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Deriverable of task 3.6 (R&D Roadmap) 1
I. INTRODUCTION

The purpose of this document is to present the roadmap for future research and development possibilities obtained as a result of the Work packages 2 and 3 in the Uniaccess project. This document contains two parts: a definition of new R&D challenges for universal accessibility; and challenges and actions for new standards, legalisation, policy and society actions for universal accessibility.

The specific purpose of this roadmap is to compare the current accessibility situation with our vision of the future in order to detect gaps. This document will focus on the challenges that will be encountered in order to achieve a universally accessible system for public transport. The defined challenges will need future research and development (R&D) before the vision can be reached. This roadmap will present an overview of the R&D challenges in the whole transport system, including the infrastructure and all the stages of the travel chain, as well as in the fields of legalisation, standards, policy and society. This roadmap will be used as a further plan for work package 4, where more detailed plans for R&D proposals will be developed on the basis of information from existing projects and technological developments. At this stage the knowledge about already existing or planned initiatives is not complete. The new knowledge will be merged with the roadmap in order to make it possible to prioritise some of the challenges for further action. The process for defining the roadmap is presented followed by the defined challenges to reach the further vision: design of universal accessibility systems for public transport.
II. THE PROCESS OF DEFINING THE ROADMAP

The process for developing the roadmap is shown in figure 1.

Figure 1: The process for developing the roadmap.

A.- State of the Art

The starting point for the definition of the roadmap was the actual state of the art in public transport. During the UNIACCESS project an overview of the current public transport systems in Europe was build up from different points of view (WP2 deliverables 2.1-2.6):

1. End users: The end users/travellers’ demands and needs play an important role in the design of useful products that can attract all people to public transport.

2. Operators: Different means of transport were considered: bus, metro, tram, train and taxi.

3. Design & Manufacturers: A study of the current accessibility solutions was the starting point to create new innovative solutions.

4. Legislation & standardisation: Standards and regulations affecting accessibility to transport, present or future, were treated here.

5. Accessibility to public transport in different countries inside Europe: accessibility models in countries like Austria, Finland, France, and Norway… were studied in order to obtain the current status in accessibility to public transport.

Deriverable of task 3.6 (R&D Roadmap)
6. Cross-cutting studies and other studies: sociological aspects were analysed, because they play an important role in the design of new accessibility systems.

These documents have given a general basis of knowledge of the current situation both technically and sociologically to detect future solutions.

B.- Vision of the future

The next step in the process was to define our vision of the future of public transport. To achieve our vision of the future, the scenario method was used. A scenario is an imaginary story used as a tool for a creative process that helps us invent our future. In this sense, scenario planning provides one of the few structured ways to get an impression of the future. Developing a scenario should be without imaginary restrictions, and need not be realistic.

Nine different scenarios were described on the basis of different types of people with reduced mobility (PRM) going through the whole travelling chain; starting at home, and using at least two different means of transport. The following scenarios were described:

- Wheelchair user
- Elderly People
- People with pram
- Visually impaired
- Hearing impaired
- PRM with learning difficulties
- An operator’s scenario
- Two Design & Manufacturer scenarios

When analysing the scenarios, the requirements of the different categories of PRM were defined and new solutions were described. The requirements from the state of the art exercise in WP2 were included at this stage. The data were divided according to whether the solution is already in existence and can be implemented more widely, or if it is a solution for the future requiring further research and development. The paramount objective for the future is Universal accessibility systems for public transport.
C.- Requirements and Emerging Concepts
Both the State of the Art and Vision of the Future documents were input to a requirement specification. The requirements were treated individually in order to generate several possible solutions. All of the concepts were evaluated on the basis of their ability to fulfil the needs of all kinds of passengers were considered Emerging Concepts. Another item took into account about these Emerging Concepts was when to be implemented:

- To be implemented within 5 years (short term).
- To be implemented within 10 years (middle term).
- Future implementation after R&D (long term).

In this step, technological gaps from the defined emerging concepts (as the most relevant requirements and those which covered more PRM needs and the current situation) were detected.

D.- Roadmap
To develop the roadmap the prospective concept was studied and the challenges to achieve these solutions were defined. This document highlights the challenges in every step of the transport chain in order to achieve universal accessibility in public transport based on universal design.

This roadmap will form the basis for further work in the Uniaccess project. The new knowledge achieved in WP4 is decisive for choosing which of the challenges shall be prioritised for further R&D projects.

A very detailed work on technological gaps and emerging concepts has been done (see Deliverables 3.1 to 3.3 and their annexes files), and this final roadmap obviously is a summary of that work and therefore not include all details worked throughout all the WP3.
III. STEP 1: BEFORE THE JOURNEY

A.- State of the art
In general, the current situation regarding information, planning and pre-ordering is chaotic. Everything depends on the service provider, some are better than others. There are no common portals to transportation information, and there is no common format for the information. Most companies still offer phone information, although this may not be available outside of normal work hours. In addition, internet information is common, but the services offered vary. Few services are especially geared towards people with special needs.

Many users find the information inaccessible and difficult to understand, and therefore do not use the information, and this reduces the attractiveness of public transportation services.

B.- Our vision of the future
The phase preceding the journey is important because it can facilitate planning, and make travelling seem possible to people with mobility issues.

The goal is to give information to everybody in a form understandable to them, and this information should be available at home as well as at other locations. It should contain all relevant information about the transportation service. In the short term this must include information about accessibility for people with special needs, but in the long term, there should be no need for such information as all transportation services will be available to everybody.

In addition, all information services should make it possible to make reservations or buy tickets, and in a non-intrusive way assure that the customer gets a service adapted to their needs.
C.- R&D challenges

Through the Uniaccess project several future challenges have been discovered related to the start of the journey:

A) Flexible, standardized access to information in many forms
   - Multi-MMi (man-machine interface) for travel information
   - Written information as well as spoken (for the visually impaired or dyslectic), braille (for blind with hearing problems)
   - Access to person-to-person conversation as an alternative for people with orientation problems or technology aversion (this should be available from the same source as other information)
   - Standardization is important as it eases understanding and orientation when new to a service
   - Multi-lingual services are a must – preferably any language should be handled
   - Standard interfaces for different information media should be developed: Internet, mobile phone, ticket vending machine, PDA etc.

B) Information
   - All passengers should have the possibility to obtain necessary information, so that a person should be able to plan a trip unaided.
   - A universally designed solution needs to be equal for all. This means that textual and spoken information need to be available on different medias like WEB, PDA, cell phone. Users need to have the possibilities to choose the characteristics of the written information (colour, contrast, letters height, speech output…), including handbooks.

C) Integrated information handling
   - Information about all public transportation must be integrated and harmonized, so that it appears as one integrated service
   - Information must be adapted to the recipient, so that for instance a parent travelling with a baby stroller will get the information relevant to this situation
IV. STEP 2: TO THE TERMINAL/ TO THE BUS STOP

A.- State of the art:
The quality of the roads leading to the bus stop or the station is the responsibility of road departments, and therefore varies among cities and different countries. The way to or from the terminal/bus stop can be decisive for many passengers whether to make use of the public transport or not. Choice of material and the design of area and building make it difficult for people with reduced mobility to use public transport.

In general accessibility is increasingly taken into account in road works, e.g. lowered pavements, pedotactile strips. But there are still many obstacles that hinder accessibility, such as street furniture, signs location, illicit parking on pavements, narrow pavements, etc. High curbstones, cobblestone and other pavement surfaces are in general the main obstacles. Crowded places, maintenance work, or poor maintenance often cause additional problems.

B.- Vision of the future:
The way to the terminal and bus stop should be accessible and comfortable for all passengers. This means that the street should be free from obstacles, offer easy information and orientation, be at a comfortable distance from the stop (short distance, frequent resting places or possibility for inner transport in the terminals between entrance and final transport), and be safe.

C.- R&D challenges:
The following challenges have been identified relating to the “to the terminal/bus stop” stage of the journey by the means of universal design in the Uniaccess project:

A) Physical obstacles:
• The way to the terminal and bus stop should be free from physical obstacles.

B) Comfortable walking:
• The way to the terminal and stop should be comfortable and effective for all passengers.
• Area planning has to be focused; short distances are essential, or an alternative transport possibility, widespread resting places.
C) Safety:

- The way to the terminal and bus stop should be safe from cars, cyclists, roller skaters and others.
- A new layout for the outdoor area/ pavement should be looked into, together with the area planning.

D) Information and orientation:

- The layout of the street should be easily understandable by all passengers
- All information on how to find the terminal or bus stop should be easy to understand for everyone without help from others.
- All passengers should be able to confirm that they are entering the right bus stop or terminal.
V. STEP 3: AT THE TERMINALS, PLATFORMS AND STOPS

V.I General

A.- State of the art:
The general impression is that terminals built during the last ten years, and some re-adjusted buildings, have increased accessibility for all passengers, however they are seldomly universally designed. The use of ramps and special equipment can be stigmatizing for some user groups. In most countries there is a big difference between the cities and the regions. Old buildings with insufficient accessibility predominate in many countries and many passengers are therefore excluded from using public transport.

Physical obstacles like height differences, steps and access to facilities are often a problem. Physical obstacles and height differences are often the main problem for accessing platforms and stops.

B.- Vision of the future:
All terminals, platforms and stop should be accessible for all passengers. This includes all of the facilities in the terminal. Services and assistance should be offered in every terminal building. All passengers should be self-reliant at all stages.

C.- R&D challenges:
The following challenges have been identified relating to “at the terminal, platforms and stops” phase by means of universal design in the Uniaccess project:

A) Physical design:
- The terminals, platforms and stops should all be free from obstacles (height differences, gaps, stairs and obstacles like signs, furniture e.g.)
- All passengers should use the same solution for entering the terminal
- All passengers should be self-reliant at the terminal, platform and stop.
- All platforms and bus stops should be comfortable for all people; this includes the provision of seating and shelter against bad weather.

B) Comfortable distances:
- The distance inside the terminal should be comfortable for all passengers.
• All passengers should have the same solution regarding the walking path.

C) Luggage handling:
• All passengers should have the possibility to choose between checking in the luggage and bringing the luggage along.
• All luggages should be properly stored for safe transport.

D) Departure information:
All passengers should have the possibility to find and understand information about time and place of departure.

Required information:
• Information points/desks are understandable and usable by all

• Information stands with connection to an information officer who can use sign language (web cam) if necessary and/or is equipped with translation in different languages.

• All passengers need to have information on ones position at the station and direction to a selected point (exit, platform, information desk…) even when crowded

• Timetables and brochures are understandable by all

• Sound information should be clearly converted into text or other visual coding (sign language transcription through an avatar), including the possibility of "record and listen again" using personal devices.

• Real-time information screens are understandable by all

• The existence of an information system's emission easily received in the mobile or other type of devices.

• Emergency alarms should be understandable to everyone
V.II Ticketing

Ticketing is no longer restricted to the terminal area, but we choose to treat it here, although buying from home or other locations is gaining in popularity.

A.- State of the art:

There are many different ways of purchasing tickets. The traditional one is to buy it at a counter where an attendant will serve you, or from a bus driver or a conductor when in a vehicle. Over the last few years, ticket vending machines have become common for metro, bus and train. Internet ticketing has also become common practice, especially for long distance travel, such as air and train travel. Mobile phone services do much the same as internet services.

Whereas the traditional sales methods accommodate users with varying mobility to a certain degree, most of the new ones have restrictions or problems. Vending machines usually require literacy and sight, and many of them are ergonomically very challenging. Internet services again require sight and literacy, and may be difficult for people with cognitive problems as well as people with little experience with computers and the internet. The same applies to mobile phone services.

B.- Vision of the future:

All public transportation services should offer multiple ticket purchase methods. Unmanned services should be flexible, so that a user could adapt it to his or her needs. Internet and mobile phone services should have user profile possibilities, so that only the relevant communication methods and questions will be asked. Artificial voice, braille, voice input and other interaction technologies should be built into all vending machines, and also be facilitated on the internet. International standards should make access to transportation information and ticketing web pages easy regardless of physical and cognitive ability. Vending machines must be ergonomically tolerant, so that any body size or physical ability is accommodated and standardized for easy understanding and access. Manned ticketing services are a useful supplement at least for all services with complicated requests, like airline or long-distance train tickets.

C.- R&D challenges:

The universal design of ticketing services meets the following R&D challenges:
A) Multiple vending methods:
Not particularly challenging, but integrating the services may require some effort. Otherwise, this is an implementation issue.

B) Fixed location automated services (vending machines):
- Making vending machines flexible so that they are accessible to any person, regardless of physical ability, requires new insight into ergonomics and new solutions in the design of vending machines.
- User interfaces with multiple technologies (voice, text, braille, voice input, etc) must be developed. Possibilities for user profiles on vending machines must be explored.
- Standards must be set for user interface design, so that a new machine is intuitively usable for a user new to this specific machine.

C) Undefined location services (internet, mobile phone etc):
- Internet services should offer a selection of interaction technologies, both for input and output.
- Mobile phone services should allow at least voice and text as interaction technologies.
- Standards should be made that make internet and mobile phone services standardized to operate, so that people with special needs will only need to learn once how to use the service. A side effect of this is that inclusion of multiple technologies is much easier and less expensive when the interface is standardized.
- User profiles should be explored as a means to communicate special needs as well as preferences, thus reducing the risk of erroneous bookings or services without the expected quality.

D) Manned services:
- Since manned services are expensive in all developed economies, they will at best be available at the main terminals and during the busiest hours. “Virtual manned services” – services generated by a computer system but appearing to be a person to person communication – are therefore desirable. Such systems could be presented on vending machines or on the internet, and would require that synthetic images of a sales attendant be combined with synthetic voice generation and voice recognition, possibly also with image recognition, so that a person with limited ability to speak could communicate in sign language. This would be major technological challenge,
and cannot be expected to be available in the short run, but would, when implemented, facilitate ticket purchases for a considerable group of people which would otherwise be reluctant to use public transportation.

VI. STEP 4: GETTING INTO/OUT OF TRANSPORT SYSTEM

A.- State of the art
The accessibility situation varies from country to country. Bus boarding is still problematic in many European countries. Low-floor buses and kneeling buses are excellent only if combined with platforms of an appropriate height. Long distance buses are worse than city buses and extremely high floors are often used. Trams range from excellent to inaccessible. Metros/subways are generally quite good: The newer the system, the better the solution. Trains are still not easily accessible. Some new trains though are satisfactory.

The main problems today are due to platform height and floor height of the transportation units. Direct access to carriages is therefore not always provided. Many transportation means are not accessible for wheelchair users at all, or users are dependent on manual assistance. Loading platforms, ramp positioning systems, lifting ramps, manually or automatic foldable ramps and lifts are employed to remedy these problems, but the implementation varies strongly according to country. Visually impaired people also encounter many obstacles today, mainly related to orientation and navigation. Solutions for contrast marking on steps, handles, clear signing, sufficient visual and tactile indicators and alternative information systems exist, but are not employed in all countries.

B.- Vision of the future
Boarding and alighting vehicles should be easy, fast and comfortable for all. The vehicle should be accessible to all passengers. The location and functioning of entrances and exits of the units must be clearly marked, easily understandable and standardized. Time used to enter and exit vehicles should not be a discriminating factor and safety should be maintained for all users in all situations, both during normal use and in emergency situations.

C.- R&D challenges
Through the Uniaccess project, several future challenges have been discovered related to “Getting into/out of transport system”.

Deriverable of task 3.6 (R&D Roadmap)
A) **Identify the entrance:**
- All passengers should be able to find the right position of the entrance without assistance.
- All passengers should be able to reach the right vehicle entrance.
- All passengers should be confirmed that the correct vehicle entrance has been reached.

B) **Boarding:**
- All passengers should be able to operate/activate the opening/closing mechanism or the entrance should not be dependent on user (e.g. automated)
- All passengers should be able to transfer from platform level to the vehicle without assistance.
- All passengers should be able to confirm correct location after entering.

C) **Alighting:**
- All passengers should be able to operate/activate the exit open mechanism or the exit should not be dependent on user (e.g. automated)
- All passengers should be able to transfer from the transport unit to platform level without assistance.
- All passengers should be informed that they have successfully exited a vehicle.

D) **Time:**
- The time available to perform tasks necessary to enter and exit a transport system should be sufficient for the individual need of each passenger to prevent discrimination and it should be as fast as possible.

E) **Safety:**
- The safety of all passengers should be maintained in all situations, both in normal use and emergency situations
- All passengers should be able to evacuate safely
- All auxiliary means for evacuation should be adapted to all users
- All passenger should be able to locate and operate emergency exits
VII. STEP 5: DURING THE JOURNEY

A.- State of the art

In general today’s situation during the journey can be described as follows:

Train:
E.g. seating for wheelchair users, there is no standard seat/space arrangement in Europe. Inside there is often a defined wheelchair seat/space integrated in an ordinary seating arrangement, and some trains have only special wagons accessible. Some long-distance trains have a compartment for wheelchair users close to an accessible lavatory. Compartments make it difficult to travel together with other passengers.

Subways:
Subways are often overcrowded and thus problematic. The need to securely fix a wheelchair or a pram during the journey is generally unsolved, or a standard is necessary. Although some operators think it is not useful to have fixing system in subway because there is no risk of collision.

Buses:
Buses have much more abrupt braking and turning than rail bound vehicles and the need to securely fix wheelchairs and prams is obvious, but generally not solved and a standard is necessary. A European directive says: “If wheelchair users are in a specific position they do not need fixing system”. Some bus companies have very few places available for wheelchairs but many reserved seats for elderly. Conversely, others have reserved space and seats for wheelchairs and handicapped people, but none for frail and/or older people.

B.- Our vision of the future

The time on board should be pleasant for all passengers. This means that all should be able to sit wherever they wish and have access to all the facilities on board.

C.- Main R&D challenges

Through the Uniaccess project, several future challenges have been discovered related to “During the journey”. Overall there is a need for new universally designed solutions within the following areas:

A) Seating and standing room:
• All passengers should have the possibility to find an available seat and standing room unaided without being an obstacle for the other passengers.
• All passengers should have the possibility to find a specific seat unaided
• All passengers should have the same possibility to sit wherever they wish, regardless of how they travel (with wheelchair, prams, luggage, guide dog etc).

B) Accessibility:
• All passengers should be able to navigate to toilets and facilities in vehicles unaided

C) Storage systems:
• All passengers should have the possibility to store luggage nearby the seat
• All passengers should have the possibility to store luggage safely inside the vehicle.

D) Safety solutions:
• All passengers should have the possibility to evacuate in an emergency situation unaided
• All personal rolling transport solutions, e.g., a wheelchair or pushchair, should have universally designed fixing safety system
• All passengers should have access to emergency systems for all alarm system. E.g. in Trains: button/device at every seat that easy to operate.
• Emergency exits should be easy to find and operate
• Maintain safety in all situations
• Universal auxiliary means for emergency

E) Information:
• All passengers should have the possibility to find and understand required information during the journey.

Required information: connecting routes, next stop, approaching personal destination, route, position along the route, delays and/or warnings, passenger price, paying, assistance, emergency information.
VIII. LEGISLATION, STANDARDISATION, POLICY & SOCIETY

A.- State of the art:
The state of the art report in legislation and standardisation showed that standards and laws are scattered and they vary from country to country and between the different types of public transport. There is an EU directive on buses and coaches, but it does not provide for universal access, and the situation for trains and taxis is not much better. Concerning infrastructure, some regulations and standards are under preparation, but they do not cover all accessibility issues in the transportation sector.

All in all, legislation and standardisation cannot be seen as having contributed to universal design in public transportation up to now. However, it also became clear during the preparation of the state of the art report that legislation and standardisation alone would not deliver universal accessibility in public transport. Additional measures, notably of a policy and society nature, are needed to complement them.

B.- Vision of the future:
In the future, legislation should give citizens / passengers rights concerning access to public transportation. Standards should ensure trouble-free and safe travel as much as possible, whatever the physical state, age or gender. Anyone should be able to access information/guidance on public transport accessibility. Certification or self-certification should assure users of the quality of services.

C.- Challenges and actions in legislation, standardization, policy and society:

A) Make comprehensive review of existing national/regional rules & regulations, enforcement and punitive measures on transport accessibility
   • Should result in recommendations based on best practice for national/regional legislators/authorities

B) Develop a comprehensive support framework for accessible design in two steps:
   • Compilation of EU-wide guidance on accessible vehicles, infrastructure, information and ticketing

Deriverable of task 3.6 (R&D Roadmap)
• **Creation of a complete set EU standards for accessible vehicles, infrastructure, information and ticketing**

**C) ‘Transport for all’ reference manual**

• Develop indicators enabling collection and comparison of current practice in relation to vehicle/infrastructure design, policy measures (financing, procurement, cooperation, information, enforcement, etc) and society actions (training, dissemination, etc)

• Prepare ‘good practice’ guide based on indicators

**D) Equality of opportunity throughout Europe**

• Creation of an EU-wide non-discrimination legislation which should cover all aspects of discrimination and all groups of people

**E) Creation of a European-level central agency on non-discrimination**

• To act as a central source of information and guidance on all non-discrimination matters, including public transport accessibility

**F) Develop accessibility certification for public transport products and services (vehicles, infrastructure, information & ticketing, etc)**

• Define the certification process, criteria and delivery means

• Self-certification requires laws that make litigation possible in the case of non-compliance

**G) Develop accessibility classification scheme for vehicles**

• Define accessibility criteria

• Establish classification classes

• Investigate voluntary versus compulsory classifications

**H) Mainstreaming universal accessibility**

• Explore possibilities of including accessibility indicators in bonus-malus scheme for assessing service performance

• Demonstration programme for accessible transport systems
I) Tackle driving behaviour

- Develop measures to reduce illegal parking at bus/tram stops, eg, technology (cameras), awareness (signs appealing to people’s conscience),
- Draw attention of drivers to vulnerable users in order to reduce speeding and driving close to kerb and greater respect of pedestrian crossings.

J) Education & dissemination

- Actions to promote accessible transport and human diversity, eg, public awareness campaigns, workshops for target groups, etc
- Develop ‘human diversity’ module for inclusion in school curriculum
IX. SUMMARY

This roadmap focused on the challenges that will have to be tackled in order to achieve universal accessibility in public transport. These challenges will need a strategy-developing process before the vision can be reached and the gaps from the current situation are bridged (figure 2)

The strategy process to reach our vision includes the following items:

- Overview of other initiatives.
- Plan for obtaining vision of the future.
- Prioritizing of research area
- Research and developing process

![Roadmap Diagram](image)

Figure 2: The process of developing a roadmap.
ANNEX I

For the next annex, which is the summary of the roadmap obtained, the next codes have been used:

PRIORITY:
- Very important
- Important
- Less important
- Completely unimportant
- Indefinite

DIFFICULTY:
- Very easy to solve
- Easy to solve
- Difficult to solve
- Not to solve
- Indefinite

PLANNING HORIZON:
- ST → 0 to 5 years
- MT → 5 to 10 years
- LT → from 10 years on
<table>
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<th>PRIORITY</th>
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<td>Easy to solve</td>
<td>MT</td>
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<td></td>
<td>FA1.2 Written &amp; spoken for all</td>
<td>Very important</td>
<td>Very easy to solve</td>
<td>ST</td>
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<td></td>
<td>FA1.3 Personal assistance</td>
<td>Important</td>
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<td></td>
<td>FA1.5 Multi-lingual</td>
<td>Indefinite</td>
<td>Easy to solve</td>
<td>MT</td>
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<td></td>
<td>FA1.6 Standard across platforms</td>
<td>Very important</td>
<td>Indefinite</td>
<td>LT</td>
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<tr>
<td>RD2. Information in general</td>
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<td>ST</td>
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<tr>
<td></td>
<td>FA7.2 Understand navigation info</td>
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<td>LT</td>
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<tr>
<td></td>
<td>FA7.3 Confirm correct arrival</td>
<td>Very important</td>
<td>Easy to solve</td>
<td>MT</td>
</tr>
<tr>
<td>RD8. Physical design</td>
<td>FA8.1 No physical obstacles</td>
<td>Very important</td>
<td>Indefinite</td>
<td>MT</td>
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<tr>
<td></td>
<td>FA8.2 Universal entering</td>
<td>Very important</td>
<td>Difficult to solve</td>
<td>LT</td>
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<td></td>
<td>FA8.3 Self-reliant in navigation</td>
<td>Very important</td>
<td>Indefinite</td>
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<tr>
<td>RD9. Comfortable distances</td>
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Deriverable of task 3.6 (R&D Roadmap)
### UNIACCESS: Design of Universal Accessibility Systems for Public Transport

<table>
<thead>
<tr>
<th>RD10. Luggage handling</th>
<th>FA10.1 Check-in or self handling</th>
<th>Less important</th>
<th>Indefinite</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA10.2 Safe storage and handling</td>
<td>Important</td>
<td>Difficult to solve</td>
<td>LT</td>
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</tbody>
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<table>
<thead>
<tr>
<th>RD11. Departure information</th>
<th>Possibilities to find and understand information about time and place of departure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA11.1 Universal access to info point</td>
<td>Important</td>
</tr>
<tr>
<td>FA11.2 Personal assistance</td>
<td>Important</td>
</tr>
<tr>
<td>FA11.3 Position and navigation aid</td>
<td>Important</td>
</tr>
<tr>
<td>FA11.4 All languages</td>
<td>Important</td>
</tr>
<tr>
<td>FA11.5 Sound and written info</td>
<td>Important</td>
</tr>
<tr>
<td>FA11.6 Universal understanding</td>
<td>Very important</td>
</tr>
<tr>
<td>FA11.7 Repeat sound and written info</td>
<td>Very important</td>
</tr>
<tr>
<td>FA11.8 Emergency alarms understandable for all</td>
<td>Very important</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RD12. Ticketing</th>
<th>FA12.1 Accessible vending machines</th>
<th>Important</th>
<th>Easy to solve</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA12.2 User interfaces with multiple technologies</td>
<td>Very important</td>
<td>Difficult to solve</td>
<td>LT</td>
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</tr>
<tr>
<td>FA12.3 Standards for user interface design</td>
<td>Very important</td>
<td>Difficult to solve</td>
<td>LT</td>
<td></td>
</tr>
<tr>
<td>FA12.4 User profiles for special needs</td>
<td>Very important</td>
<td>Difficult to solve</td>
<td>LT</td>
<td></td>
</tr>
<tr>
<td>FA12.5 Virtual manned services</td>
<td>Very important</td>
<td>Difficult to solve</td>
<td>MT</td>
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</table>

<table>
<thead>
<tr>
<th>RD13. Identify the entrance</th>
<th>FA13.1 Locate correct entrance</th>
<th>Very important</th>
<th>Easy to solve</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA13.2 Accessibility to entrance location</td>
<td>Very important</td>
<td>Easy to solve</td>
<td>ST</td>
<td></td>
</tr>
<tr>
<td>FA13.3 Confirm correct arrival</td>
<td>Very important</td>
<td>Easy to solve</td>
<td>ST</td>
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<table>
<thead>
<tr>
<th>RD14. Boarding</th>
<th>FA14.1 Closing mechanism independent of user</th>
<th>Very important</th>
<th>Indefinite</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA14.2 Able to transfer into vehicle</td>
<td>Very important</td>
<td>Easy to solve</td>
<td>MT</td>
<td></td>
</tr>
<tr>
<td>FA14.3 Confirm correct boarding</td>
<td>Important</td>
<td>Easy to solve</td>
<td>MT</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>RD15. Disembarking</th>
<th>FA15.1 Able to transfer to ground level</th>
<th>Important</th>
<th>Indefinite</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA15.2 Confirm correct disembarking</td>
<td>Important</td>
<td>Easy to solve</td>
<td>ST</td>
<td></td>
</tr>
</tbody>
</table>

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**Deriverable of task 3.6 (R&D Roadmap)**
### RD16. Time

| FA16.1 Time not discriminating factor | Important | Indefinite | MT |

### RD17. Safety

| FA17.1 Maintain safety in all situations | Important/very important | Easy to solve/Difficult to solve | MT |
| FA17.2 Self reliance in evacuation | Important | Indefinite/Difficult to solve | MT |
| FA17.3 Universal auxiliary means for emergency | Very important | Difficult to solve | LT |
| FA17.4 Locate and operate emergency exits | Very Important | Easy to solve | ST |

### RD18. Seating and standing room

| FA18.1 Find available seat or place | Important | Easy to solve | MT |
| FA18.2 Find specific seat or place | Important | Easy to solve | MT |
| FA18.3 Completely free placement | Important | Indefinite | LT |

### RD19. Accessibility

| FA19.1 All passengers should be able to navigate to toilets and facilities in vehicle unaided | Very important | Difficult to solve | LT |

### RD20. Storage systems

| FA20.1 Store luggage nearby the seat | Less important | Indefinite | MT |
| FA20.2 Safe storage | Less important | Indefinite | MT |

### RD21. Safety solutions

| FA21.1 Self reliance in evacuations | Very important | Difficult to solve | LT |
| FA21.2 Safety fasten solutions | Important | Easy to solve | MT |
| FA21.3 Access to alarm in all locations | Important | Easy to solve | MT |
| FA21.4 Locate and operate emergency exits | Very important | Easy to solve | MT |
| FA21.5 Maintain safety in all situations | Important/Very important | Easy to solve/Difficult to solve | MT |
| FA21.6 Universal auxiliary means for emergency | Important | Easy to solve/Difficult to solve | MT |

### RD22. Information

| All passengers should have possibilities to find and | | | |

---

Deriverable of task 3.6 (R&D Roadmap)
<table>
<thead>
<tr>
<th>RD23. Dissemination</th>
<th>Underline needed information during the journey</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA22.1 Locate and understand info</td>
<td>Important</td>
</tr>
<tr>
<td>FA23.1 Marketing campaigns for accessible transport</td>
<td>Very important</td>
</tr>
<tr>
<td>FA23.2 Conferences to raise awareness</td>
<td>Important</td>
</tr>
<tr>
<td>FA23.3 Workshops to work out problems</td>
<td>Important</td>
</tr>
<tr>
<td>FA23.4 Public awareness campaigns</td>
<td>Important</td>
</tr>
<tr>
<td>RD24. European level central agency for non-discrimination and equality</td>
<td></td>
</tr>
<tr>
<td>FA24.1 Coordinate network of national auditing bodies</td>
<td>Important</td>
</tr>
<tr>
<td>RD25. Non-discrimination law for Europe</td>
<td></td>
</tr>
<tr>
<td>FA25.1 Work in the European Parliament</td>
<td>Very important</td>
</tr>
<tr>
<td>FA25.2 Europe-wide non-discrimination legislation</td>
<td>Very important</td>
</tr>
<tr>
<td>RD26. “Transport for all” guidance</td>
<td></td>
</tr>
<tr>
<td>FA26.1 Guidance for “good practice”</td>
<td>Important</td>
</tr>
<tr>
<td>FA26.2 Accessibility criteria in public transport tendering</td>
<td>Important</td>
</tr>
<tr>
<td>FA26.3 Consider legislation in stead of guidance</td>
<td>Important</td>
</tr>
<tr>
<td>RD27. Guidance on enforcement and punitive measures</td>
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<tr>
<td>FA27.1 Penalties for non-compliance with non-discrimination of accessibility legislation</td>
<td>Important</td>
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<tr>
<td>RD28. Review of existing national legislation</td>
<td></td>
</tr>
<tr>
<td>FA28.1 Recommendations based on best practice</td>
<td>Important</td>
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<tr>
<td>RD29. Self-certification versus a certification body</td>
<td></td>
</tr>
<tr>
<td>FA29.1 Accessibility certification for vehicles</td>
<td>Very important</td>
</tr>
<tr>
<td>FA29.2 Accessibility certification for infrastructure</td>
<td>Very important</td>
</tr>
<tr>
<td>FA29.3 Accessibility certification for information and ticketing systems</td>
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Deriverable of task 3.6 (R&D Roadmap)
<table>
<thead>
<tr>
<th>RD</th>
<th>Description</th>
<th>FA</th>
<th>Importance</th>
<th>Solvability</th>
<th>Timeframe</th>
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<tbody>
<tr>
<td>RD30. Define accessibility criteria</td>
<td>FA30.1 Define vehicle accessibility criteria</td>
<td>Very important</td>
<td>Difficult to solve</td>
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<td></td>
<td>FA30.2 Define vehicle classification criteria</td>
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<td>FA30.3 Establish classification classes</td>
<td>Less important</td>
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<td>FA30.4 Self-certification versus certification body</td>
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<td>FA30.5 Voluntary versus compulsory classifications</td>
<td>Important</td>
<td>Difficult to solve</td>
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<tr>
<td>RD31. Standard questions and guidelines for operators</td>
<td>FA31.1 Must be non-discriminatory</td>
<td>Important</td>
<td>Easy to solve</td>
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<tr>
<td></td>
<td>FA31.2 Must be non-intrusive</td>
<td>Important</td>
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<td>FA31.3 Service for the passengers</td>
<td>Important</td>
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<td></td>
<td>FA31.4 Training based on standards for operators</td>
<td>Important</td>
<td>Easy to solve</td>
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<tr>
<td>RD32. Investigate area of specialized transport services</td>
<td>FA32.1 Interim solutions</td>
<td>Important</td>
<td>Easy to solve</td>
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<td></td>
<td>FA32.2 Guaranteed solution for all passengers</td>
<td>Important</td>
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<tr>
<td>RD33. Mainstreaming universal accessibility</td>
<td>FA33.1 Public awareness about lack of accessibility</td>
<td>Very important</td>
<td>Easy to solve</td>
<td>ST</td>
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<tr>
<td></td>
<td>FA33.2 Possibilities of bonus-malus scheme</td>
<td>Important</td>
<td>Indefinite</td>
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<td></td>
<td>FA33.3 Demonstration programme for accessible transport systems</td>
<td>Important</td>
<td>Indefinite</td>
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<tr>
<td>RD34. Financial incentives to promote accessible transport</td>
<td>FA34.1 Recommendations for legislation</td>
<td>Important</td>
<td>Difficult to solve</td>
<td>MT</td>
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<tr>
<td>RD35. Driving behaviour</td>
<td>FA35.1 Reduce illegal parking</td>
<td>Very important</td>
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<td></td>
<td>FA35.2 Rise awareness of drivers</td>
<td>Important</td>
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<tr>
<td>RD36. Education</td>
<td>FA36.1 Campaigns about lack of accessibility</td>
<td>Very important</td>
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<td></td>
<td>FA35.2 Human diversity module for school curriculum</td>
<td>Important</td>
<td>Easy to solve</td>
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</table>