed indicators have been defined under these headlines (see the following tables). It is acknowledged that there will be some overlap between themes. If some indicators are difficult to interpret, please look at the presentation of the principles (section 3.2) and the glossary to see if there is some helpful guidance. Not all terms are precisely defined.

A scale for the measurement of each indicator is also indicated. This is briefly explained in the following section (3.4). The aim of the scale is to assess the level of the indicator to communicate the direction (progress or lack of progress in reducing the accessibility gap) and the pace of development. Sometimes local context influences how the parameters building up an indicator should be measured. Indicators may be kept intact even if there is a need to readjust the scales.

⁸ Grouping into these five headings is based on both literature review and input from working group meetings.

⁹ Targeting urban public transport and the domain of local authorities, focus is on policy indicators and performance indicators, with little weight on impact indicators and outcome indicators, see 2.2.1.

Table 5: Key indicators on urban public transport accessibility

No	Indicator	Explanation	Measure (scale) Most positive alternative first
A Policy and investment			
A1	Accessibility plan	Accessibility plan & strategy: Current plan at urban level.	Yes / no
A2	End-user involvement	End-user involvement in all stages: Involvement of older people and disabled people in planning, implementation, monitoring and evaluation.	Qualitative description
A3	Integrated accessibility policy	Accessibility integrated in all relevant policy: How accessibility is an integral part of all policy issues for all partners involved.	Qualitative description
B Service operations and standards			
B1	Meeting user needs	Available assistance, staff training, complaint procedures, user feedback, personal security measures.	Qualitative description
B2	Accessibility maintenance	Plan, routines, and monitoring.	Qualitative description
B3	Fare policies & alternative services	Fare policies & public transport affordability, and availability of alternative services.	Qualitative description
C Information and ticketing			
C1	Accessible information	Multi-format information before and during the trip: Multimodal and dynamic travel information, disruption information, and accessibility information according to user requirements, before and during the trip. Passenger travel training.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
C2	Accessible ticketing	Ease of buying and validating ticket. Simplicity, intuitive systems, possibility to buy multimodal tickets (all the way through).	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
D Vehicles and built environment			
D1	Accessible vehicles and built environment	Possibility to travel by public transport: Barrier-free (physical) environment, modest mental effort (information, orientation) and low exposure of allergens throughout travel chain (pedestrian environment, stops and stations, platform, and vehicle).	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
E Seamless travel			
E1	Seamless travel	Considering physical access, information, ticketing and fare concessions it is easy for older people and disabled people to travel by public transport, even when they need to use more than one route or mode. This also includes relevant measures and assistance to guide older people and disabled people through security systems.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none

The selected indicators reflect elements important from both the customer perspective (perceived quality) and the service operator perspective (planned quality), as indicated in the following tables. Accessibility can be measured objectively and compared with planned quality (Iwarsson and Ståhl 2003), while usability may be an integrated part of perceived quality (influenced by motivation, situational factors etc.). Although presented here under these two broad categories, for most key indicators, there may be elements of both planned and perceived quality. The indicators are a tool to provide factual information (measurement of performance), and may be supplemented by the self-assessment tool which combines the factual information with perceived quality and opinions of different stakeholders (measurement of satisfaction).

Table 6: Looking at indicator themes from the customer perspective

<i>Customer perspective (perceived quality)</i>		
Category	Key indicator	Detailed indicator themes
Vehicles and built environment	Accessible vehicles and built environment	Possibility to travel by public transport: Barrier-free (physical) environment, modest mental effort (perceptible information, clarity and ease of orientation) and low exposure of allergens throughout travel chain (pedestrian environment, platform and vehicle)
Information and ticketing system	Accessible information	Multi-format information before and during a trip (a choice of formats): Multimodal information, dynamic information and information about disruptions, and accessibility information according to user requirements.
	Accessible ticketing	Ease of buying and validating ticket. Simplicity, intuitive systems, possibility to buy multimodal tickets (all the way through).
Seamless travel	Seamless travel	Simplicity, connectivity & modal interoperability: Simplicity, homogeneity and connectivity of ticketing, information and physical environment throughout the public transport network.
Service operation and standards	Fare policies & available tailored services	Fare policies & public transport affordability. Availability of special transport services and door-to-door services.

Table 7: Looking at indicator themes from the service operator perspective

<i>Service operator perspective (service delivery)</i>		
Category	Key indicator	Detailed indicator themes
Policy and investment	Accessibility plan	Accessibility plan & strategy: Status, monitoring frequency, political commitment
	User involvement	User involvement at all stages: Planning, implementation, monitoring and evaluation
	Integrated accessibility policy	Accessibility integrated in all relevant policy: Short & long term, new & retrofitting, procurement rules, funding and investments, qualification requirements, stakeholder involvement, maintenance policy
Service operation and standards	Meeting user needs	Available assistance, staff training, complaint procedures, user feedback, personal security measures
	Accessibility maintenance	Plan, routines, monitoring
Information and ticketing system	(part of before trip info)	Passenger travel training

3.3.2 Policy and investment indicators

Key indicators and sub-indicators for each topic are presented in the following tables.

The first two indicator themes (A. Policy and investment, and B. Service operations and standards) reflect how organisations work to achieve improved accessibility (policy indicators corresponding to the planning and evaluation phases in **Figure 5**). Policy and investments mainly cover user involvement and the planning phase for new policy.

Table 8: Policy and investment indicators

Category	No	Indicator	Explanation	Measure Scale: Most positive alternative first
Policy and investment	A1	Accessibility plan	Accessibility plan & strategy: Updated plan at urban level	Yes / no
	A1.1	Accessibility plan status	Existence of formal or voluntary plan at city level, which is not out of date.	Yes / no
	A1.2	Political commitment	Political commitment at local, regional and national levels.	Both national and local / either / no
	A2	User involvement	User involvement in all stages: Involvement of older people and disabled people in planning, implementation, monitoring and evaluation.	Qualitative description
	A2.1	End-user involvement in planning	Involvement of older people and disabled people (representing a range of abilities) in planning.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	A2.2	End-user involvement in implementation	Involvement of older people and disabled people (representing a range of abilities) when implementing new measures.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	A2.3	End-user involvement in monitoring	Involvement of older people and disabled people in monitoring, and in establishing monitoring routines.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	A2.4	End-user involvement in evaluation	Involvement of older people and disabled people when evaluating measures.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	A3	Integrated accessibility policy	Accessibility integrated in all relevant policy: How accessibility is an integral part of all policy issues for all partners involved.	Qualitative description
	A3.1	Physical planning	Accessibility is a major requirement in all building projects, new and retrofitting.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none Qualitative description
	A3.2	Maintenance routines	Accessibility issues are an integrated part of maintenance routines.	Yes / partly / no
	A3.3	Procurements, tendering contracts, service level agreements	Accessibility is a major issue in procurement procedures and tendering contracts, both as selection criteria and for monitoring the contract.	Yes / partly / no
	A3.4	Qualification requirements	Qualifications on accessibility issues/universal design are asked for when employing staff and when engaging consultants.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	A3.5	Funding and investments	The priority of accessibility is reflected in a substantial share of investments on a steady or increasing level over time.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	A3.6	Involvement of stakeholders	There is an on-going process of engaging all relevant stakeholders in the delivery of an accessible transport system.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none

3.3.3 Service operations and standards indicators

Service operations and standards cover management, maintenance, monitoring and evaluation issues.

Table 9: Service operations and standards indicators

Category	No	Indicator	Explanation	Measure
				Scale: Most positive alternative first
Service operations and standards	B1	Meeting user needs	Available assistance, staff training, complaint procedures, user feedback, personal security measures.	Qualitative description
	B1.1	Staff training	All staff undergo theoretical and practical disability awareness training and have the necessary skills to meet the needs of the travellers.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	B1.2	Customer satisfaction surveys	Customer satisfaction surveys are applied to improve services for all potential customers, and especially for older people and disabled people.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	B1.3	Complaint procedures	Complaint procedures are applied to improve services for all customers, and especially for older people and disabled people.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	B1.4	Staff availability	Staff are available to provide on-trip information on stations and vehicles.	To a great extent / to some extent / rarely
	B1.5	Personal security measures	A personal security policy covering the whole travel chain is in place.	Yes / partly / ad hoc or none
	B2	Accessibility maintenance	Plans, routines and monitoring to ensure accessibility is maintained.	Yes / partly / ad hoc or none
	B3	Fare policies and alternative services	Fare policies and alternative services	Qualitative description
	B3.1	Public transport affordability	Fare policies & public transport affordability (including reimbursement procedures)	Yes / partly / no
	B3.2	Available alternative services	Availability of alternative services; special transport services and door-to-door services.	Yes / partly / no

3.3.4 Information and ticketing indicators

The next themes focus on the performance (the accessibility status) of the urban public transport system; information before and during trips, ticketing, the pedestrian environment, platforms and vehicles. These performance indicators correspond to the implementation phase of the policy cycle.

Information and ticketing focus on whether the information meets user needs in format and content, before and during trip, and the ease of buying and validating tickets.

Table 10: Information and ticketing indicators

Category	No	Indicator	Explanation	Measure Scale: Most positive alternative first
Information and ticketing	C1	Accessible information	Multi-format information before and during trip: Multimodal info, dynamic info and accessibility info according to user requirements, before and during trip as well as disruptions info. Passenger travel training.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	C1.1	Information before and on trip meeting user requirements	Multimodal info, dynamic info and accessibility info according to user requirements.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	C1.2	Disruption and emergency info	Information about disruptions and emergencies are designed to reach all end-user groups and staff are trained to assist travellers who need assistance (existence of an emergency / evacuating plan).	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	C1.3	Passenger travel training	Passenger travel training is provided to a broad range of passenger groups covering a wide range of barriers to transport.	Yes / partly / none
	C2	Accessible ticketing	Ease of buying and validating ticket. Simplicity, intuitive systems, possibility to buy multimodal tickets (all the way through).	Policy approach: Integrated / system-oriented / isolated / ad hoc / none

3.3.5 Vehicles and built environment indicators

Accessible vehicles and built environment is about accessibility on the way to a public transport stop and on stops, terminals, and platforms, as well as the match between platform and vehicle and the trip on board.

Table 11: Vehicles and built environment indicators

Category	No	Indicator	Explanation	Measure Scale: Most positive alternative first
Vehicles and built environment	D1	Accessible vehicles and built environment	Possibility to travel by public transport: Barrier-free (physical) environment, modest mental effort (information, orientation) and low exposure of allergens throughout travel chain (pedestrian environment, stops and stations, platform, and vehicle).	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	D1.1	Barrier-free pedestrian environment	Actors cooperate in their efforts of making the way to and from public transport barrier-free and easy to find.	Pedestrian environment is: Improving / as before / getting worse
	D1.2	Platform accessibility	Platforms have level access to vehicles and to pedestrian network, are smoke-free and have audio and visual announcements.	Policy approach: Integrated / system-oriented / isolated / ad hoc / none
	D1.21		Platforms have level access to vehicles and to pedestrian network, are smoke-free and have audio and visual announcements.	Share of platforms (%)
	D.1.22		Platforms have level access to vehicles and to pedestrian network, are smoke-free and have audio and visual announcements.	Share of lines (%)
	D1.3	Vehicle accessibility	Vehicles have low floor, kneeling and/or ramps, designated place for wheelchair users and both audio and visual announcements.	Integrated / system-oriented / isolated / ad hoc (approach) / none
	D1.31		Vehicles have low floor, kneeling and/or ramps, designated place for wheelchair users and both audio and visual announcements.	Share of vehicle-km (%)
	D1.32		Vehicles have low floor, kneeling and/or ramps, designated place for wheelchair users and both audio and visual announcements.	Share of lines (%)

3.3.6 Seamless travel indicator

The indicator theme “Seamless Travel” is a bit different from the others. If we manage to achieve a high level accessibility resulting in a usable and inclusive system, the system could be rated as seamless. Confidence and simplicity for the traveller are central concepts, and customer satisfaction and feeling of safety before and during the trip are important parameters. Seamless travel depends upon the actual accessibility of transport hubs and routeing between transport modes, and on accessible information on multimodal routeing and the accessibility of transport hubs and routes between them, etc. The idea here is not to count each aspect separately (for example the percentage of low floor vehicles), but to investigate the proportion of the transport network where all main accessibility features are in place (proportion of accessible travel chains) and have a predictable standard (standardisation). The option to buy a single ticket for the whole journey and similarity of solutions throughout the transport network makes it easier to learn the system and to travel.

Table 12: Seamless travel indicator

Category	No	Indicator	Explanation	Measure Scale: Most positive alternative first
Seamless travel	E1	Seamless travel	Considering physical access, information, ticketing and fare concessions it is easy for older people and disabled people to travel by public transport, even when they need to use more than one route or mode. This includes relevant measures and assistance to guide older people and disabled people through security systems.	Integrated / system-oriented / isolated /ad hoc (approach) / none

3.4 The use of indicators: How to collect data and assess each indicator

For the data collection phase there needs to be a checklist or questionnaire to define the data needed for the indicators. The investigation of the urban public transport system is, however, a joint undertaking for all the actors involved in the provision of local public transport. There are two suggested ways to organise the process:

- The local authorities may ask all relevant actors to provide the data needed to complete the questionnaire for which they are responsible.
- The local authorities invite all relevant partners around a table to give input to the indicators. Each partner then must have prepared the necessary data beforehand.

To achieve valuable information on the direction and pace of development, it is important to assess the aspects in a comparable way each time. It will be important to document the procedure. This also indicates that it may be better to keep the number of people involved low and to give sufficient information and training to those involved. Documentation regarding indicators need to be carried

out at a reasonably high level in each organisation, with senior staff in charge of the investigation to ensure straightforward assessment, without the need to make things look better than they are.

Before the data collection phase we recommend that the transport system to be assessed is clearly defined in terms of geographical area, public authorities, transport operators, modes etc (see **Table 13** for an example). This helps to ensure that all relevant partners are identified and included in the process. It also helps the partners to collect data in a consistent way for all aspects of the transport system, relating to the same geographical area, length of network, modes and number of vehicles etc. It clarifies the level at which each outcome is relevant (city region, city level, or single operator).

Table 13: An example of defining the transport system to be assessed

<p>To make sure all actors have the same understanding it is useful to define the urban public transport system to be assessed: In terms of geographical area (urban conglomeration, municipality, city, urban district or part of city), relevant modes, transport providers and transport authorities involved. This may be supplemented with a list of the number of vehicles for each mode, length of network, number of stops etc.</p>	
Geographical area:	_____
	(name of district/city/region etc. or description)
Modes:	_____
	(list assessed modes within the geographical area)
Public Transport Operators:	_____
	(list names of companies being assessed)
Public Transport Authorities:	_____
	(list authorities responsible for the Public Transport network and pedestrian network of the geographical area)

Once the geographical area of the assessment has been chosen, it may be a good idea to describe the actual transport network in terms of the number of vehicles for each mode and the number of stops and terminals of certain categories. This may also simplify the process of repeating the assessment, as there may not be a need to assess the same vehicles again the next time, unless changes are made. To learn from the assessment a certain level of detailed investigation is needed. If the work load of data collection seems overwhelming, it might be better to start with a sub-area and widen the area as a next step.

3.4.1 The assessment of each indicator

Each sub-indicator may represent a set of questions and datasets. The assessment for each sub-indicator is an overall assessment based on the data provided. Themes listed in the Appendix may

be applied as a checklist for data to be collected for each sub-indicator. Then, the assessment of the key indicator is an overall assessment based on the sub-indicators in that group. Basically all sub-indicators have the same weight, but there may be exceptions. What is important is to document how each indicator has been assessed, to allow comparison over time and follow the direction and pace of development.

A scale of how to assess the indicator is given. This may be quantitative (a number or percentage), a qualitative scale (better, as before, worse) or a qualitative description etc. For some indicators it is advisable to add a qualitative description to the more quantitative score, to facilitate comparison over time. The scales presented here are best judgements based on the nature of each theme, expectations on the availability of data and current knowledge

While most scales are quite intuitive, the scale describing the policy approach needs some clarification (see also tables 3 and 4):

Integrated approach:	The policy approach for this indicator theme considers all population groups, all elements of the travel chain, and all stages of the policy circle (see figure 2).
System-oriented approach:	The policy approach for this indicator considers population groups and/or travel chain elements in a systematic way through all policy stages (planning, actions, monitoring, evaluation)
Isolated approach:	The policy approach for this indicator is systematic in its approach, but isolated to specific population groups, travel chain elements, or parts of the transport system.
Ad hoc approach:	For this indicator theme accessibility issues are sometimes included, for specific projects and periods.
No approach	Accessibility issues have not been considered for this indicator theme.

The policy approach scale is clearly connected to the Total Quality Management approach and the idea of improving from one level to another. This also links the indicators to the self-assessment tool. If this scale proves not to be sensitive enough to provide information on the development, it is possible to keep the indicators and adjust the scales¹⁰. Each indicator is based on a set of data, including quantitative data supporting the assessment of the phase and direction of development.

The set of key indicators and sub-indicators may be kept even if scales are revised or changed, but it will make it difficult to compare results before and after.

¹⁰ There is no guarantee that a quantitative (as compared to qualitative) scale is more sensitive to small changes. The Nordic Initiative applies a checklist approach (Nordic Disability Council 2009). For each station, platform, vehicle etc. a list of requirements needs to be fulfilled. If one of the requirements on the list is not fulfilled, this travel chain element is regarded not accessible. Not unlikely at least one requirement is not fulfilled, even after substantial improvements. The threshold for influencing the indicators is quite high, making it hard to register a positive development.

3.4.2 Examples of assessment procedures

For the Mediate project a draft indicator questionnaire provided clearly defined procedures for the assessment, reducing the subjectivity of the judgement. For each theme a short description was presented of main elements to consider, explanation of some terms, and guidance on how to assess (measure) the (key/sub-) indicator and interpret the suggested scale (Mediate 2009). The following tables present examples for two different scales.

Table 14: An example of assessment procedure for the policy approach scale

The yellow text box describes an ideal situation and/or provides guidance on what elements to look for. The blue text box gives advice on how to assess the gathered information, which may be based on the presented questions. The assessment for C1.2 is one part of information for the overall assessment for C1 Accessible information. A qualitative description may be added, e.g. if the result in one area differs significantly from the general impression.

C1.2 Disruption and emergency info For all parts of the transport network the organisations have provisions and procedures to communicate irregularities (disruptions, unforeseen changes to services) and emergency situations to all travellers, and to provide assistance in emergency evacuation. Provisions and procedures are tested and evaluated with the involvement of end-users.			
C1.2	Disruption and emergency info	Information about disruptions and emergencies are designed to reach all end-user groups and staff is trained to help travellers who need assistance.	Integrated / system-orientated / isolated / ad hoc (approach)
<p><i>Disruptions and irregularities</i></p> <ol style="list-style-type: none"> Is there a mechanism for communicating unforeseen changes and disruption to passengers? (Y/N) If yes, in what forms is such information accessible? <input type="checkbox"/> Audio announcements <input type="checkbox"/> Visual information <input type="checkbox"/> More than one language Are there quality assessment procedures as to whether passengers get the information they need in case of disruptions? How is this checked? Do you have enough trained back-up staff on call to provide information and assistance in the event of disruption? <p><i>Emergencies</i></p> <ol style="list-style-type: none"> Are there provisions or procedures, in the event of an emergency evacuation, for communicating with disabled people? (Y/N) If yes, are staff trained, in the event of an emergency evacuation, to provide assistance to and/or communicate with disabled people? (Y/N) <ul style="list-style-type: none"> <input type="checkbox"/> People who are blind or partially sighted <input type="checkbox"/> People who are deaf or hard of hearing <input type="checkbox"/> People with a learning disability <input type="checkbox"/> Wheelchair users and people with walking difficulty <input type="checkbox"/> Others; specify: Are there quality assessment procedures as to whether passengers get the help and information needed in case of emergency? (Y/N) How is this checked?Are end-users involved? (Y/N) <p>Additional comments:</p>			
<p>Based on your answers to the questions, tick the category below which describe the provision of disruption and emergency information for the public transport system best:</p> <p>Integrated: The provision of both disruption info and emergency info is planned and monitored to meet the needs of different passenger groups, for main elements of the transport system.</p> <p>System-orientated: The provision of disruption info and/or emergency info is planned and monitored to meet the needs of specific passenger groups, for some parts of the transport system.</p> <p>Isolated: Generally disruption info and emergency info may be hard to access for older people and disabled people, but the provision is good for a specific part of the transport system.</p> <p>Ad hoc: There have been a few attempts to improve the information on disruptions and emergencies but without any systematic following up.</p> <p>Additional qualitative descriptions may include end-user involvement, and specific projects and improvements.</p>			

Table 15: An example of assessment procedure for a qualitative scale

The yellow text box provides a description of an ideal situation or guidance on what elements to look for. In this case no guidance is provided (no blue text box) on to how to assess the information gathered based on the presented questions. The scale indicates an assessment mainly based on the range of passenger groups included in the training, while the number of people receiving training and the contents of the delivered training are considered as well. The assessment for C1.3 is part of the information considered for C1 Accessible information. A qualitative description may be added, for example if the result in one area differs significantly from the general impression.

C1.3 Passenger travel training Within the defined urban area passenger travel training is conducted in collaboration between authorities and public transport operators, with end-users involved in the training delivery. Training is offered at certain intervals and to a wide range of groups, and spreading information on changes in the public transport system is part of the agenda.			
C1.3	Passenger travel training	Passenger travel training is provided to a broad range of passenger groups including a wide range of barriers to transport	Yes / partly / none
1. Is the public transport system (authorities, operators etc.) providing or sponsoring any form of training for passengers in using public transport, or in travelling in the pedestrian environment? (Y / N / data not available)			
2. If yes, for which groups is this training intended to be of benefit?			
Passenger groups	Received training during past year Yes, training conducted	How many received training (approx.)	Yes, the outcomes are monitored and measured
People with learning disabilities:	<input type="checkbox"/>(number)	<input type="checkbox"/>
Disabled children	<input type="checkbox"/>(number)	<input type="checkbox"/>
Non-disabled children	<input type="checkbox"/>(number)	<input type="checkbox"/>
Older people	<input type="checkbox"/>(number)	<input type="checkbox"/>
People who are blind or partially-sighted	<input type="checkbox"/>(number)	<input type="checkbox"/>
Wheelchair users, people with physical disabilities	<input type="checkbox"/>(number)	<input type="checkbox"/>
Other people; describe:	<input type="checkbox"/>(number)	<input type="checkbox"/>
Additional comments:			

4 Discussion and concluding remarks

4.1 A complex set of indicators

The overall objective of Mediate is to contribute to the development of inclusive urban public transport systems with better access for all citizens. The aim is to contribute to the efficiency of the improvement process by developing methodology and tools to describe accessibility to transport, indicators being one of these tools. A precondition to the Mediate project has been not to develop a benchmarking tool. There may be several reasons for this; the baseline situation for urban public transport is quite different around Europe as well as cultural differences in the understanding of accessibility and disability. The framework of Total Quality Management points to another argument. For local actors to reach a higher quality level, they need to identify and improve their weakest point. Comparison (benchmarking) is therefore between policy domains within the urban public transport system, rather than between cities. Also, there is a general impression on the use of indicators of a move away from indexes and benchmarking towards greater focus on the communication and understanding of each indicator theme.

Key indicators and sub-indicators as presented in tables 6 and 8-12 form a quite complex set of indicators. The reason for this is the holistic approach of the process; including:

- All elements of a travel chain; information before and during trip, travel to stop, ticketing, boarding/alighting and travelling by public transport, and the travel to destination.
- Quality elements from the operator point of view and the customer point of view, including some aspects of customer usability issues, although the main focus is on accessibility.
- All relevant end-user groups; potential public transport travellers, and all relevant service delivery actors for public transport and pedestrian environment.
- All phases of the planning process; identifying needs, planning, acting, monitoring and evaluating.

The indicators aim to reflect a wide set of human diversity and real situations, and users and end-users point out numerous themes and aspects to be considered, eager to cover all important aspects (see Appendix). There is a clear concern that “what is not counted, doesn’t count”. This is a well founded concern, since the often used phrase “the devil is in the detail” definitively applies for accessibility issues.

A clear distinction from some previous initiatives is that this is not a benchmarking tool providing comparison between cities, but a tool facilitating the learning process within an organisation and pointing at strengths and weaknesses in the local public transport system. Moreover the indicators are based on the idea of Total Quality Management (TQM) recognising that the development and implementation of accessibility is a dynamic learning process of sequential stages that bring accessibility up to a higher level of development. To reflect the basic idea of a learning process, a basic assumption has been that performance indicators alone are not providing sufficient background information for the development of new policy, and that indicators should also reflect the way organisations work to improve accessibility (policy indicators). This provides for two additional indicator groups (A. Policy and investment, and B. Service operations and standards), both including a wide range of topics which are relevant indicator themes. The inclusion of policy indicators (A. Policy and investment, and B. Service operations and standards) is a distinctly different approach from public transport accessibility indicators in the Nordic countries. The challenge is to balance the

framework of the holistic approach and the full policy cycle against the advantages of precise information on a limited number of indicator themes (see **Figure 5**).

4.2 Quantitative or qualitative scales to access the indicators

The use of different scales adds to the complexity of the indicators. It is stated that indicators should be comparable and sensitive to small changes, based on data that can be collected in the near future at an acceptable cost, and the tool needs to be supportive and fairly easy to use. Given the large number of issues covered and the complexity of measures, some individual indicators will not be able to meet these criteria (while each sub-set of indicators should be sensitive to small changes).

The scope of this project has been to provide a tool to highlight the strengths and weaknesses of each local public transport system. The scope has neither been to provide quantitative data facilitating comparison between cities and regions, nor a registering system to provide accessibility information to the public about the transport system (for internet travel planners etc.). Therefore there has been less emphasis on the requirement for each sub-indicator to have precise and easy-to-use scales for comparison, arguing that as long as each organisation documents how measures are assessed, this will be good enough for the comparison over time.

A reason for doing this has been an underlying assumption that although numbers may reflect status (performance indicators), they may not provide sufficient information for the organisation to learn and to improve their performance. There may be some doubt as to whether quantitative indicators are the best tool for identifying and improving the weakest part of the policy circle, which is essential in the Total Quality Management approach. A basic assumption is that although quantitative data have many advantages, the holistic approach and qualitative aspects are not fully reflected. Although it is the nature of indicators to provide clear and simple information there is a fear for oversimplification, not providing the necessary insight needed for creating real improvements¹¹. Although many aspects of vehicle design may be counted, a qualitative description may give additional information; e.g. on the user group characteristics considered in the design process, whether some groups were deliberately excluded and others not even thought of, and which compromises were made. Another example is that although the share of low floor vehicles reflects one part of the accessibility issue, it fails to show whether this measure is combined in a way to provide truly accessible travel chains.

With this in mind, we have taken a practical approach choosing the most appropriate scale based on our knowledge of the indicator theme and aspects in question, and the possibilities for providing data. Other indicator sets apply a similar approach (e.g. Marques et al. 2009; p. 37). While it is possible to count the number and percentage of low-floor vehicles, it seems more difficult to describe the urban pedestrian environment in absolute numbers. In the absence of reliable data, the informed opinion on a qualitative scale is asked for. Scales may be adjusted to the purpose of application. The scales presented for the different sub-indicators and key indicators are based on a detailed

¹¹ Nenseth & Nielsen (2009) state that qualitative data sometimes provides a deeper insight in the investigated problem.

questionnaire with indicator themes and aspects, and a procedure¹² for each item to arrive at the assessment on the scale.

This judgement may be discussed for several reasons. The methodological objections to qualitative scales in theoretical and methodological literature are frequent (although as mentioned, other indicator sets apply a variety of scales depending on the availability of data). It may be that our insight in the achievements of balanced scorecard models is limited. It may also be that the slightly different approach is a reasonable response to lessons learned from New Public Management. Unless documentation is good, qualitative assessments may lead to an uncertainty about what is actually measured and the development over time¹³. It is possible that, by applying the theoretical frameworks of Total Quality Management and levels of development, we have created a “gap” between the measure and the indicator theme that complicates the phenomenon rather than simplifying it. But applying the mindset of levels of development on data reflecting local status may in itself provide a learning process.

There are a few important issues to be kept in mind:

- Although the measures for key indicators are mainly descriptive scales, these are based on quantitative data providing a transparent assessment. Each sub-indicator is based on quantitative and qualitative data, and the underlying quantitative data will be available for comparison over time.
- We believe we have a sound basis for the selection of key indicators. Data collection and the use of the indicators will give valuable experience on the effectiveness of the scales. It is clearly possible to keep the set of indicators, and adjust the scales according to data availability and the insight gained.

4.3 Awareness crucial in meeting user needs

The end-user platform has expressed satisfaction with the holistic approach and a comprehensive list of indicators. They point out that indicators, as well as other tools, need to be applied with competence and caution. They stress the importance of developing indicators in close cooperation with the movement representing people with disabilities.

On a general basis, they point out some possible causes for failure when indicators in some cases fail to meet user needs (Nordic Disability Council 2009b):

- Indicators may not fully reflect the diversity of people with disabilities;
- Indicators may not cover all the necessary areas relevant for people with disabilities in relation to public transport;

¹² These are detailed descriptions not included in this report, but should be presented in practical guidelines on how to apply the indicators.

¹³ In such situations it may be questioned whether indicators is still the right term.

- Indicators may be more useful for administrative and political bodies than for persons with disabilities themselves; and are generally not selected to provide sufficient information for disabled persons to choose whether or not to travel.
- The purpose of developing indicators may be to give politicians and civil servants the possibilities to allocate resources based on these indicators, from a political perspective and not from a human rights perspective or not even from the perspective of the possibilities for persons with disabilities to be able to use public transportation.

They raise the concern that benchmarking lead to a low level of ambition. Local actors may feel that they do well, as compared with few concrete requirements in standards and international guidelines, and the wide variation of local circumstances.

4.4 Innovation level

As a coordination and support action, this work builds on previous developments. The innovative aspect is the integration of identified and selected indicator themes from end-users, local authorities, operators and experts and the systematic framework based on previous approaches to accessibility, planning processes and quality management. Different systems and approaches are systemized, and the work constitutes a step forward in the definition of a holistic set of indicators.

To merge accessibility and quality management is a novel approach. While previous approaches have mainly been performance indicators on accessibility (reflecting the results or outcomes of policy actions measured as accessibility delivery), the inclusion of policy indicators makes these indicators a distinctively different approach from established public transport accessibility indicators in the Nordic countries. Although even this approach focuses mainly on accessibility, it opens up usability aspects including the customer's point of view (end-user evaluations and complaint procedures etc.), making it possible to investigate the gap between service delivery (from the service deliverer's point of view) and the perceived quality.

Another novel approach is the connectivity of the Mediate tools, the selected indicators are closely connected to the Good Practice Guide and the Self-Assessment Tool, and based on the same framework. When indicators point out an area in need of improvement, the Self-Assessment Tool provides cues on how to improve and the Good Practice Guide may be consulted for new ideas. In this way the different tools supplement each other.

4.5 Further developments

The scope of Mediate work package 2 has been to identify appropriate themes and select indicators, while the refinement of data collection and methodology for measurement and presentation will continue through the next steps of data collection and self-assessment validation, and beyond this project. The scope for this report is to document the process and methods to define the indicators and establish the rationale for these indicators.

In the next steps of Mediate, the selected indicators form a basis for data collection (work package 3) and the development of a self-assessment tool (work package 4). These indicators will guide the data collection phase. Then data collection and analysis of quantitative and qualitative data from the

cities will serve to investigate and validate the selected set of indicators, and may give valuable information on the effectiveness of different sub-indicators and scales.

The indicators and the analysis of data from European cities will both inform the development of a tool for self-assessment, based on the idea of Total Quality Management with step-by-step improvements considering the whole policy loop of planning, actions, evaluation etc. The self-assessment tool will be tested at two sites. Both analysing the data collected and validating the self-assessment tool will bring new insights as to how to refine the set of indicators, and may at a later stage, act as a review of the selected indicators in this work package. The results will be communicated to relevant standardisation bodies.

The following further activities are suggested. The substantial contribution to the data collection form provided detailed insight into the different aspects of the problem area, and a further follow-up may be to develop this as informative documentation for many actors in the transport sector.

Another suggestion for further work is to make a practical guide (instruction manual) on how to collect data, utilise the scales and use the indicators. This may contain detailed data collection checklists or questionnaires and assessment procedures. Lessons learned from data collection and self-assessment tool tests should be included.

The process of identifying and selecting common indicators for describing accessibility is crucial for the development of systematic development and monitoring. The challenge is now how to measure them objectively and efficiently using tools that can be applied fast and reliably in local public transport and at city levels. A suggestion for further activities may be to develop the practical guidelines further into easy-to manage spreadsheets and tools for visual presentation of data, e.g. radar charts.

An even further step would be to explore the actual measuring and implementation of results into practical policy in society. A research case study on the use of the indicators may be recommended, looking at how results are interpreted and turned into policy and implemented measures, and how the effects of the efforts are evaluated,. Further knowledge is needed to gain a better understanding of the relationship between actual efforts in the implementation process and how accessibility issues are treated in the organisation or municipality. Further work should also include a close cooperation with end-users, transport providers and actors in the public transport sector.

The Indicators selected in the Mediate project are the result of input from end-users, public transport providers, authorities, designers and experts, with the usefulness of the tool for local authorities in mind. The feedback from the end-user platform also indicates a demand to develop an additional set of indicators, based purely and entirely on the needs and experiences of the end-users. Most likely such an initiative should be lead by the end-users themselves. Such an initiative may provide systematic and detailed insight in the different aspects and a sound baseline for further developments in design, technology, and information systems (including accessibility data for real time information systems and web based travel planners) for public transport.

The Mediate working group discussions revealed the need to increase the focus on standardisation and harmonisation, supporting the efforts at local level. The need for attention to be paid to the education of staff for all different professions contributing to the delivery of urban public transport services was also highlighted. An urgent need was identified for a systematic approach to implementing disability awareness issues and universal design subjects into the curriculum of higher education relevant to public transport issues.

4.6 Concluding remarks

Presented here are selected indicators on urban public transport accessibility. The aim is to provide a tool for municipalities and transport operators to speed up the process of making it possible for people with disabilities to be able to use urban public transportation. To be practical, indicators need to be a simplification of the real world. A holistic approach is needed, taking the full door-to-door transport chain in its consideration. There is always a challenge to reflect the diversity of persons with disabilities and all relevant areas. In this work we have focused on themes which have proved to be important in physical planning; the mobility and physical accessibility, ease of orientation, and issues related to allergies and asthma.

This is a step forward in establishing meaningful indicators of accessibility, and corresponds to the objectives of the Mediate project. The suggested set of indicators has potential to form a sound basis for further work in the project. Further developments should include the close cooperation with end-users, transport providers and actors in the public transport sector.

Glossary and explanations

Accessibility; in this context we think of the relationship between person, action, and environment; a person-environment match which makes it possible and easy to make a trip or not. This differs somewhat from the more common use of the term accessibility in transport describing the effort to travel from A to B in terms of time, distance or money. Accessibility targets people with disabilities (barrier-free design). The importance of accessibility, and its focus in the beginning of the planning process, is pointed out by U.N. Standard Rules for Equalisation of Opportunities for Persons with Disabilities (UN 1993). This is a more narrow scope than design for all and universal design.

Accessible formats: A variety of formats is needed to ensure all citizens can access the information. For visually impaired people it is useful to provide auditory information (call centres, loudspeakers), accessible internet formats, easy to read text (font, size, colour contrast etc.) etc. A minimum requirement is that all essential information must be presented in both an audible and visual form. For more extensive information there needs to be a choice of formats to meet different preferences and requirements.

Ad hoc approach; i.e. a project or development which has been introduced in response to a particular local need or initiative but which is not yet fully evaluated, for example a one-off initiative in response to a specific complaint or problem.

Barrier-free design targets people with disabilities with focus on built environment and legislation. This term is used world-wide.

Barrier-free travel; barrier-free travel is a concept mainly concerned with physical access. Travel should be possible without physical hindrances and steps/level differences being a substantial barrier to moving by wheelchair or other means on wheels (horizontal and vertical gaps need to be kept to a maximum of a few centimetres). Barriers to communication, information and orientation may be included in the concept.

Cognitive disabilities; is the experience of difficulties related to understanding the information given.

Comprehension barriers is about understanding information; the failure to present a simple and logical transport system with clear orientation and information, for all citizens to understand, independently of their ability to concentrate and to abstract reasoning.

Defined public transport system: This is the actual public transport system for which the accessibility is being assessed. This is delimited by geographical borders (see defined urban area) with its local authorities, operators and modes, including the pedestrian environment. The operators, modes and public transport infrastructure in this area constitute the defined public transport system. It is important to have the total public transport system in mind (all modes, vehicles, infrastructure etc) to have consistent measures for all indicators.

Defined urban area; this is the urban area for which the accessibility of the public transport system is being assessed. This may be the boundaries of the city or the municipality, an urban agglomeration, or part of a city (district). The idea is to make clear for all actors what is the geographical area in question; which administrative bodies are involved, and which operators and modes run in this area. This is necessary to have consistent measures for all indicators. For the defined area, both the public transport system and the pedestrian network are assessed, influencing travel opportunities.

Design for All is design for human diversity, social inclusion and equality (EIDD Stockholm Declaration, 2004). “Design for all” is a similar concept to “universal design”, and mainly used in Europe. It is described as a philosophy and strategy, not clearly defined by definitions, design rules or design methods. In some countries “design for all” has a more limited scope focusing built environment, information and technology. “Design for all” is best defined by the EIDD Stockholm Declaration 2004:

Design for All is design for human diversity, social inclusion and equality. This holistic and innovative approach constitutes a creative and ethical challenge for all planners, designers, entrepreneurs, administrators and political leaders.

Design for All aims to enable all people to have equal opportunities to participate in every aspect of society. To achieve this, the built environment, everyday objects, services, culture and information – in short, everything that is designed and made by people to be used by people – must be accessible, convenient for everyone in society to use and responsive to evolving human diversity.

The practice of Design for All makes conscious use of the analysis of human needs and aspirations and requires the involvement of end users at every stage in the design process.

From The EIDD Stockholm Declaration©, 2004

While accessibility targets people with disabilities, the scope for “design for all” and “universal design” is all people.

Dial-a-ride; dial-a-ride services are demand-responsive and most often door-to-door services. They can be open to anyone or restricted to specific groups of customers.

End-users: Public transport end-users are both travellers and potential travellers in the pedestrian network and the public transport system. The Mediate project and these indicators target especially older people and disabled people.

Geographical area; in this context this means the urban area for which the public transport accessibility is being assessed, the term urban area is mainly applied for this defined area.

Icons; symbols, visual presentations.

Implementation phase includes the actual realisation of procurements, infrastructure elements or a policy.

Inclusive design is a specific design approach; a process-driven approach whereby designers and industry ensure that products and services address the needs of the widest possible consumer base, regardless of age or ability. Emphasis is placed on working with 'critical users' to stretch the design brief. The design of mainstream products and/or services which are accessible to, and usable by, as many people as reasonably possible on a global basis, in a wide variety of situations and to the greatest extent possible without the need for special adaptation or specialised design.

Indicator is a simplified expression of complex phenomena and relationships. Indicators are used to achieve, facilitate or promote communication about such phenomena and relationships, in a way which ensure that important characteristics remain intact.

Integrated approach; i.e. a project or development which has been fully integrated into the public transport network and for which a routine and on-going cycle of monitoring and evaluation is in place.

Isolated approach; i.e. a project or development specifically intended to meet the needs of disabled or older people but which is not yet embedded as part of the transport system, for example an initiative that is self contained and does not link with other parts of the public transport system or other policy areas.

Monitoring phase is the routine for checking and supervising as part of the ordinary running of the service.

Orientation & sensory barriers is about perceiving information; the lack of orientation cues and information in adequate formats for all citizens to access this information; independent of sensory abilities, proficiency in languages, experience and skills.

People with reduced mobility; means all people who have difficulty when using public transport, such as disabled people including people with sensory and intellectual impairments, and wheelchair users, people with limb impairments, people of small stature, people with heavy luggage, elderly people, pregnant women, people with shopping trolleys, and people with children including children seated in pushchairs (Directive 2001/85/EC). This is a term often used in transport policy documents, often shortened PRM.

Physical access; concerning the accessibility related to physical measures like width, height, size, steps, gradients, need for strength etc.

Physical barriers are barriers in the physical environment restricting the mobility and travel opportunities of some citizens.

Physical disabilities; experiencing difficulties of movement, strength, balance and stamina.

Pictograms; standardised image symbols on signage to simplify the message to the traveller.

Procurement procedures; rules and routines for purchases, acquisitions, order documents and commissioned work.

Public transport system; in this context this is the public transport authorities, operators, modes and infrastructure within the defined urban area which is assessed. By public transport we mean all modes for which you can buy a ticket for a specified trip. Taxi and dial-a-ride systems are not included.

Sensory disabilities; impairments affecting sensory perceptions, i.e. visual impairments, hearing impairments etc..

Service lines; public transport routes served by bus, minibus or taxi with a specified timetable, origin and destination, but which are routed close to residential areas, entrances etc. and have sufficient time to wait for customers to board the vehicle and get seated. Staff are trained and often know their customers well.

Social model of disability focuses on the barriers people meet because the society is not planned for the full range of the population. Barriers in the physical environment and social arrangements disable people, limiting their opportunities in life.

Staff vetting procedures are procedures for the screening of personnel to be employed.

System-oriented approach; i.e. a project or development which has been planned and is being evaluated on a regular basis to ensure feedback from all stakeholders, for example an initiative which has been developed as part of a wider policy and in which end-users have been involved from an early stage.

Universal design is 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. The intention of universal design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal design benefits people of all ages and abilities. Definitions, design principles and guidelines are presented by the Center for Universal Design; www.design.ncsu.edu/cud/.

While “design for all” is a common term in Europe, “universal design” is used in U.S, Japan, Norway and global. U.N. establishes universal design as the main target, with accessibility as one measure to reach the goal of inclusive universal design and equal opportunities. The U.N. Convention on the Rights of Persons with Disabilities (2006) commits nations to promote universal design through research, education, standards, guidelines, and the development of products and facilities. Included in the convention, universal design is not only a design principle, but is given a meaning as a basic right. The U.N. underlines universal design not only of products and environments, but also of programmes and services, and at the same time makes it clear that universal design needs to consider the use of technical aids etc. for user groups.

Urban area; in this context this means the geographical area for which the urban public transport accessibility is being assessed. Sometimes geographical area is the term used.

References

Carlsson, G. (2002): *Catching the bus in the old age. Methodological aspects of accessibility assessments in public transport*. Lund: Lund University, Division of occupational therapy.

Carreno, M., Stradling, S., Rye, T. & A. Willies (2004): Urban design principles for vulnerable pedestrian groups. *ICCT 2004 Dalian*, PR China.

CEN (2002): *European Standard EN 13816 Transportation – Logistics and services – Public passenger transport – Service quality definition, targeting and measurement*. Brussels: CEN, European committee for standardization.

Center for Universal Design: Universal design; Universal design principles http://www.design.ncsu.edu/cud/about_ud/about_ud.htm (2010-01-21)

Commission of the European communities (2009): *Communication from the commission to the European parliament, the Council, the European economic and social committee and the committee of the regions. Action plan on urban mobility*. COM (2009) 490/5.

CWA (2004): *Guidelines to standardisers of Collective Transport Systems – Needs of older people and persons with disabilities – Part 1: Basic guidelines*. CEN /CENELEC Workshop agreement.. CWA 45546-1: 2004. Brussels: CEN, European committee for standardization.

Design for all in Wikipedia; [http://en.wikipedia.org/wiki/Design_for_All_\(design_philosophy\)](http://en.wikipedia.org/wiki/Design_for_All_(design_philosophy)) (2010-01-20)

EIDD Design for all Europe; www.designforalleurope.org/Design-for-All (2010-01-20)

EDeAN European Design for All e-Accessibility Network; www.edean.org (2010-01-20)

ECMT (2006): *Improving Transport Accessibility for All: Guide to Good Practice*. Paris: European Conference of Ministers Of Transport.

European Commission (2009): *Action Plan on Urban Mobility*. Brussels: European Commission.

Gabrielsen, P. & P. Bosch (2003): *Environmental indicators: Typology and use in reporting*. EEA internal working paper. European Environmental Agency.

Høyer, K.G. (2009): Indicators and indicator systems. Presentation, *Workshop on indicators*, Oslo March 3rd 2009.

Iwarsson, S. & A. Ståhl (2003): Accessibility, usability and universal design – positioning and definition of concepts describing person-environment relationships. *Disability and rehabilitation* 25:2, 57-66.

Iwarsson, S., Jensen, G. & A. Ståhl (2000): Travel Chain Enabler: Development of a pilot instrument for assessment of urban public bus transport accessibility. *Technology and Disability* 12:1, 3-12. Amsterdam: IOS Press.

Lid, I.M. (2006): *Tilgjengelig reise - hvordan kan vi måle tilgjengeligheten til hele reisekjeden?* (Accessible travel – how can we measure the accessibility of the total trip chain? - in Norwegian) Oslo: Health Directorate, Deltasenter.

Marques, C. (2009): *Towards an improved accessible transport system in Europe Discussion and Policy Recommendations*. EuroAccess: For a European Accessibility for Public Transport for people with Disabilities. Lisbon: TIS.Pt. www.euro-access.com

- Marques, C., Rodrigues, A. & D. Carvalho (2009): *Mediate WP2 – Identify indicators for describing accessibility. Task 2.1 – Review of previous and existing initiatives and methods for defining and measuring accessibility in public transport*. 2009.10.05. Lisbon: TIS.Pt.
- Matthews, H., Beale, L., Picton, P. & D. Briggs (2003): *Modelling Access with GIS in Urban Systems (MAGUS): capturing the experience of wheelchair users*. *Area* 35:1, 34-45.
- Mediate (2009): *Urban Public Transport Accessibility Indicators Questionnaire*. Draft version Nov. 2009. TTR / SINTEF.
- Mediate (2010): *Mediate questionnaire. Final version March 2010* (Mediate wp3 Data collection). Lichfield: Transport & Travel Research Ltd
- Meyers, A.R., Anderson, J.J., Miller, D.R., Shipp, K. & H. Hoening (2002): *Barriers, facilitators, and access for wheelchair users: Substantive and methodological lessons from a pilot study of environmental effects*. *Social Science & Medicine* 55, 1435-1446.
- Nenseth, V. & G. Nielsen (2009): *Indikatorer for miljøvennlig bytransport – en kunnskapsstatus*. (Indicators for environmental-friendly urban transport – a knowledge status). Oslo: Institute of Transport Economics. (In Norwegian)
- Norwegian Ministry of Finance (2005): *NOU 2005:5 Enkle signaler i en kompleks verden. Forslag til et nasjonalt indikatorsett for bærekraftig utvikling*. (White paper: Simple signals in a complex world. A proposal for a national indicator set on sustainable development.) Oslo. (In Norwegian)
- Nordic Disability Council (2009a): *Nordiske indikatorer. Forslag til indikatorer for tilgjengelighet i den kollektive transport* (Nordic indicators. Proposal for indicators on the accessibility to public transport). Final report. Nordic workgroup on street & rail public transport. Denmark. (In Danish)
- Nordic Disability Council (2009b): *Nordiske indikatorer. Tilgjengelighet til den kollektive transport for mennesker med handicap* (Nordic indicators. Accessibility to public transport for disabled persons). Draft report. Denmark. (In Danish)
- Øvstedal, L. & E. Ryeng (2004): *PROMPT Pedestrian Comfort Synthesis Report*. Trondheim: SINTEF Technology and Society.
- Pearmain, D., Swanson, J., Kroes, E., Bradley, M. (1991): *Stated Preference Techniques. A guide to practice*. Second edition. Den Haag: Steer Davies Gleave, Richmond/Hague Consulting Group.
- Ryhl, C. (2009): *Tilgjægelighed – udfordringer begreber og strategier* (Accessibility – challenges, terms and strategies). SBI 2009: 12. In Danish. Denmark: Aalborg University, Statens Byggeforskningsinstitut.
- Slagsvold, B. (1995): *Om å måle kvalitet i aldersinstitusjoner*. Avhandling (dr. philos.) – Universitetet i Oslo. Rapport nr. 1 /1995. Oslo: Norsk gerontologisk institutt. (Measuring quality in institutions for the elderly, a doctoral thesis at the University of Oslo)
- Ståhl, A. & Wretland, A. (2008): *EuroAccess: User needs and expectations relative to accessible transport. Framework for mobility planning*. Lund: Lund University.
- Stradling, S., Anable, J. & M. Carreno (2006): *Performance, importance and user disgruntlement: A six-step method for measuring satisfaction with travel modes*. *Transportation research Part A* 41, 98-106.

Sweers, W. (2009): *Mediate: Setting up the Self-Assessment Tool*. Mediate working paper version 2009-03-06. Belgium: Timenco.

Tiresias.org; <http://www.tiresias.org/research/guidelines/inclusive.htm> (2010-01-20)

Tormans, H., Janssens, D., Brijs, T. & G. Wets (2009): *Context and development of an instrument for quality assessment and guidance for local road safety policymaking in Flanders*. Submitted paper 2009.

United Nations (2007): *World Urbanization Prospects: The 2007 Revision Population Database*. <http://esa.un.org/unup> (2010-03-10)

United Nations (2006): *The U.N. Convention on the Rights of Persons with Disabilities*.

United Nations (1993): *The Standard Rules for Equalization of Opportunities for Persons with Disabilities*.

WHO (2001): *International Classification of Functioning, Disability and Health (ICF)*. Online version <http://www.who.int/classifications/icf/en/> (2008-11-27)

Appendix: List of relevant urban public transport accessibility themes

Below is a list of themes and issues discussed during the process of identifying urban public transport accessibility indicators, based on documents and minutes from Mediate working group meetings and comments from the Mediate End-user platform, working group members, experts and consortium members. The list is not exhaustive.

Based on aspects discussed in the 1st working group meeting, a data collection questionnaire was presented. Through the following iterative process more aspects were added and questions were refined. The idea of how to assess the quality changed from emphasis on the detail of information an actor could provide, to measures of actual performance and assessment of the level of development.

General:

- What has been accomplished since the indicators were measured last time? Are there changes to the transport system that may have affected accessibility positively?
- Have there been changes to the system that may have had a negative effect?
- Independent travel is important for many user groups, while other user groups either need or appreciate assistance from others. Independent travel may provide an approach for a quality scale, e.g.:
 - System needs driver or third party assistance
 - Manually operated by user
 - Automatic / no barrier (best quality)

A. Accessibility plan & Strategy

- Current formal or voluntary plan, user involvement, political commitment, does it cover a range of barriers, is it in an accessible format. Are there responsibility gaps?
- User involvement in all stages of planning, implementing, monitoring and evaluation. On-going or ad hoc steering groups, which user groups are involved, is there a specific position or permanent unit centred on the coordination of accessibility within the local authority or company?
- Involvement of other stakeholders in the process of delivering an accessible transport system: Operators, manufacturers, legislators, planners, user organisations. Do coordination, separate budgets, unclear responsibilities etc. cause delays or other problems?
- Is there specific investment in making transport more accessible? By whom: Local government, regional government, public transport authority, infrastructure authorities, public transport operators? Level and development of investment (operational, capital, maintenance, short/long term, new/retrofitting), focused on the public transport system, the pedestrian network or both?
- Are concession criteria clear? Do they lead to reduced services? Are there specific procurement rules related to accessibility? Which specific requirements are included in contracts? For which modes? Which specific elements are covered in Service Level agreements?

- Is there a platform for accessibility and service level discussions in which disabled people, older people, transport operators, street managers, and local administration take part?

B. Service operation and Standards

- User Satisfaction Surveys: Involvement of end-users (and non-travellers), do surveys have accessible formats and cover accessibility issues, are surveys followed up with actions, are results communicated, frequency, which parts of the network are covered etc.
- On-trip methods of assessing accessibility: Technical visits, mystery travellers etc.
- Complaint procedures; in accessible formats, are complaints analysed and acted upon, are there ways of penalising companies if accessibility requirements are not fulfilled?
- Staffing, available staff for assistance at stops, terminals and vehicles
- Disability awareness (theoretical and practical) as part of staff training; which staff, which barriers are included, are guidelines used? Frequency of refresher courses. Disability awareness campaigns for the public.
- Confidence: Regularity, punctuality, frequency (at off-peak periods) and the confidence that accessibility measures and service levels are in place (predictability, consistency).
- Availability of other transport solutions; service lines, door-to-door transport etc.
- Affordability issues, fare policies; which groups are granted discounts, for all travel or specific periods.
- Is insurance covering accidents which may occur when staff are assisting travellers?
- Is a personal security scheme for public transport passengers in place (public transport network, pedestrian network or both)? Which measures are included (staffing, lighting, alarm points, camera surveillance, opening hours, etc.) Is the issue of personal security included in design guidelines? Are staff available to assist older people and disabled people through the barriers caused by security systems?

C. Accessible Information and Ticketing Systems

- Is the provision and monitoring of pre-trip and on-trip information and signage included in the accessibility plan? (visual and audio announcements, real time information, directional signage, tactile signs, tactile surfaces, pictograms) Are formal guidelines for the provision of accessible information and signage used? Are users involved in planning and monitoring information? The need to standardise information formats across Europe.
- Is public transport information available in different formats (visual, audio, accessible internet sites, phone, info-kiosks, staff, sign language when appropriate) before trip and on trip?
- Is accessibility information available? Is it possible to obtain information on travel options according to specific requirements? Is information about the pedestrian network included? Are public transport stops easy to find?
- Are staff available to provide on-trip information (on vehicles, stops, stations etc.)? Is there a clearly indicated phone help line available? Percentage of platforms with audio and visual announcements.
- How are disruptions, emergencies etc. communicated to all travellers? In which formats and languages, are enough staff available with sufficient training? Is the quality checked

and how? Are users involved in the provision and monitoring of disruption and emergency information? Is there an emergency / evacuation plan?

- Is the purchase and validation of tickets accessible for all, intuitive and understandable? Are tickets available to be purchased from a variety of sources (accessible counters, machines, internet etc., SMS, on vehicles, stations and non-transport outlets)? Are websites for purchase accredited as being accessible? Percentage of stations: Physically accessible counters with induction loops, accessible and usable vending machines (physically, sensory, ease of understanding etc.)? Accessible ticket design. Are guidelines for accessibility used?
- Is passenger training provided (local authorities, transport operators, other organisations)? Which people and how many receive training? Are guidelines for training delivery applied?
- Is accessibility in an overall sense a basis for communication campaigns?

D. Accessible Vehicles and Built Environment

- Quality scale regarding independent travel: 1) System needs driver or third party assistance, 2) manually operated by the user, and 3) automatic / no barrier.
- Is there a policy for making the pedestrian environment accessible? (condition of pavements, pedestrian paths, street crossings, separation of pedestrians and cyclists, lighting levels etc.) Is there a policy to keep pedestrian areas accessible and free of obstructions? Are guidelines used? How are the policies enforced? Are long walking distances (and steep hills) to public transport stops a problem? Benches and seating. Good signage and tactile guiding pavements.
- Is there level access from street network to public transport platform and from platform to vehicle? (Percentage of stops for each mode; with level access, and with ramps, lifts etc.). Share of platforms (stops) where the system needs driver or third party assistance, manually operated by the user, and automatic. Are formal accessibility guidelines applied? Is door-to-door transport (taxi, private car, special transport services etc.) available at PT stop? Is there a policy to prevent cars from parking at bus stops?
- Percentage of stations, stops, vehicles etc. where smoking is not allowed and this is clearly signed. Is there effective surveillance and penalty system for a non-smoking policy? Share of stations, stops, vehicles etc. with clear rules (separate sections etc.) for the carriage of pets and assistance dogs. Is there a clear policy for the choice of allergy friendly materials, cleaning procedures and ventilation systems?
- Share of vehicle fleet which is "low floor" or has alternative mechanisms to achieve level access. When is the total fleet expected to be "low floor"? Share of vehicle fleet with designated place for wheelchair users (how many places per vehicle). Is there a policy for prioritising the space for wheelchair users, people with push chairs etc.? Sufficient space for assistance dogs. Contrast marking of steps, rails etc. Are formal guidelines for accessibility within the vehicles used?
- Vehicle fleet: Average age and replacement cycle for each mode
- Available toilets on trip (pedestrian network, stations, stops, vehicles; the existence of toilets, dimensions, the way doors open etc.)
- Is there a system for monitoring safety issues and analysing accident data and incidents? Are doors equipped with sensors to avoid closing the door when passengers are in the doorway? Are vehicles equipped with a locking system restricting motion without safely closed doors?

E. Seamless travel (modal interoperability)

- Is there a combined source for pre-trip information for more than one public transport mode? Are there combined sources (information points etc.) for on-trip public transport information?
- Are tickets and fare concessions valid for more than one mode?
- Is physical accessibility provided throughout the entire transport network, including modal interchanges? The need for standards and uniformity of pedestrian environment across Europe.
- Is there an accessibility plan in which all operators and authorities are involved? Is the plan monitored regularly and are there sanctions when obligations are not fulfilled?