Connecting LOnge and Short-distance networks for Efficient tRansport

Deliverable D6.1
Guidance and recommendations for interconnection between long distance and local/regional passenger transport

Due Date: December 2012
Submitted: December 2012

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)
THEME 7: TRANSPORT (including AERONAUTICS)
Collaborative Project (Small or medium-scale focused research project)
Contract number 234180
Project Start Date: 1st January 2010, Project Duration: 3 years
# Document Control Sheet

<table>
<thead>
<tr>
<th>Project no.</th>
<th>Acronym</th>
<th>CLOSER</th>
</tr>
</thead>
</table>

**Project Title**

Connecting LOng and Short-distance networks for Efficient tRansport

**Work Package**

WP6

**Deliverable no.:**

D6.1

**Title:**

Guidance and recommendations for interconnection between long distance and local/regional passenger transport

**Version**

Version 1

**Revision**


**Issue Date**

21/12/2012

**Dissemination Level**

Public

**Future references**


**Author(s)**

Tuuli Järvi (VTT), Ingrid Nagel (FhG-IVI)

**Responsible Organisation**

Teknologian tutkimuskeskus VTT - VTT Technical Research Centre of Finland

**WP Leader**

Teknologian tutkimuskeskus VTT - VTT Technical Research Centre of Finland

**Quality Review**

Institut français des sciences et technologies des transports, aménagement et réseau - IFSTTAR

**CLOSER PO**

Elena-Mihaela Williams

**Participant’s name**

1. Fraunhofer Gesellschaft, Institut für Verkehrs- und Infrastruktursysteme – FhG-IVI
2. Institut français des sciences et technologies des transports, aménagement et réseau - IFSTTAR
3. Transportekonomisk institutt - TOI
4. Eurogrant GmbH – EUG
5. Teknologian tutkimuskeskus VTT
6. Centrum dopravního výzkumu v.v.i - CDV
7. Centre for Research and Technology Hellas / Hellenic Institute of Transport – CERTH/HIT
8. Vilniaus Gedimino technikos universitetas / Transporto mokslo institutas – VGTU-TMI
9. Centro de Estudios y Experimentación de Obras Públicas - CEDEX
Index

LIST OF ABBREVIATIONS
EXECUTIVE SUMMARY

1 INTRODUCTION .................................................................................................................. 1
1.1 INTRODUCTION TO THE CLOSER PROJECT AND THE GUIDEBOOK ........... 1
1.1.1 Targets of CLOSER ................................................................................................. 1
1.1.2 Targets of CLOSER regarding passenger transport ........................................... 4
1.1.3 About the guidebook .............................................................................................. 5
1.1.4 Cluster projects ....................................................................................................... 6
1.2 POLICY CONTEXT ....................................................................................................... 7
1.2.1 Policy goals set by European Commission .......................................................... 7
1.2.2 National policy goals ............................................................................................ 8
1.3 TYPOLOGY OF PASSENGER TRANSPORT INTERFACES ........................................ 9
1.3.1 Interface characteristics ....................................................................................... 9
1.3.2 Typologies and types ............................................................................................ 10
1.3.3 CLOSER passenger transport typology ............................................................... 11
1.4 STAKEHOLDERS ...................................................................................................... 13
1.4.1 Classification of stakeholders .............................................................................. 13
1.4.2 Operational stakeholders .................................................................................... 13
1.5 INDICATORS ............................................................................................................. 15
1.5.1 Overview of indicators ......................................................................................... 15
1.5.2 Core indicators for long/short-distance passenger interfaces ............................. 15
1.5.3 Indicators in relation to EC policy goals ............................................................... 17
1.5.4 Indicators in cluster projects ............................................................................... 18
1.6 EMERGING MOBILITY SCHEMES (EMS) ............................................................... 19
1.7 OVERVIEW OF PASSENGER CASE STUDIES ......................................................... 22
1.7.1 National hubs ....................................................................................................... 23
1.7.2 National city terminals and other city or local terminals ................................... 25
2 NATIONAL HUBS: AIRPORTS AND PASSENGER OR FERRY PORTS ..... 27
2.1 CORE INDICATORS .................................................................................................. 27
2.1.1 Policy .................................................................................................................... 27
2.1.2 Organisational and institutional structure .......................................................... 28
2.1.3 Supply-side performance ..................................................................................... 29
2.1.4 Terminal properties .............................................................................................. 30
2.1.5 Level of service .................................................................................................... 32
2.2 EMERGING MOBILITY SCHEMES ........................................................................... 34
2.2.1 Mobility trends ..................................................................................................... 34
2.2.2 Improved public transport services .................................................................... 36
2.2.3 New technology .................................................................................................. 38
## List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoW</td>
<td>Description of Work</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>ETP</td>
<td>European Transport Policy</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FP</td>
<td>Framework Programme</td>
</tr>
<tr>
<td>FP7</td>
<td>Seven Framework Programme</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>ITS</td>
<td>Intelligent Transport Services</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
</tr>
<tr>
<td>PAG</td>
<td>Policy Advisory Group</td>
</tr>
<tr>
<td>RTD</td>
<td>Research and Technological Development</td>
</tr>
<tr>
<td>SME</td>
<td>Small and Medium Enterprise</td>
</tr>
<tr>
<td>WP</td>
<td>Work Package</td>
</tr>
<tr>
<td>PO</td>
<td>Project Officer</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

The European Transport Policy (ETP) proposes the concept of co-modality as an essential instrument to achieve, at the same time, a high level of mobility and environmental protection; but the existing transport system still remains far away from that concept. The interface between long- and short-distance transport networks remains often as the weak link in the transport chain, for both passengers and freight. This situation favours the choice of uni-modal solutions, i.e. cars for passenger transport, and jeopardises the development of sustainable transport chains. The improvement of interfaces between long- and short-distance transport is a key element in achieving the objectives of ETP.

The objective of the CLOSER (Connecting LOng and Short-distance networks for Efficient tRansport) project was to develop innovative tools for the analysis of interfaces between long- and short-distance transport networks in order to improve the efficiency of door-to-door movements using sustainable co-modal transport chains covering all movement of passengers and goods, weather international, national, regional or local. The research work carried out between 2010 and 2012 included exploration of current transport network interconnection problems, emerging mobility schemes, policy frames and decision-making as well as development of indicators for assessment and using case studies to deepen and validate the research results.

The summary of the outcomes of the CLOSER project is published as a set of three separate guidebooks, available on the project website http://www.closer-project.eu. This guidebook addresses the interconnection of long- and short-distance passenger transport, the second guidebook addresses freight transport and the third has its focus on decision-making level guidance. These guidebooks will help practitioners to categorise the long/short distance interface issues, identify gaps and challenges and increase the level of co-modality by means of better integrated interfaces ready for future requirements. All approaches, the operational and the legal, are considered as successful solutions for the future need cooperation between all stakeholders, authorities and private.

This guidebook dealing with passenger transport is mainly aimed at operators and other stakeholders involved in planning, implementation and management of a passenger transport terminal or other major interconnection point. It is structured in two parts, a general introductory part and a set of fact sheets describing the key issues. Chapter 1 presents shortly the background of the key issues taken up in the CLOSER project regarding operation of passenger transport interchange points. In chapters 2 and 3 division according to the CLOSER typology to national hubs (commonly airports and passenger ports or ferry terminals) and national city terminals and other city or local terminals (rail and bus stations) is used. These chapters are structured in a fact sheet format, where each topic within a section is presented with a one- to three-page fact sheet. The fact sheets are designed to have clear, uniform outline and contents starting with a description of the topic, followed by a list of challenges, good practices and recommendations. These are formulated based on the CLOSER research and the CLOSER case studies.
D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport
1 Introduction

1.1 Introduction to the CLOSER project and the guidebook

1.1.1 Targets of CLOSER

Introduction

The project CLOSER (Connecting LOng and Short-distance networks for Efficient tRansport) deals with interconnections between short- and long-distance transport networks of all modes in order to improve the efficiency of door-to-door movements using sustainable co-modal transport chains of both passenger and freight transport. It is co-financed by the European Commission within the 7th Framework Programme. The project was launched in 2010 and final results will be published in early 2013. There are eight partners from seven European countries working together within this project.

The goal of CLOSER is to develop innovative tools for analysis of interfaces between short- and long-distance transport networks of all modes, consequently check these tools in a number of case studies, and finally, give guidance and specific recommendations for the stakeholders (officials, planners, operators and decision-makers) to achieve a more systematic approach to the whole project cycle from planning to operation as well as decision-making and financing.

Emerging mobility schemes

The first phase of the project was to identify and analyse emerging mobility schemes separately for passenger and freight transport (WP 2). The term mobility scheme used within the CLOSER project incorporates the entire spectrum of mobility concepts, from trends and themes within European mobility to mobility management and strategies, policies as well as measures enhancing sustainable mobility behaviour of citizens and sustainable transport of goods.

Core indicators

The next phase of the project (WP 3) aimed at establishing the core indicators, which would reflect the most critical issues related to interfaces of short and long distance transport networks and services for both passenger and freight transport also taking account of common transport policy goals set by the European Commission.

In total 30 key indicators were defined covering issues like policy, environment, organisational and institutional aspects, supply-side performance, terminal properties and level of service. The main focus was on end-users and was set on description of the functionality of the terminals and benchmarking of interfaces by typology. For the selection of the key indicators a larger number of indicators were tested on the group of case study candidates.
D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

Decision-making framework

The aim of this part of the project (WP 4) was to explore the planning and decision-making processes as well as financing structures adopted in the European Union member states regarding different functions connected to long and short-distance interfaces. The analysis was divided to four separate aspects: planning and policy, infrastructure, operation and consideration of the end-users.

The work focused on identification of all stakeholders involved, analysis of the existing regulatory framework in the EU and its member states and analysis of the planning and financial processes adopted across Europe regarding the interconnection of the short and long-distance networks.

Policy Advisory Group (PAG)

A Policy Advisory Group (PAG) was set up to give guidance for the analyses to be carried out within the project and evaluate the results of work phase. PAG evaluation results given out in D4.2 of WP 4 and evaluation of the case studies carried out in WP 5 were of special importance.

Test cases

The main objective of test cases was to deepen and validate the understanding of results from the preceding work done within the CLOSER project. Furthermore, the case studies provided examples of good and bad practices from European passenger and freight terminals to be further analysed while developing recommendations in the final phase of the project. Seven case study terminals were chosen as a representative selection of European passenger and freight terminals of different types.

Several conclusions and recommendations are common for both freight and passenger transport, e.g. the need for master plans for operations and for development of terminals and other interchange points. In addition, for proper dialogue between all relevant stakeholders both expert and public forums should be established as the importance of communication between all stakeholders is great.

Harmonisation

Harmonisation and standardisation of common procedures of operation is relevant in both passenger and freight transport, but at different levels. Due to the more global dimension of freight flows, there is a need for standardisation across countries and regions, for instance in terms of information systems. The EU and other pan-national organisations and structures play a particular role in this respect as such issues cannot be handled at country level.

In passenger transport, there is a need for standardisation, harmonisation and integration of information and ticketing systems across modes of transport, typically linking local and regional transport systems. These problems need integration at local/regional level, but it is also a stated policy goal of the Commission to establish the
framework for a European multimodal transport information, management and payment system by 2020.

The CLOSER project contributes to these goals by taking forward key issues affecting harmonisation, presenting good practices and giving recommendations and guidance regarding interconnection between long- and short-distance transport.

Figure 1. Work flow in the CLOSER project.
Table 1: List of the CLOSER deliverables and key deliverables of the cluster projects

<table>
<thead>
<tr>
<th>Bibliography for further reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSER research reports</td>
</tr>
<tr>
<td>D1.2</td>
</tr>
<tr>
<td>D2.1</td>
</tr>
<tr>
<td>D2.2</td>
</tr>
<tr>
<td>D3.1</td>
</tr>
<tr>
<td>D3.2</td>
</tr>
<tr>
<td>D4.1</td>
</tr>
<tr>
<td>D4.2</td>
</tr>
<tr>
<td>D5.1</td>
</tr>
<tr>
<td>D5.2</td>
</tr>
<tr>
<td>D6.1</td>
</tr>
<tr>
<td>D6.2</td>
</tr>
<tr>
<td>D6.3</td>
</tr>
</tbody>
</table>

External resources

<table>
<thead>
<tr>
<th>INTERCONNECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.2</td>
</tr>
<tr>
<td>D3.1</td>
</tr>
<tr>
<td>D4.1</td>
</tr>
<tr>
<td>D5.4</td>
</tr>
<tr>
<td>HERMES D6</td>
</tr>
</tbody>
</table>

1.1.2 Targets of CLOSER regarding passenger transport

“A chain is only as strong as its weakest link.” In the context of long distance travel this link is typically the interconnection point between the long- and short-distance transport legs. Problems such as wasted time, high costs, poor information provision, dysfunctional interfaces and neglect of vulnerable user groups are faced by
D6.1 Guidance and recommendations for interconnection between long distance and local/ regional passenger transport

passengers daily. These gaps may lead to unsustainable travel choices e.g. in mode choice or routing, and commonly in favour of car to public transport.

1.1.3 About the guidebook

The objective of the final phase of the CLOSER project is to give guidance and recommendations by summing up the project results in three parallel guidebooks: one addressing the decision-making level and two guidebooks focusing on more practical aspects specific to passenger and freight transport separately. The guidebooks will be published and made available on the CLOSER website.

As the guidebook is only a collection of earlier published results it does not give any references to the original sources of information but only refers to the CLOSER deliverables for more information including the relevant sources.

This guidebook is structured in three sections:

Chapter 1 gives introduction to the CLOSER project, its goals, methods and work flow and the purpose of the final results of the project, the guidebooks. It also presents shortly all main issues regarding operation of passenger transport interchange points that have been handled in the CLOSER project in the operational point of view. The decision-maker’s point of view and matters important are presented in CLOSER deliverable D6.3 “Decision-making guidebook for the interconnection between short and long-distance transport networks”.

Chapter 2 deals with terminals that are classified as national hubs by the CLOSER typology. A national hub may be an airport, a rail station (high-speed or conventional), a bus station or a passenger port or ferry terminal which connects with other terminals at national or international level. The terminal operation and guidance is presented in terms of core indicators, contribution to the common policy goals of the European Commission and affecting emerging mobility schemes.

Chapter 3 deals with national city terminals and other city or local terminals. A national city terminal may have more or less the same long-distance modes as a national hub, but it is located closer to a city centre and with more direct access to local city network of public transport. Its orientation is mainly at regional and national (interregional) level, but international connections may also be offered. Other city or local terminals are interchanges within a city, commuting area or local community.

Chapters 2 and 3 are structured in a fact sheet format, where each topic within a section is presented with a one- or two-page fact sheet. The fact sheets are designed to have clear, uniform outline and contents starting with a description of the topic, followed by a list of challenges, good practices and recommendations. These are formulated based on the CLOSER research and the CLOSER case studies. Within each topic, references to further reading in the CLOSER research reports are given.
1.1.4 Cluster projects

In addition to CLOSER two parallel projects were funded under the same topic: HERMES and INTERCONNECT. Both projects worked on the connection of short- and long-distance transport, but mainly focussing on passengers. While HERMES put a lot of effort in business plan analysis, INTERCONNECT was related to practical topics, providing a large list of gaps in interconnection points and solutions for improvement. This list was used by CLOSER as a base for gap identification in relation to passenger transport.

A key element in developing the results of the INTERCONNECT project to become a significant policy lever is the toolkit of Deliverable 3.1 which provides systematic knowledge on the problems and solutions of interconnectivity. Combined with the description of the case studies (Deliverable 4.1) the project provides guidance to the stakeholders and to the future development of interconnection terminals, which is of paramount importance. (www.interconnect-project.eu)
1.2 Policy context

1.2.1 Policy goals set by European Commission

CLOSER D3.1 reviewed policy documents prepared by European Commission in relation to interfaces between short and long-distance passenger transport networks. These documents were:


♦ The mid-term review of the European Commission’s 2001 Transport White Paper, *Keep Europe moving - Sustainable mobility for our continent* (European Commission, 2006). It was stated that co-modality, i.e. the efficient use of different modes on their own and in combination, will result in an optimal and sustainable utilisation of resources.


♦ The Action Plan on Urban Mobility (Commission of The European Communities, 2009 (COM(2009) 490 final) and


The new white paper sets out ten ambitious goals for a competitive and resource-efficient transport system grouped into three categories of which relevant for long/short-distance passenger transport interchanges are¹:

### Developing and deploying new and sustainable fuels and propulsion systems

1. Halve the use of ‘conventionally fuelled’ cars in urban transport by 2030 and phase them out in cities by 2050.

### Optimising the performance of multimodal logistic chains, including by making greater use of more energy-efficient modes

4. By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.

5. A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

---

¹ The numbering of the goals used is original taken from the White Paper
Only passenger transport parts of the goals are cited
6. By 2050, connect all core network airports to the rail network, preferably high-speed.

**Increasing the efficiency of transport and of infrastructure use with information systems and market-based incentives**

7. Deployment of the modernised air traffic management infrastructure (SESAR) in Europe by 2020 and completion of the European common aviation area. Deployment of equivalent land and waterborne transport management systems (ERTMS, ITS, SSN and LRIT, RIS²). Deployment of the European global navigation satellite system (Galileo).

8. By 2020, establish the framework for a European multimodal transport information, management and payment system.

9. By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport.

10. Move towards full application of ‘user pays’ and ‘polluter pays’ principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.

### 1.2.2 National policy goals

In addition to European wide or even global policy goals the most important and most familiar for the citizens are the national policy goals which are updated and published according to legal regulation or national praxis of the country. However, in most countries these two sets of policy goals are merged to single set of goals. In addition to the nation and EU wide policy goals separate counties, regions and cities may have their own additional goals.

---

² European Rail Traffic Management System (ERTMS), Intelligent transport systems (ITS), SafeSeaNet (SSN), long-range identification and tracking (LRIT) of vessels and River Information Services (RIS).

---

See Policy Guide Book D6.3. In addition, EC transport policy goals are presented in D3.1 and present practice in D4.1.
1.3 Typology of passenger transport interfaces

1.3.1 Interface characteristics

Regarding a transport interchange or a terminal we can define many characteristics that describe the terminal and of which many can be used as indicators for analysis purposes. There is no universal list of characteristics to use to describe a terminal. In CLOSER the following set of characteristics of transport interfaces grouped into five categories was used:

1. **Policy objectives and measures** that affect the transport system, including objectives connected to modal split, environmental effects, efficiency and safety, as well as measures that initially can be divided into broad categories such as economic/financial, legal and physical/infrastructure.

2. **Organisational and institutional structure** refers to the role of and relations between organisations (stakeholders), e.g. ownership, responsibility for infrastructure and operation, and the institutions that affect these organisations, such as regulations and financial structure. These issues apply throughout the transport chain concerning all stages: access/egress, long-distance and interfaces/terminals.

3. **Supply side performance** is connected to energy use, investments, performance and efficiency in the utilisation of resources, financial performance, social standards and actual transport volumes/flows revealed. Also these issues may be relevant throughout the transport chain.

4. **Terminal properties** are aspects of the specific terminal or long/short-distance interface, capturing design, location and accessibility, scope of services offered, signage, space and capacity offered, as well as the technology and equipment possessed.

5. **Level of service** represents the quality and cost that is delivered to the customers, including classical concepts as relations with customers, comfort, cost, flexibility, frequency of services, information delivered, shipment losses and damages, reliability of service, safety and security issues, integration of services, integration of fares and tickets, as well as time use and efficiency in the operations. Level of service may be considered at different assessment levels and on different legs within a transport chain.

In the passenger transport context, Goudeau (2011) labelled four dimensions of interfaces between transport systems meeting in stations:

- Physical interface
- Information interface
- Fare interface
- Institutional interface
Compared to the interface characteristics listed above, physical interface is very closely related to the “terminal properties”. The institutional dimension of the interface is closely related to “organisational and institutional structure”. Information interface and fare interface are closest related to the information and ticket integration parts of “level of service”. There are two approaches for including fare and information interfaces, should they be considered as level of service attributes in the same way as travel time, reliability, etc. or whether they should be considered as properties that affect level of service.

1.3.2 Typologies and types

A typology is a taxonomic classification of a phenomenon, where a set of important characteristics (the types) are used to create a structured representation. In the literature there exist a range of different typologies for terminals depending on the context where it has been used. Regarding long/short-distance interfaces a proposed selection of dimensions to consider in CLOSER is shown in Table 2. The idea of the table was to summarise the most interesting properties, where each dimension is briefly explained below the table.

### Table 2. Important dimensions of the long/short-distance interface structure.

<table>
<thead>
<tr>
<th>Terminal type (modal combinations)</th>
<th>Passenger</th>
<th>Freight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Airport</td>
<td>Airport</td>
</tr>
<tr>
<td></td>
<td>Rail station</td>
<td>Maritime port</td>
</tr>
<tr>
<td></td>
<td>Bus terminal</td>
<td>Rail freight terminal</td>
</tr>
<tr>
<td></td>
<td>Ferry/passenger port</td>
<td>Unimodal truck terminal</td>
</tr>
<tr>
<td>Spatial scale</td>
<td>International / National / Regional / Local</td>
<td></td>
</tr>
<tr>
<td>Independence of terminal</td>
<td>Long-distance operator owns terminal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Short-distance operator owns terminal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Independent private or governmental terminal owner</td>
<td></td>
</tr>
<tr>
<td>Terminal operating entity</td>
<td>Public body or entity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private company</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public-private partnership (PPP)</td>
<td></td>
</tr>
<tr>
<td>Level of integration</td>
<td>Separated services / Linked services / Integrated services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integration of ticketing and/or information</td>
<td></td>
</tr>
</tbody>
</table>

**Terminal type (modal combinations)**

Even though long/short-distance interfaces occur for a large number of modal combinations, there is a set of interfaces that can be said to represent the vast majority of such interfaces. In passenger transport, these are airports, rail stations and bus terminals. Also variants of urban public transport stations could be considered, even though many of them not primarily are used for trips involving multiple spatial scales. In addition, in some countries maritime passenger transport plays an important role and thus also ferry terminals and passenger port terminals should be considered. In freight
transport, we included one category for each main long-distance mode, namely airports, maritime ports, rail freight terminals, and unimodal truck terminals. However, also other logistics centres combining for instance rail freight activities with unimodal truck transfer are common.

**Spatial scale**

The spatial scale refers to the main spatial scale of the long-distance mode, which to some degree is related to the terminal type.

**Ownership and independence of terminal**

Presently there are several different ownership models for terminals. There are situations where a long-distance operator or a short-distance operator owns the terminal alone, a joint venture of the operators has been established, or the terminal owner may be an independent entity of the transport operators. The role of the terminal owner is important as it may affect the access to the terminal on equal conditions.

**Terminal operating entity**

This topic is related to the previous one, and the terminal operating entity may be a public body or entity, a private company, or some sort of public-private partnership. The analysis of candidate terminals in WP3 showed that all these models are relevant.

**Level of integration**

The level of integration refers to two properties, the first one is the integration of services and the second is ticket or fare integration, which has been considered an important interconnection issue in the literature. However, this is a complex issue in organisational terms, because fare integration usually means that the passengers pay less for the same journey, and the operators’ revenues may suffer. Actually there is a trade-off between lower total revenue per user and a positive effect in the number of users due to improved service. In any case, a revenue sharing system must be negotiated if there are several operators involved.

**1.3.3 CLOSER passenger transport typology**

As mentioned in the previous chapter there are many ways to establish typologies, but for CLOSER it’s important to capture aspects of long/short-distance interfaces, and differences between such interfaces.

Although the passenger and freight terminals are similar in many aspects there are certain key elements that are specific only for the other (e.g. for freight terminals, cargo types handled, very large number of stakeholders, warehousing) which makes it natural to differentiate the typologies of passenger and freight terminals to better fit the analysis purposes. However this does not hinder global analysis where appropriate.

In passenger transport, there are big modal differences that in many senses overrule other aspects. Nevertheless a typology which is focusing on spatial range and orientation of long/short-distance interfaces was chosen to be used in CLOSER. The proposed typology is presented in Table 3.
Table 3. Passenger transport terminal typology

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>National hub: Airports and passenger/ferry ports</th>
<th>National city terminal</th>
<th>Other city or local terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-distance modes</td>
<td>Air, high-speed rail, conventional rail, interurban bus, ferry</td>
<td>High-speed rail, conventional rail, interurban bus</td>
<td>Conventional rail, interurban bus, ferry</td>
</tr>
<tr>
<td>Main authority levels</td>
<td>National/regional</td>
<td>National/regional/local</td>
<td>Local/regional</td>
</tr>
<tr>
<td>Orientation</td>
<td>National/international</td>
<td>Regional/local/city</td>
<td>City</td>
</tr>
<tr>
<td>Type (level) of interconnection</td>
<td>International/national &lt;-&gt; Local/regional/national</td>
<td>National/regional &lt;-&gt; Regional/local</td>
<td>Regional &lt;-&gt; local</td>
</tr>
<tr>
<td>Ownership</td>
<td>National authorities or their representatives, varying private influence</td>
<td>National/regional/local authorities or their representatives, sometimes private influence</td>
<td>Usually local/regional authorities but also national, not much private influence</td>
</tr>
</tbody>
</table>

A national hub may be an airport, a rail station (high-speed/conventional), a bus station or a ferry terminal which connects with other terminals at national/international level. They are often located outside the core centre of a city and the connection is not directly to the local city network, but rather in terms of airport express trains and/or buses. National authorities have in some sense interest in and influence on the terminal, and it is affected by national policies. Depending on the circumstances, private actors may be involved in the terminal, but usually governmental companies or administrative bodies own and/or operate national hubs.

A national city terminal may have more or less the same long-distance modes as a national hub, but it is usually located closer to a city centre and with more direct access to local city network of public transport. Its orientation is mainly at regional and national (interregional level), but international connections may also be offered. National authorities often have a role connected to the terminal organisation and investments, but the regional influence is stronger than for national hubs.

Other city or local terminals are oriented towards a city or local community/smaller region. Local or regional authorities are usually involved in the organisation of the terminal, but also national authorities can be involved.

For more information, see D3.1 and D3.2.
1.4 Stakeholders

1.4.1 Classification of stakeholders

There is a range of stakeholders that may affect the long/short-distance interfaces. The following is not an exhaustive list, but gives an idea of different categories of stakeholders involved, here divided into five groups by phase and category of involvement and type of role:

♦ Planning and policy: These are stakeholders influence the conditions of the transport system regionally/nationally/European wide through regulations and planning
♦ Infrastructure: Stakeholders whose role is connected to the infrastructure
♦ Operations: Stakeholders involved in the management or operation of transport services or other terminal operations or services. (Often divided into two separate groups: Management and operation of the terminal and Transport service operations.)
♦ Demand side: The end users i.e. passengers
♦ Other: Stakeholders that do not belong to any of the above groups

1.4.2 Operational stakeholders

The operation of the terminal can be divided into terminal operation and long- and short-distance transport operation, although in some cases these may be inseparable. Terminal operations include e.g. ticket sales, passenger information provision and administrative duties regarding both transport related services and other services.

The governance tasks of a terminal can be clustered and managed by just a few organisations or there can be separate and even parallel organisations attending to each task. In the end, the public sector is responsible for control and strategic planning, whereas governance structures of management, ownership, financing and operation may involve the public and private sectors together or separately. Single organisations may cover several roles within a terminal or within one mode of transport, or several roles across assessment levels. Typical alternatives and complementary roles of the public and private sector stakeholders affecting the interfaces are illustrated in Table 4.
### Table 4: Stakeholders in passenger transport affecting the long/short-distance interfaces

<table>
<thead>
<tr>
<th>Planning and regulations</th>
<th>Access/egress</th>
<th>Long-distance</th>
<th>Integration (terminal)</th>
<th>Door-to-door</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local policy-makers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Regional policy-makers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>National policy-makers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Customs authorities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Air authorities</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Rail authorities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Road authorities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Waterways authorities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>General transport authorities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Access/egress</th>
<th>Long-distance</th>
<th>Integration (terminal)</th>
<th>Door-to-door</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail infrastructure manager</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Road manager</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Air slot allocation manager</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Air traffic control</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>River operator</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Parking company</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Taxi depot operator</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Property management</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Rolling stock provider</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operations</th>
<th>Access/egress</th>
<th>Long-distance</th>
<th>Integration (terminal)</th>
<th>Door-to-door</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail operator</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Car rental company</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bus operator</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Local public transport operator</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ferry operators</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Taxi operators</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Airline</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ship operators</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Terminal operator</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Airport ground services</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hotel</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Shops</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Repair and maintenance services</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Security companies</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Recycled materials clearance</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Piloting (for ships)</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ship brokers</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demand-side stakeholders</th>
<th>Access/egress</th>
<th>Long-distance</th>
<th>Integration (terminal)</th>
<th>Door-to-door</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passengers</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th>Access/egress</th>
<th>Long-distance</th>
<th>Integration (terminal)</th>
<th>Door-to-door</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour union</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

For more information, see D3.1, D4.1, D4.2 and D6.3.

---

3 Sometimes transport operators (rail, bus, etc.) also act as terminal managers
1.5 Indicators

1.5.1 Overview of indicators

The goal of WP 3 of CLOSER is to establish a set of core indicators that reflect the most crucial issues connected to interfaces between short and long-distance transport networks, both for passenger and freight transport. This includes the creation of a structured representation of these interfaces as described in Chapter 1.3, determination of core indicators, and the assessment of usability of the core indicators.

Indicators may be qualitative or quantitative, and they may be defined at aggregated or detailed level. For policy analysis it might be appropriate to use relative indicators for benchmarking and evaluation. It may for instance be more relevant to compare vehicle kilometres per capita in different countries than just the total number of vehicle kilometres.

Core indicators for long/short-distance interfaces should facilitate:

♦ Description of the functioning of interfaces (good/bad)
♦ Recommendations for improving the interfaces
♦ Global assessment: prioritisation of actions (what is important to work on)
♦ Benchmarking of intersections (for instance compare large versus small platforms)

In total 30 indicators of which 25 are relevant for passenger transport were defined covering issues like policy and environment, organisational and institutional aspects, supply-side performance, terminal properties and level of service.

The final set of indicators were based on a review of existing indicators related to interfaces between long and short-distance freight and passenger transport and were selected in a three-level process, including review of indicator selection criteria, test quantification of indicators for a set of specific candidate terminals, and inputs from the CLOSER expert panel Policy Advisory Group (PAG). In addition gaps were identified and reduced.

Indicator selection process and criteria are explained in D3.2.

1.5.2 Core indicators for long/short-distance passenger interfaces

The main output of CLOSER WP 3 is a selection of core indicators for long/short-distance interfaces. The suggested core indicators for passenger transport are presented in Table 5. There are in total 25 indicators for passenger terminals which are grouped by the five-level structure that was introduced for terminal characteristics in Chapter 1.3.1. For each indicator, we present ID in the first column (the indicators are numbered from C1-C30 with reference to the total set of 30 indicators, and where C stands for Core). Then there are columns for indicator name and description, respectively. Most indicators are applicable for all types of interchanges but there also
are indicators that are applicable for specific interchange types (e.g. passenger transport airports). Finally, in the last two columns, we indicate by “x” if the indicator is applicable at interchange level (for specific terminals/interchanges), at more aggregated level (typically for a city, region or country), or both.

Table 5. Suggested core indicators for long/short-distance interfaces

<table>
<thead>
<tr>
<th>ID</th>
<th>Indicator name</th>
<th>Description and unit of measurement</th>
<th>Airports only</th>
<th>Interchange level</th>
<th>Aggregated level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Multimodality rate</td>
<td>Percentage of multimodal versus unimodal shipments or itineraries</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Modal split in access/egress</td>
<td>Percentage of trips, road, rail, bus, taxi, slow modes</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>C3</td>
<td>GHG emissions</td>
<td>GHG emissions, grams per passenger km and grams per tonne km</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisational and institutional structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>Independence of terminal/interchange management</td>
<td>Independence from transport operators and local actors</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>Fair and equal access</td>
<td>Whether all companies have access to a terminal/interchange on equal conditions (yes/no/partial)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>C6</td>
<td>Institutional complexity</td>
<td>Number of institutional levels involved in a) interchange planning b) interchange investments</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply side performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7</td>
<td>Employee productivity</td>
<td>Ratio between flows and inputs, TEU transhipped per employee and year and passengers per employee and year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C9</td>
<td>Flows</td>
<td>Number of passengers per year</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>Energy productivity</td>
<td>Interchange/terminal energy use per year and per passenger (kWh)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal properties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C11</td>
<td>Saturation ratio</td>
<td>Ratio between actual volumes and maximum capacity (daily average, %)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C12</td>
<td>Expandability</td>
<td>Potential for expandability of interchange/terminal (% increase compared to today’s capacity)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C13</td>
<td>Distance from city centre</td>
<td>Number of kilometres from city centre to interchange/terminal</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C15</td>
<td>Platform access distance</td>
<td>Average walking distance from entrance to platform/gate</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Guidance and Recommendations for Interconnection between Long Distance and Local/Regional Passenger Transport

#### 1.5.3 Indicators in relation to EC policy goals

The most recent White Paper on Transport, *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* (Commission of the European Communities, 2011) sets out policy goals for a competitive and resource-efficient transport system (see Chapter 1.2.1). The CLOSER core indicators can be used to measure the level of achievement of these policy goals, but also developments.

<table>
<thead>
<tr>
<th>ID</th>
<th>Indicator name</th>
<th>Description and unit of measurement</th>
<th>Airports only</th>
<th>Interchange level</th>
<th>Aggregated level</th>
</tr>
</thead>
<tbody>
<tr>
<td>C16</td>
<td>Airport transfer distance</td>
<td>Average walking distance from arrivals hall to main public transport modes (bus, rail and metro)</td>
<td>*</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C17</td>
<td>Access/egress cost ratio</td>
<td>Ratio between access/egress cost by car vs public transport (%)</td>
<td>*</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>C18</td>
<td>Access/egress time ratio</td>
<td>Ratio between access/egress time by car vs public transport (%)</td>
<td>*</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>C19</td>
<td>Clarity of ways</td>
<td>Clarity of ways within interchange/terminal</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>C21</td>
<td>Overall quality</td>
<td>Needs to be defined as an index in passenger transport with components physical effort needed, personal comfort, information, perceived safety/security and facilities</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>C22</td>
<td>Ticket integration</td>
<td>Availability of integrated tickets between long and short-distance modes (Yes/No/partial)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C23</td>
<td>Information integration</td>
<td>Common information for long and short-distance modes (Yes/No/partial)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C24</td>
<td>Average interchange time</td>
<td>Average time for transfer between modes (minutes)</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>C25</td>
<td>Variability of interchange time</td>
<td>Standard deviation of transfer time between modes (minutes)</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>C26</td>
<td>Punctuality</td>
<td>Percentage of departures within defined tolerance for delay</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>C27</td>
<td>Non-movement factor</td>
<td>Non-movement time as share of total origin-destination shipment or travel time</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>C29</td>
<td>Interchange injuries</td>
<td>Number of persons killed or seriously injured in interchange/terminal per year by category (staff, passengers, and other)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

The indicators are further presented in the *fact sheets* in Chapters 2 and 3 for national hubs and other terminals respectively together with good practices, recommendations and challenges.
in the efforts to reach the aims for a resource-efficient transport system. Achievement of policy goals can be measured through the use of indicators in two different ways:

- “direct” indicators, core indicators used for measuring achievements of different policy goals as such and
- “indirect” indicators, core indicators relevant for the analysis of achievement of the EC policy goals by measuring associated properties to the goal but not giving a direct measurement of any feature of the goal.

In this way both direct and indirect indicators are valuable for use in evaluation of policy goal achievements.

In the fact sheets describing each core indicator group it is highlighted whether these indicators can be used in evaluation of policy goal achievements. In addition, examples of evaluation results based on case studies are given including relevance of the policy for the particular case study terminal, as well as initiatives aimed at reaching the policy goal.

1.5.4 Indicators in cluster projects

The INTERCONNECT project is solely on passenger transport case study terminals but the indicators are defined in a somewhat different context than the CLOSER indicators, and are tested at aggregated geographical level by use of models like TRANS-TOOLS, but in the recommendations common features are found.

EC transport policy goals are presented in D3.1, coverage of the goals by core indicators in D3.2 and case study response in D5.2.
1.6 Emerging mobility schemes (EMS)

The term “mobility scheme”, as it is used in CLOSER, covers the entire spectrum from politics to operation, from providing facilities for sustainable mobility and transport to influencing on the human behaviour concerning transport. It is usable for passengers as well as for freight. The identification of emerging trends is based on the extensive review of existing literature, which included scientific reports but also articles of the popular scientific field with visionary ideas for the future development of transportation. Mobility schemes arise due to necessities and general trends in society, but also because of new scientific/technical possibilities and outstanding ideas, which then lead to an alternation in human behaviour. Therefore, both aspects have to be taken into account; the provable and scientifically verified changes, and some of the revolutionary ideas which could lead to new trends.

When examined in different regions or countries all over Europe, recently adopted and emerging mobility schemes show parallels as well as notable differences. Some trends appear almost everywhere, simultaneously or postponed - depending on the country's initial situation and its development. E.g. changes in demography, sustainable land use planning and reduction of GHG emissions are well known trends and are well in line with actions to improve terminal and last mile performance. But there are also mobility schemes which are only relevant for one or some parts of Europe. Hence, the investigation of emerging mobility schemes has to acknowledge the significance of geographical aspects. Transport within the vicinity, i.e. within the region or within one country, is impeded by boundary conditions distinct from those applicable for large scale activities. This leads to mobility schemes depending on the spatial scale of transportation. This spatial scale has also to be taken into consideration when categorising emerging mobility schemes.

Future trends and emerging mobility schemes can only be predicted with a certain probability. They may be more or less realistic but are always a bet on the future, as opposed to something that is certain to take place. In order to define the relevance of a specific emerging mobility scheme, the probability of occurrence is to be considered. In addition, the trend is to be evaluated with respect to its impact on CLOSER's objectives, a high level of mobility and environmental protection.

In the case studies some of the most interesting emerging mobility schemes and trends are selected. Then their influences and impacts in the specific long/short-distance interfaces that are studied in the CLOSER case studies are mapped. A list of the selected emerging mobility schemes for passenger transport is presented in the Table 6, their relevance by terminal typology in Table 7 and classification by impact on mobility and environment in Figure 2 below.

In D2.2 of a list of EMS was prepared. The EMS were explained and analysed in detail but were not assigned to terminals. The descriptions of key EMS and their impacts or implications on long- and short-distance terminals and the last mile are provided in the fact sheets for both national hubs and other terminals in Chapters 2 and 3 respectively.
### Table 6: Emerging mobility schemes for passenger transport (D5.2, based on D2.2).

<table>
<thead>
<tr>
<th>Passenger transport</th>
<th>Impact on interchange terminal and last mile:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced bicycle usage</td>
<td>More bicycle stands at terminals</td>
</tr>
<tr>
<td></td>
<td>Safer bicycle stands</td>
</tr>
<tr>
<td>Simplifying the payment</td>
<td>Possibility to take bicycles into vehicles</td>
</tr>
<tr>
<td></td>
<td>Computer equipment for payment services</td>
</tr>
<tr>
<td></td>
<td>Hardware for registration in terminals</td>
</tr>
<tr>
<td></td>
<td>Ticket control mechanisms for eTickets</td>
</tr>
<tr>
<td>Real time information</td>
<td>Information boards in terminals</td>
</tr>
<tr>
<td></td>
<td>Scheduling of routes on base of real time data</td>
</tr>
<tr>
<td>Individual Access and Egress</td>
<td>Sufficient, safe and affordable parking areas/stands for private vehicles</td>
</tr>
<tr>
<td></td>
<td>Appropriate equipment in terminal area</td>
</tr>
<tr>
<td></td>
<td>Release of barriers for private access/egress</td>
</tr>
<tr>
<td>Electro mobility</td>
<td>Possibility to charge batteries in the parking area</td>
</tr>
<tr>
<td>Cooperation of transport operators</td>
<td>Shared terminals</td>
</tr>
<tr>
<td></td>
<td>Coordination of schedules</td>
</tr>
</tbody>
</table>

### Table 7: Relevance of EMS for passenger terminal by typology (D2.2 final)

<table>
<thead>
<tr>
<th>No.</th>
<th>EMS Description</th>
<th>Relevance for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>National hubs: Airports and passenger/ferry ports</td>
</tr>
<tr>
<td>[1]</td>
<td>Young adults in cities prefer PT</td>
<td>low</td>
</tr>
<tr>
<td>[2]</td>
<td>Parents take children by car</td>
<td>no</td>
</tr>
<tr>
<td>[3]</td>
<td>Enhanced bicycle use</td>
<td>low</td>
</tr>
<tr>
<td>[4]</td>
<td>Flexibilisation of services</td>
<td>moderate</td>
</tr>
<tr>
<td>[5]</td>
<td>Simplifying the payment</td>
<td>moderate</td>
</tr>
<tr>
<td>[6]</td>
<td>Real time information</td>
<td>high</td>
</tr>
<tr>
<td>[7]</td>
<td>Personal Navigation</td>
<td>no</td>
</tr>
<tr>
<td>[8]</td>
<td>Cooperation of transport operators</td>
<td>moderate</td>
</tr>
<tr>
<td>[9]</td>
<td>Individual Access and Egress</td>
<td>low</td>
</tr>
<tr>
<td>[10]</td>
<td>Electro mobility</td>
<td>low</td>
</tr>
<tr>
<td>[12]</td>
<td>Low cost carrier flights</td>
<td>low</td>
</tr>
<tr>
<td>[13]</td>
<td>Individualisation of flights</td>
<td>low</td>
</tr>
<tr>
<td>[14]</td>
<td>Low cost cruise ships</td>
<td>low</td>
</tr>
<tr>
<td>[15]</td>
<td>Home office</td>
<td>no</td>
</tr>
<tr>
<td>[16]</td>
<td>Video conferences</td>
<td>no</td>
</tr>
</tbody>
</table>
D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

**Figure 2: Classification of EMS in passenger transportation**

For more information, see D2.2 for detailed descriptions and D5.2 for analysis of EMS in the case studies.
1.7 Overview of passenger case studies

The selected case studies form a heterogeneous set of studies. Within passenger transport, there are several long-distance modes covered: air, maritime, rail and road transport by coaches and bus. Vilnius airport and Thessaloniki port present national hubs whereas Armentières station and Oslo bus terminal Vaterland present both national and local city terminals. The allocation of case studies to the passenger transport typology is presented in Table 8 and their geographical distribution in Figure 3. Due to the limited number of cases, it will not be possible to cover all categories equally well.

Table 8. Passenger transport case studies related to CLOSER typology

<table>
<thead>
<tr>
<th></th>
<th>National hub: Airports and passenger/ferry ports</th>
<th>National city terminal</th>
<th>Other city or local terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armentières station</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Oslo bus terminal</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Thessaloniki port</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vilnius airport</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Geographical distribution of the case studies
1.7.1 National hubs

**Thessaloniki port**

The Thessaloniki port serves both passengers and freight. Passenger traffic is not very well operated, but the container terminal handling conventional cargo is up-to-date with high degree of automatic operation and control.

The Thessaloniki Port Authority (THPA) was transformed into a public limited company in 1999, while in 2001, a concession agreement for a period of 40 years was concluded between the Greek State (represented by the Ministers of Finance and Mercantile Marine) and THPA, under which THPA was granted the exclusive right to use and exploit the lands, buildings and facilities of Thessaloniki Port Land Zone owned by the Greek State. The company’s shares were listed for trading on the Main Market of the Athens Exchange.

The geographical coverage of the port is international, national and regional. The port services 5% of the national maritime passenger transport and 95% of the national maritime freight flows.

The total number of access/egress passengers was 64,735 in 2011. There is a reduction of 35.7 per cent compared to 2010. This reduction is most likely caused by the financial situation of the country. Passengers departing from Thessaloniki for travelling to a regional destination (defined as a zone within a 200 km radius of the port) represent 38.2% of the total passenger flow of the terminal. In addition, 44% of the total flow arrives to Thessaloniki originating from a regional destination. Accurate profiles of modes used by passengers to reach or to leave the terminal have not been investigated yet. However, it is assumed that the majority of passengers using the terminal use car as a transport mode for arriving to and getting out of the port. There is also a bus terminal right outside the port, and new bus lines are about to start.

![Panoramic view of Thessaloniki port](image)

*Figure 4. Panoramic view of Thessaloniki port*
Vilnius Airport

Vilnius international airport is a subsidiary of The Ministry of Transport and Communication. The airport was constructed during Stalin’s time and is considered as a cultural heritage.

Vilnius International Airport is only 7 kilometres away from the city centre. You can drive this distance by car in 15 minutes. Vilnius International Airport is also well accessible by public transport: inter-city bus, scheduled city bus, scheduled city taxi (vans), taxi and train. The airport is also well-connected to the main bus and rail station for inter-city travel by Airport Express service (Vilnius bus station – Airport). A special scheduled train runs from Vilnius Railway Station to the airport. The railway stop, stairs, and passenger lift are installed just outside the airport terminal. For the safety of passengers there is lighting and a video surveillance system. Schedules of the airport train are composed to match inter-city train schedules.

Vilnius International Airport's geographical coverage is Europe. Regular flights are operated mainly to European countries. Charter flights are operated to some touristic African counties: Morocco, Tunisia, Egypt and Israel. The Airport Newsletter (2011 January) announces top 10 most popular flight directions: Riga (11.10 % of passengers), Copenhagen (10.70 %), Frankfurt (7.50 %), Antalya (7.00 %), London (6.00 %), Dublin (5.80 %), Prague (5.00 %), Helsinki (4.60 %), Warsaw (3.90 %), Hurghada (3.70 %) and other (34.70 %).

In 2011 the number of arriving and departing passengers was 1,700 thousand passengers of which 44% travelled on business and 56% fell into the so-called "leisure" segment.

Figure 5 Airport overview. Source: http://www.vilnius-airport.lt/en/airport/airport-plan/
1.7.2 National city terminals and other city or local terminals

**Armentières railway station**

The Armentières railway station is located in Lille Urban Community within Région Nord-Pas-de-Calais. The municipality of Armentières is located 14 km to the North-West of Lille and at 20 km from the Airport of Lille Lesquin. It counts 25,000 inhabitants, with a density of 4,000 inhabitants per km². The Urban Community of Lille counts 1.1 million inhabitants. The municipality is close to the Belgian border.

The Armentières railway station in Lille has gone through a renovation project, which also involved a new location for the bus station, close to the railway station. The renovation is considered by the Regional Council as a good example of cooperation among stakeholders for the planning of exchanges between modes. The local government (Commune of Armentières) co-financed the project, while Lille Métropole communauté urbaine (LMCU) was in charge of the renovation of the whole station area. The station is located next to big motorways, and it serves as an entry station for the Lille urban area. In the station building there is a shop. An interesting aspect is the link to the urban city; the interchange contains multiple storey car parks. The new bus terminal is close and the walking footpaths have been improved.

Armentières is a relatively small station, with only 4,600 passengers per day. This makes walking distances short, and it also makes it easy for the passengers to get an overview of the terminal, consequently reducing information problems. Secondly, Armentières is also an urban terminal located only 800 meters away from the city core. This will e.g. increase the importance of the planning phase and preparation for future development if the terminal ever experiences capacity problems. Thirdly, concerning the urban transport side of the interchange the French principle of “delegation of public service” makes it impossible to separate the transport operator from the platform operator which separates the French case from the other countries.

![General view of the Armentières exchange pole](source PDU 2010)
Oslo bus terminal Vaterland

Oslo bus terminal Vaterland was chosen as a case study terminal in order to balance the set of case studies in terms of modes and scope even though it was not included as a candidate terminal. The Vaterland bus terminal was opened in 1989 and is the main bus station in Oslo. The terminal is located next to the Oslo Central Rail Station, and serves local buses to Akershus county as well as domestic destinations all over Norway, and international coaches to more than 500 towns in Europe. Two Metro Stations and several tram stations are located less than 5 min walk from the bus terminal. The Vaterland bus terminal is owned by Akershus county authority (78.5 %) and The City of Oslo (21.5 %). Management and administration of the terminal is subcontracted to Akershus public transport terminals, which is a public company. The connection to the closely located Oslo central rail station will also be considered in this case study.

The terminal was originally planned for 450 daily departures and accommodate up to 6,000 passengers each day. However, increased demand made it necessary to accommodate twice as much. In 2011, about 1,100 buses departure daily and about 27,000 travellers pass the terminal on an average day. Total number of passengers and buses has consequently increased between 240 and 400 %. This was possible due to e.g. shorter slots for buses and pre-payment of tickets which facilitated shorter slot times. There have also been investments of 100 MNOK to get tangential bus-bays. The capacity is, however, about to be reached, and there is little room for further expansion in daily departures or passengers without new infrastructure.

Figure 7. Overview of the Vaterland bus terminal

For more information, see D5.1 and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.1 Core indicators

2.1.1 Policy

Description

The core indicators for airports and passenger ports reflecting policy goals are:

- Modal split in access/egress
- Greenhouse gas (GHG) emissions

C2 Modal split in access/egress

Percentage of trips, car, rail, bus, taxi, slow modes. This indicator is especially important for airports as commonly it’s only a question of price of the parking – not space, but also for ports where similar conditions may exist. The indicator is mainly used for comparison of modal split at terminal access/egress but it can be used at a more general level having an environmental perspective of the modal share. Use of private cars and taxis i.e. modal split in access/egress (% of trips) should be as low as possible.

The indicator also points to the need for improved public transport connections, information provision, ticket integration etc.

Indicates achievement of EC policy goals directly:
- PG6 Connect airports to the rail network
- PG9 EU is a world leader in safety and security of transport in all modes of transport
- PG10 Move towards full application of ‘user pays’ and ‘polluter pays’ principles

and indirectly:
- PG1 Reduce the use of conventionally fuelled cars

C3 GHG emissions

GHG emissions, grams per passenger km. Intended for use at aggregated level, and can for instance be used for comparison of unimodal versus multimodal itineraries. GHG emissions should be as low as possible. The indicator has been included to serve the need for covering environmental aspects. These aspects include e.g. GHG emissions caused by connection transportation to and from terminals using conventionally fuelled cars, taxes, buses etc. with different combinations. Also possible transportation inside terminals or between terminals should be considered.

Indicates achievement of EC policy goals directly:
- PG6 Connect airports to the rail network
- PG1 Reduce the use of conventionally fuelled cars

Good practices

C2 Modal split in access/egress

- In the city of Thessaloniki a metro station is under construction in the area of the railway station. The goal is that the reconstruction of the existing infrastructure will result in a modern integrated bus-railway-metro station. It will be located closely to the port and will improve the public transport services for the passengers.

Recommendations

C2 Modal split in access/egress

C3 GHG emissions

- Public transport connections should be prioritised: high frequency, fast routes preferably an express train connection from the city centre, and short walking distance between the stop and terminal entrance (see also C16 and C18)

For more information, see D3.1, D3.2, and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.1 Core indicators

2.1.2 Organisational and institutional structure

Description
Core indicators related to organisational and institutional structure are:

- Independence of terminal/interchange management
- Fair and equal access
- Institutional complexity

C4 Independence of terminal/interchange management
Independence of management from transport operators and local actors. This indicator requires description if there are dependencies (formal or informal) between different actors involved in the management of the terminal. Commonly, but not always, independence is desired. Often (but not always), independence is desired.

C5 Fair and equal access
Defines whether all actors/companies have access to the terminal at equal conditions (Yes/no/partial). Indicator value “Yes” is desirable.

C6 Institutional complexity
This is a two-level indicator reflecting number of institutional levels involved in a) planning of the terminal and b) terminal investments i.e. number of decision levels required for investments in or construction of terminal infrastructure. For efficiency purposes and implementation ability, a low number is desired.

In most cases it seems possible to identify the number of decision levels involved, but e.g. for EU funding the complexity of the process might be unclear.

Recommendations
C6 Institutional complexity
- All different levels of decisions whether national or European by origin should be treated as separate levels.
- A low level of complexity is recommended
- Clear hierarchy of decision levels reduces complexity but may still prolong the process.

Challenges
C6 Institutional complexity
- Nowadays institutional complexity in planning and implementation phases is often reality as in addition to national authorities there are numerous local actors involved and thereto complex funding mechanisms including all different EU funding.
- Role and importance of public funding is still very much emphasised, especially in the initial investment phase (build-up of a terminal) and in relation to terminal renovation, modernisation, extension, etc.

Good practices
C6 Institutional complexity
- For Vilnius airport it was questioned how EU institutions should be considered as many infrastructure projects are funded by EU.
- For Prague airport the importance of the indicator was questioned.

Figure 8. Internal organizational structure of the Thessaloniki Port Authority

For more information, see D3.1, D3.2, and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.1 Core indicators

2.1.3 Supply-side performance

Description

Four core indicators covering supply-side performance are defined:

• Employee productivity
• Flows
• Energy productivity

C7 Employee productivity

This indicator relates terminal throughput to the amount of staff i.e. passengers per employee and year. There are problems how to calculate the number of employees. In particular because airports have so many different additional services like shops, restaurants and hotels, it is difficult to define which categories should be included. The Air Transport Research Society (ATRS http://www.atrsworld.org/) uses this indicator for ranking of airports worldwide, and it is therefore assumed that it will be possible to make reasonably fit-for-purpose calculations. The indicator testing for candidate terminals revealed some problems with definition, but this must be defined for the particular studies where the indicators are used. Desirable level is as high as possible.

C9 Flows

This indicator maps the size of the terminal in terms of volume, at passenger airports simply the number of passengers per year. High value might be good if large volumes are desired, but this depends on context. The indicator is based on PAG members’ recommendations.

C10 Energy productivity

Energy use of the terminal related to the production in terms of passengers served, simply energy use per year and per passenger (kWh). The lower the energy use, the better. The indicator has been included to serve the need for covering aspects related to environmental performance.

Indicates achievement of EC policy goals directly:

• PG1 Reduce the use of conventionally fuelled cars

Recommendations

C9 Flows

• Recommended by Policy Advisory Group (PAG)

For more information, see D3.1, D3.2, and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.1 Core indicators

2.1.4 Terminal properties

**Description**
The following eight indicators have been included to represent terminal properties for a national hub:

- Saturation ratio
- Expandability
- Distance from city centre
- Platform access distance
- Airport transfer distance
- Access/egress cost ratio and
- Access/egress time ratio
- Clarity of ways

**C11 Saturation ratio**
This indicator represents how much of the terminal capacity is utilised based on a daily utilisation rate if applicable i.e. ratio between actual daily average volumes and maximum capacity. A too low saturation ratio calls for increased volumes in order to promote effectiveness, while a too high saturation ratio calls for expansion of the terminal or other measures. The indicator was recommended by PAG.

**C12 Expandability**
Potential for expandability of the terminal in percentage increase compared to today’s capacity. The testing for candidate terminals revealed some difficulties with this indicator, but it is nevertheless included because it has been considered important by both PAG members and consortium members. Depending on data access and appropriateness, the calculations can be based on daily or annual capacity. A high expandability potential is considered to be good.

**C13 Distance from city centre**
Distance in kilometres from the city centre to the terminal. The importance of this indicator has been highlighted by PAG members and through testing of candidate terminals. A short distance reduces last mile costs and external effects.

Indicates achievement of EC policy goals indirectly:
- PG1 Reduce the use of conventionally fuelled cars

**C15 Platform access distance**
Average walking distance from entrance to the gates. For terminals with heterogeneous values, the "typical" distance can be used. The distance should be as short as possible.

**C16 Airport transfer distance**
Average walking distance from arrivals hall to main public transport modes, bus, rail and metro. The indicator represents ease of transfer between air and public transport at airports, which is an important determinant of access/egress modal split. The distance should be as short as possible.

Indicates achievement of EC policy goals indirectly:
- PG6 Connect airports to the rail network

**C17 Access/egress cost ratio and**

**C18 Access/egress time ratio**
Ratio between access/egress cost and time by car versus public transport respectively (in %). These indicators are very challenging and need case-specific specification, but are considered important for modal split in access/egress. It is recommended to use actual travel times instead of scheduled ones with data obtained from travel surveys for typical trips. Also parking costs for an average stay in airport parking areas should be included. For both indicators, the value should be as high as possible for the use of presumably environmentally friendly modes. These indicators could be included into “supply side performance” but was chosen to better fit to “terminal properties”.

Indicates achievement of EC policy goals indirectly:
- PG1 Reduce the use of conventionally fuelled cars

**C19 Clarity of ways**
Clarity of ways within the terminal and terminal area. This is an indicator specific for large passenger terminals and reflects the quality and goodness of the design and signage. It should be measured on a scale (for instance 1-5). It has also been emphasised by PAG members.
### Recommendations

- C11 Saturation ratio, C12 Expandability, C13 Distance from city centre and C19 Clarity of ways are highlighted by PAG members

### Challenges

- To minimise the effort and cost of access/egress by public transport modes, distance, time (frequency and adapted timetables) and cost.

For more information, see D3.1, D3.2, and D5.2.

---

**Figure 11.** People in the departure hall of Helsinki Airport (Source: Finavia Oyj)

**Figure 12.** Short and long distance transport interconnections in Vilnius international airport. 1 – bus stop (public transport); 2 – taxi parking lot; 3 – train stop; P – car parking lots
2 National hubs: Airports and passenger or ferry ports

2.1 Core indicators

2.1.5 Level of service

**Description**

Eight indicators for describing the level of service have been included. The large number of indicators reflects the importance and variety of service issues:

- Overall quality
- Ticket integration
- Information integration
- Average interchange time
- Variability of interchange time
- Punctuality
- Non-movement factor
- Interchange injuries

**C21 Overall quality**

Needs to be defined as an overall index in passenger transport with components like personal comfort, information, perceived safety/security, physical effort needed at the terminal and facilities. This is an important indicator, and the main question is how it can be operationalised. Context-dependent studies will be needed for the use of the indicator. For airports overall quality indicators already exist, e.g. the Airport Service Quality index.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

**C22 Ticket integration**

Availability of integrated tickets between long and short-distance modes makes the transfer significantly easier for the end user i.e. the traveller. This is an important interchange indicator. The area is however challenging, with several technological, fiscal and legal dimensions. Indicator values can be Yes/No/partial, but additional explanations should also be given.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

**C23 Information integration**

The indicator reflects whether common information is available for long and short-distance modes. The indicator covers both information available in the internet and at the interchange points. A joint route planner, all inclusive information boards at terminals etc. are good examples of integrated information provision. Typical values can be Yes/No/partial (with additional explanation), “Yes” is the desirable value.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

**C24 Average interchange time**

Average time for transfer between modes (in minutes) is an important factor. The interchange time depends both on distances between transport modes (indicator C15) and frequencies or timetable integration. The interchange time should be as low as possible. Feasible values depend on mode of transport and context. The indicator was emphasised by PAG members.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

**C25 Variability of interchange time**

Standard deviation of transfer time between modes (in minutes) is an important factor. The interchange time should be as low as possible. The indicator reflects the overall picture of the functioning of the terminal.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

**C26 Punctuality**

Percentage of delayed departures within defined tolerance for delay from all departures. The delay may depend on local conditions, arrival times, modes involved, etc. which should be taken into account.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.
consideration. Local adaptations are thus needed, also with respect to what is regarded to be punctual (5-10-15 minutes?) The punctuality indicator should be as high as possible. Different companies have different targets, typically between 90% and 99%/100%.

Indicates achievement of EC policy goals directly:

- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

C27 Non-movement factor
This indicator represents the share of the total origin-destination time that a passenger is not moving. The indicator points at the efficiency of terminal operations. The indicator value should be as low as possible.

C29 Interchange injuries
The indicator captures the number of persons killed or seriously injured in interchange/terminal per year by category (staff, passengers, and other). The value should be as low as possible, with zero as the target value. This indicator was not specifically tested for candidate terminals, but arose in the discussion of the results.

Good practices

**Thessaloniki port**
- Establishment of collaboration schemes with other public and private parties of Thessaloniki and deploy a port-visit strategy in order to introduce the port to the citizens.

**Vilnius airport**
- Public transport operators cooperate to adjust their timetables not only to air traffic schedules but also to timetables of intercity busses and trains leaving from the main station of Vilnius (common station area for busses and trains),
- Passengers are the driving force to improve service. E.g. public transport operators serving the airport as well as the airport operator react positively to complaints of passengers,
- Operators are familiar with transport policy, understand the importance of achieving both national and EU level goals and are willing to adopt new practices.

Recommendations

- If voluntary integration between operators and other stakeholders does not work external influence with clear future vision by authorities should be considered (e.g. in the form of mandatory agreements of integration).
- Clear goals and corresponding legislation is extremely important to encourage operators to collaborate, as separate initiatives are rarely considered seriously enough by other operators.

Challenges

**C21 Overall quality**
- The challenge is to define the indicator for practical use for all terminals. It should capture all important issues for a passenger, such as overall satisfaction, access, passport/ID-control, security, finding the way and airport facilities.

**C22 Ticket integration**
- The area is challenging with several technological, fiscal and legal dimensions. Presently tickets for long and short distance mostly must be bought separately at different locations,
- In an end user i.e. passenger’s point of view full integration is preferable i.e. all actors should be involved in integration.

**C23 Information integration**
- The area is challenging with several technological, fiscal and legal dimensions. Presently in most terminals information on schedules and routes of different modes is provided on separate displays situated in far apart locations or even outside the terminal,
- In an end user’s i.e. passenger’s point of view full integration is preferable i.e. all actors should be involved.
- Integrated information should also encompass real time information on delays, exceptional and emergency situations, which is an additional challenge for the systems.

**C26 Punctuality**
- Punctuality is a very important indicator of the operation and level of service and affects directly the opinion of end users i.e. passengers. Technically it’s a challenge to determine if a delay is due to the operations of this terminal or perhaps late arrival due to late departure and thus referring to previous terminal operations.
2 National hubs: Airports and passenger or ferry ports

2.2 Emerging mobility schemes

2.2.1 Mobility trends

Description
Two main emerging mobility schemes affecting mobility trend have been identified:
• Young adults in cities prefer public transport
• Enhanced bicycle use

EMS1 Young adults in cities prefer public transport
In a growing number of European states cars become less important among young adults who live in cities. More and more members of this group use PT whenever possible. While the car is losing its position as a symbol of status, other state-of-the-art technologies, such as smartphones, for instances, take up this position. Those new trends provide public transportation operators with new possibilities to spread information and by increasing the knowledge about available services, the usage of tram, bus and train will ascend even more. But this trend has to be reflected in terminals, especially in inner city terminals. They have to be adapted to young peoples’ needs as special services, Wi-Fi access etc.

Impacts on the interchange point and access/egress:
• Planning of public transport services for the last mile with respect to young peoples’ needs
• Improving terminals and vehicles to support the young peoples’ interest, e.g. wireless LAN.

EMS3 Enhanced bicycle use
More and more people use bicycles for the last mile. Besides, the number of e-bikes, bicycles with an electric motor, is rising, which allows less athletic people to cycle as well. But terminals have to be prepared for this trend, providing safe bicycle stands and the opportunity to reload batteries.

Impacts on the interchange point and access/egress:
• More bicycle stands at terminals
• Safe bicycle stands
• Possibility to take bicycles into vehicles.

Good practices

Thessaloniki port
• The Thessaloniki Port Authority (ThPA SA) plans to establish cruising along with bicycles for cruiser passengers. The plan constitutes of a private initiative of hiring bikes for passengers of cruise ships during their stay in the city of Thessaloniki. This may not be considered as an indicative kind of multimodal transport, because there is not any explicit transport leg (origin – destination), though it could be treated as combined transport that supports urban mobility.

Vilnius airport
• Passengers are the driving force to improve services; their opinion is asked and taken into account.

Recommendations
• To carry out customer satisfaction surveys regularly to find out the needs of different user groups.

Challenges
• The relevance of these emerging mobility schemes regarding airports and ports has been assessed low but efficient public transport connections are essential for all terminals. In addition, for some passenger ports promoting bicycle use is recommended.

Figure 13. City bikes for rent in Seville, Spain
Connecting Long and Short-distance networks for Efficient Transport

D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

For more information, see D2.2 and D5.2.

Figure 14. Thessaloniki passenger terminal

Figure 15. Urban public transport network (blue) and bikeway network (pink) around the Thessaloniki passenger terminal
2 National hubs: Airports and passenger or ferry ports

2.2 Emerging mobility schemes

2.2.2 Improved public transport services

Description

The following main emerging mobility schemes affecting public transport have been identified:

- Flexibilisation of services
- Simplifying the payment
- Real time information
- Personal Navigation
- Cooperation of transport operators
- Individual Access and Egress

EMS4 Flexibilisation of services

Neighbourhood busses and busses on demand are part of the customary services in many regions. Besides, for people with special needs and seniors, more can be done. Information, which is specifically prepared in order to meet the clients’ demands, can be provided. Mobility guides, people who can be called when help is needed for someone with problems to manage a trip, are even more helpful.

Impacts on the interchange point and access/egress:

- Design and implementation of flexible services.
- Recruitment of staff as guides at terminals, especially for people with special needs.

Figure 16. Friendly customer service at Helsinki Airport (Source: Finavia Oyj)

EMS5 Simplifying the payment

Especially at the interface between short and long distance transportation there are some current efforts, testing new or enhanced concepts. A lot of effort is put on the simplification of the process of buying a ticket.

Impacts on the interchange point and access/egress:

- Equipment for electronic payment services at terminals.
- Equipment for electronic registration in terminals.
- Ticket control mechanisms for eTickets.

EMS6 Real time information

During the past and also in current projects a lot of endeavour has been made to enhance the information of passengers. Scheduling information and real time information about departures is available combining information from different transport operators and for different modes and different devices.

Impacts on the interchange point and access/egress:

- Scheduling and rescheduling of routes on base of real time data encompassing disturbances.

EMS7 Personal navigation

The next step behind routing and real time data for public transport is a navigation system on mobile phones as it is well known for individual car travelling. But this scheme is more related to personal devices than to terminals.

Impacts on the interchange point and access/egress:

- Availability of localisation information in terminals
- Information about personal navigation systems in terminal (especially those used by many foreigners).
D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

**Figure 17. Navigation by mobile phone**

**EMS8 Cooperation of transport operators**

Cooperation between transport operators is an important trend in public transport. While there was a situation based on rivalry in the past, transport operators learn to work together on a regional base, supported by transport associations especially founded for that reason. There is also an increase of bilateral cooperation, for example the inclusion of on-demand services (usually special taxi services) where regular public transport services are inefficient, or air & rail services.

Impacts on the interchange point and access/egress:
- Shared terminals
- Coordination of schedules.

Core indicators reflecting the impacts:
- C1 Multimodality rate
- C2 Modal split in access/egress
- C22 Ticket integration
- C23 Information integration.

**EMS9 Individual access and egress**

For customers preferring to manage the last mile on their own, a lot of concepts dealing with bikes or car sharing are coming up. While bikes are more important at inner city terminals, car sharing is an important topic at all types of passenger terminals.

Impacts on the interchange point and access/egress:
- Sufficient, safe and affordable parking areas/stands for private vehicles
- Appropriate equipment and facilities in the terminal area
- Release of barriers for private access/egress (promote car sharing and carpooling, etc.)

**Good practices**

**EMS6 Real time information**

- In the port of Thessaloniki information to passengers is provided through the programme TRANSLOGNET and the use of electronic Variable Message Signs. There is also a special electronic gate for information on passenger services that is available through the website of the port.

**EMS8 Cooperation of transport operators**

- Air&rail provided by Air France and SNCF. The TGV station in Paris (Charles de Gaulle airport) allows connecting a flight to Paris with a fast train trip to other cities in France. Combined tickets are sold.
- At some train stations with airport express trains it is already possible to check in for a flight, drop and collect your luggage. In Switzerland, you can check in your luggage for flights from Zurich, Geneva, and Bern Airport already from 30-50 railway stations.

**Challenges**

- The relevance of “real time information” regarding airports and ports has been assessed high and of the others moderate or low (except of “personal navigation”) which puts a pressure on the terminals to accommodate to the requirements of these EMS.

For more information, see D2.2 and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.2 Emerging mobility schemes

2.2.3 New technology

Description

Regarding new technology two main emerging mobility schemes have been identified:

- Electromobility
- Driverless transportation

EMS10 Electromobility

Personal electric cars are more and more available and because of their current cruising radius, they are especially interesting for the last mile. The inner city terminals should be prepared to provide possibilities to charge or replace the batteries. Besides, vehicles that are powered solely by electricity are only one part of electro mobility. Hybrid drives and the usage of range extenders are very common alternatives, leading to similar requirements at airports or stations outside of cities. The public transport industry itself introduces more and more electric or hybrid drives in buses, requiring fast recharging during the boarding time.

Impacts on the interchange point and access/egress:

- Possibility to charge batteries in the parking area for cars and at stops or waiting areas for buses.

EMS11 Driverless transportation

Driverless vehicles are available in special areas already and may become a comfortable way to ensure high frequency in public transport, but can also be used in on-demand travel service for the last mile even in regions with a minor demand. But, at the moment driverless systems still require separate driveways of their own to operate safely. Terminals providing such services must meet special precautions to protect passengers.

Impacts on the interchange point and access/egress:

- Driverless vehicles and appropriate (and safe) lanes
- Multilingual, understandable visual guidance for the usage.

Challenges

- The relevance of “driverless transportation” regarding airports and ports has been assessed moderate and of “electromobility” low which puts a pressure on the terminals to accommodate to the requirements of these EMS.

Figure 18: London Heathrow Personal Rapid Transit Cabin (Prototype)

Figure 19. AutoTram

For more information, see D2.2 and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.2 Emerging mobility schemes

2.2.4 Air and maritime transport

Description
Three main emerging mobility schemes affecting special air and maritime transport have been identified:
- Low cost carrier flights
- Individualisation of flights
- Low cost cruise ships

EMS12 Low cost carrier flights
Passenger transportation by air is growing very fast especially in the sector of low cost carriers, often using secondary airports. This trend only concerns a very special type of terminal, while it has much impact on the network planning.

Impacts on the interchange point and access/egress:
- Upgrade public transport services to airports used by LCC - rail and fly for LCC
- Cooperation between all airlines in terminals.

EMS13 Individualisation of flights
Other new schemes in the air transportation are related to an individualisation of flights, for example on-demand air taxi services. But since this trend is limited to a small group of passengers, the impact on terminals is negligible.

Impacts on the interchange point and access/egress:
- Upgrade public transport services to airports used by individual flights
- Special car park areas at airports for individual flights.

EMS14 Low cost cruise ships
A relatively new trend in maritime transport is Low-Cost Cruise Ships. The group of the cruise ships vacationer has changed and nowadays young people like to make boat trips. This may lead to more passenger traffic in ports and the necessity to increase the PT network or parking areas, but has not really much impact on the terminal design or services.

Impacts on the interchange point and access/egress:
- Upgrade public transport services to ports used by Low-Cost Cruise Ships.
- Special parking areas at ports for the use of customers of Low-Cost Cruise Ships.

Challenges
- The relevance of these emerging mobility schemes regarding airports and ports has been assessed low which puts a low pressure on the terminals to accommodate the requirements of these EMS.

Figure 20. Tram connecting Athens and Piraeus, Greece.

For more information, see D2.2 and D5.2.
2 National hubs: Airports and passenger or ferry ports

2.2 Emerging mobility schemes

2.2.5 Avoiding traffic, especially during rush hours

Description
There are two main mobility schemes that still affect the daily commuting trips and also business trips:
- Home office
- Video conferences

EMS15 Home office
Working in a home office gets more and more usual. Especially employees who want to reconcile family and career often spend parts of their working time in home offices. For terminals this might lead to fewer passengers. But the relevance is rather low.
Impacts on the interchange point and access/egress:
- Few impact on terminals and last mile
- Broadband internet must be available

EMS16 Video conferences
The videoconferencing market has shown a remarkable growth during the past 15-20 years. Videoconferencing has replaced, and will continue to replace, some business travel, but has not much relevance for the interconnection terminals.
Impacts on the interchange point and access/egress:
- Few impact on terminals and last mile
- Broadband internet must be available

Challenges
- The “new” still growing working trends are important in reducing travel especially during rush hours in cities but the effect at terminals is minor. In addition, the globalisation of work may cause new travel which cancels out the reduction especially regarding air travel.

For more information, see D2.2 and D5.2.
3 National city terminals, other city or local terminals

3.1 Core indicators

3.1.1 Policy

Description
Three core indicators reflecting policy goals have been defined:

- Percentage of multimodal versus unimodal itineraries
- Modal split in access/egress
- Greenhouse gas (GHG) emissions.

C1 Multimodality rate
Percentage of intermodal versus unimodal chains in door-to-door trips at passenger transport terminals. Represents the degree of multimodality at an aggregated level, typically for a region, and facilitates comparison of different regions, which again may point at need for policy actions. Regarding environmental goals the indicator value should be as high as possible. For consideration of the competitiveness of intermodal solutions, a low indicator value may reveal that intermodal transfers are not sufficiently competitive.

In some passenger transport contexts, the indicator could be divided into sub-indicators by distance bands using categories:

- Slow modes door-to-door
- Car door–to-door
- Intermodal door–to-door trips including at least one means of public transport.

The final use of the indicator could then be between the motorised modes i.e. including only trips with at least one stage (leg) by motorised transport, car or public transport.

C2 Modal split in access/egress
Percentage of trips by car, rail, bus, taxi and slow modes. This indicator was reported to be important for airports, but it can also be extended to other passenger transport contexts. The indicator is mainly used for comparison of modal split at terminal access/egress but it can be used at a more general level having an environmental perspective of the modal share. Use of private cars and taxis i.e. modal split in access/egress (% of trips) should be as low as possible.

C3 GHG emissions
GHG emissions, grams per passenger km, is intended for use at aggregated level, e.g. for all trips originated in the service area of the terminal and can for instance be used for comparison of unimodal versus multimodal itineraries. GHG emissions should be as low as possible. The indicator has been included to serve the need for covering environmental aspects. These aspects include e.g. GHG emissions caused by connection transportation to and from terminals using conventionally fuelled cars, taxes, buses etc. with different combinations. Also possible transportation inside terminals or between terminals should be considered.

Indicates achievement of EC policy goals directly:
- PG6 Connect airports to the rail network
- PG9 EU is a world leader in safety and security of transport in all modes of transport

and indirectly:
- PG1 Reduce the use of conventionally fuelled cars.

The indicator also points to the need for improved public transport connections, information provision, ticket integration etc.

Indicates achievement of EC policy goals directly:
- PG10 Move towards full application of ‘user pays’ and ‘polluter pays’ principles

and indirectly:
- PG1 Reduce the use of conventionally fuelled cars.
Good practices

Armentières railway station
- In terms of planning, there is a positive dynamic of the two main stakeholders, the region and the metropolis, creating a synergy around this interface.
- Armentières terminal is well adapted for bicycle usage in access/egress.

Oslo bus terminal Vaterland
- Vaterland bus terminal is located in the centre of Oslo with short transfer to rail, metro, tram, bus and taxi. This is an important structural factor facilitating easy transfers between short and long transport. Location was also highlighted as the most favourable factor by passengers travelling to the terminal.
- Vaterland has a low car share in access/egress, and it is likely that it is linked to high charges for parking and good connection to public transport modes.

Recommendations

C2 Modal split in access/egress
- For environmental purposes, and to save space, the car share for travels to the terminal should be as low as possible.

Challenges
- The development of public transport interchange points with easy car access and parking can lead to undesirable urban sprawl with low density. Use of private cars in access/egress should be monitored and actions taken to avoid undesirable development.

For more information, see D3.1, D3.2, and D5.2.
3 National city terminals, other city or local terminals

3.1 Core indicators

3.1.2 Organisational and institutional structure

**Description**
Core indicators related to organisational and institutional structure are:

- Independence of terminal/interchange management
- Fair and equal access
- Institutional complexity.

**C4 Independence of terminal/interchange management**
Independence of terminal/interchange management from transport operators and local actors. This indicator requires description if there are dependencies (formal or informal) between different actors involved in the management or operation of the terminal. Commonly, but not always, independence is desired.

**C5 Fair and equal access**
Defines whether all actors/companies have access to an interchange/terminal at equal conditions (Yes/no/partial). Indicator value “Yes” is desirable.

**C6 Institutional complexity**
This is a two-level indicator reflecting number of institutional levels involved in a) planning of the terminal and b) terminal investments i.e. number of decision levels required for investments in or construction of terminal infrastructure and in other words number of institutional levels involved in the multimodal supply. For efficiency purposes and implementation ability, a low number is desired.

In most cases it seems possible to identify the number of decision levels involved, but e.g. for EU funding the complexity of the process might be unclear.

---

**Good practices**

**Armentières railway station**
- The two main stakeholders, the region and the metropolis, have a positive dynamic cooperation in planning of this interface creating synergy
- For Armentières railway station there was a question on the difference between decision levels and institutional levels that were used in indicator C6 Institutional complexity.

**Oslo bus terminal Vaterland**
- Vaterland is a public company, and ownership of the terminal is separated from operation. This can be important to establish trust among actors and secure a fair and equal access to the terminal for operators. Vaterland bus terminal emphasise their good relationship with authorities. Moreover, their recommendations have up till now always been taken into account.

---

**Recommendations**

**C4 Independence of management**
- Constitute transport infrastructure management body for all modes (PAG).
- Separate the owner from the operator (PAG).

**C6 Institutional complexity**
- All different levels of decisions whether national or European by origin should be treated as separate levels.
- A low level of complexity is recommended
- Clear hierarchy of decision levels reduces complexity but may still prolong the process.
Challenges

C6 Institutional complexity

- Nowadays institutional complexity in planning and implementation phases is often reality as there are numerous local actors involved and thereto complex funding mechanisms including all different EU funding.
- Role and importance of public funding is still very much emphasised, especially in the initial investment phase (build-up of a terminal) and when facing transitions (terminal renovation, modernisation, extension, etc.).
- The meaning and terminology of these indicators should be harmonised. A common framework that is not country or case specific should be developed for both the large number of different actors involved in the management or operation of a terminal or interchange and for the institutional levels.

Figure 24. Share of partner financial contribution in the Armentières project

For more information, see D3.1, D3.2, and D5.2.
3 National city terminals, other city or local terminals

3.1 Core indicators

3.1.3 Supply-side performance

Description

Three core indicators covering supply-side performance are defined:

- Employee productivity
- Flows
- Energy productivity.

C7 Employee productivity

This indicator relates terminal throughput to the amount of staff i.e. passengers per employee and year. The indicator testing for candidate terminals revealed some problems with the definition, how to calculate the number of employees, but this must be defined for the particular context where the indicator is used. Desirable level is as high as possible.

C9 Flows

This indicator maps the size of the terminal in terms of volume i.e. number of passengers using the terminal. High value might be good if large volumes are desired, but this depends on context. The indicator has been based on PAG members’ recommendations.

C10 Energy productivity

Energy use of the terminal related to the production in terms of passengers served, simply energy use per year and per passenger (kWh). The lower the energy use, the better. The indicator has been included to serve the need for covering aspects related to environmental performance.

Indicates achievement of EC policy goals directly:

- PG1 Reduce the use of conventionally fuelled cars

Recommendations

C9 Flows

- For comparison, there should be indicators that directly refer to the size of the interchange.
  Recommended by Policy Advisory Group (PAG)

Challenges

C7 Employee productivity

- How to calculate the number of employees, only permanent? Which activities and services should be included?

Figure 25. Passenger flow at Helsinki railway station

For more information, see D3.1, D3.2, and D5.2.
3 National city terminals, other city or local terminals

3.1 Core indicators

3.1.4 Terminal properties

**Description**
The following five indicators have been included to represent terminal properties:

- Saturation ratio
- Expandability
- Distance from city centre
- Platform access distance
- Clarity of ways.

**C11 Saturation ratio**
This indicator represents how much of the terminal/interchange capacity is utilised based on a daily utilisation rate if applicable i.e. ratio between actual daily average volumes and maximum capacity. A too low saturation ratio calls for increased volumes in order to promote effectiveness, while a too high saturation ratio calls for expansions of terminals or other measures. The indicator was recommended by PAG.

**C12 Expandability**
Potential for expandability of the terminal in percentage increase compared to today’s capacity. The testing for candidate terminals revealed some difficulties with this indicator, but it is nevertheless included because it has been considered important by PAG members and consortium members. Depending on data access and appropriateness, the calculations can be based on daily or annual capacity. A high expandability potential is considered to be good.

**C13 Distance from city centre**
Distance in kilometres from the city centre to the terminal. The importance of this indicator has been highlighted by PAG members and through testing of candidate terminals. A short distance reduces last mile costs and external effects.

Indicates achievement of EC policy goals indirectly:
- PG1 Reduce the use of conventionally fuelled cars

**C15 Platform access distance**
Average walking distance from entrance to platform/gate. Good links between transport modes (short walking distances) is an important factor. For terminals with heterogeneous values, the “typical” distance can be used. The distance should be as short as possible.

**Figure 26. The bridge connecting the train and bus terminals in Oslo**

**C19 Clarity of ways**
Clarity of ways within the terminal and terminal area. This is an indicator relevant for all passenger terminals and reflects the quality and goodness of the design and signage. The importance of the indicator increases with the size of the terminal. It should be measured on a scale (for instance 1-5). It has also been emphasised by PAG members.

**Recommendations**
- The PAG members have highlighted the following indicators: C11 Saturation ratio, C12 Expandability and C13 Distance from city centre and C19 Clarity of ways.

For more information, see D3.1, D3.2, and D5.2.
3 National city terminals, other city or local terminals

3.1 Core indicators

3.1.5 Level of service

Description
Eleven indicators for describing the level of service have been included. The large number of indicators reflects the importance and variety of service issues:

- Overall quality
- Ticket integration
- Information integration
- Average interchange time
- Variability of interchange time
- Punctuality
- Non-movement factor
- Interchange injuries.

C21 Overall quality
Needs to be defined as an overall index in passenger transport with components like personal comfort, information, perceived safety/security, physical effort needed at the terminal and facilities. This is an important indicator, and the main question is how it can be operationalised. Context-dependent studies will be needed for the use of the indicator.

C22 Ticket integration
Availability of integrated tickets between long and short-distance modes makes the transfer significantly easier for the end user i.e. the traveller. This is an important interchange indicator. The area is however challenging, with several technological, fiscal and legal dimensions. Indicator values can be Yes/No/partial, but additional explanations should also be given.

C23 Information integration
The indicator reflects whether common information is available for long and short-distance modes. The indicator covers both information available in the internet and at the interchange points. A joint route planner, all inclusive information boards at terminals etc. are good examples of integrated information provision. Typical values can be Yes/No/partial (with additional explanation), “Yes” is the desirable value.

Figure 27 A dynamic real-time information of buses coupled with high quality signaling on the parvis at Armentières exchange pole (photo L'Hostis-Belibi)

C24 Average interchange time
Average time for transfer between modes (in minutes) is an important factor. The interchange time depends both on distances between transport modes (indicator C15) and frequencies or timetable integration. The interchange time should be as low as possible. Feasible values depend on mode of transport and context. The indicator was emphasised by PAG members.

Indicates achievement of EC policy goals directly:
- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

C25 Variability of interchange time
Standard deviation of transfer time between modes (in minutes). The indicator is directly related to the previous one and indicates the reliability and trustworthiness or the change. The variability
should be as low as possible. The indicator reflects the overall picture of the functioning of the terminal.

Indicates achievement of EC policy goals directly:
- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

Figure 28. Distances between terminals in Oslo

C26 Punctuality
This is the percentage of delayed arrivals and departures within defined tolerance for delay from all vehicle movements. The delay may depend on local conditions, modes involved, etc. which should be taken into consideration. Local adaptations will thus need to be done, also with respect to what is regarded to be punctual (5-10-15 minutes?). The punctuality indicator should be as high as possible. Different companies have different targets, typically between 90% and 99%/100 %.

Indicates achievement of EC policy goals directly:
- PG5 A fully functional and EU-wide multimodal TEN-T ‘core network’ by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.

C27 Non-movement factor
This indicator represents the share of the origin-destination time that a passenger is not moving. The indicator points at the efficiency of terminal/interchange operations in a region, and the indicator value should be as low as possible.

C29 Interchange injuries
The indicator captures the number of persons killed or seriously injured in interchange/terminal per year by category (staff, passengers, and other). The

value should be as low as possible, with zero as the target value. This indicator was not specifically tested for candidate terminals, but arose in the discussion of the results.

Good practices
Armentières railway station
- An e-ticket system which is planned to function in a few months has been implemented at Armentières

Oslo Bus Terminal Vaterland
- Authorities and other actors are working to establish a system for integrating pricing of the public transport system. This is regarded to be important for offering a better service for passengers by the national authorities.
- In Oslo and Akershus there have been several improvements for public transport. In 2011, a common fare system for travels within Oslo and Akershus was established. In addition, the zone system for ticketing was reduced from 88 zones to 12. It is also possible to buy tickets electronically and by mobile phones.
- At Vaterland there are only a couple of minutes of transfer for any transport mode as all terminals are close to each other (Figure 28)

Recommendations
- For fare integration a revenue sharing system must be negotiated if there are several operators involved.
- For the best service to the customers it is recommended to handle delays in cooperation i.e. make an agreement on adaptation to delays by another operator whenever possible (e.g. postpone bus departure in case of train delay).
Challenges

C21 Overall quality
- The challenge is to define the indicator for practical use for all terminals.

C22 Ticket integration
- The area is challenging with several technological, fiscal and legal dimensions. Presently tickets for long and short distance mostly must be bought separately at different locations.
- Ticket system integration usually means that the passengers pay less for the same journey, and the operators’ revenues may suffer. A challenge is to balance the trade-off between lower total revenue per user and a positive effect in the number of users due to improved service.
- In an end user i.e. passenger’s point of view full integration is preferable i.e. all actors should be involved in integration.

C23 Information integration
- The area is challenging with several technological, fiscal and legal dimensions. Presently in most terminals information on schedules and routes of different modes is provided on separate displays situated in far apart locations or even outside the terminal.
- In an end user’s i.e. passenger’s point of view full integration is preferable i.e. all actors should be involved.
- Integrated information should also encompass real time information on delays, exceptional and emergency situations, which is an additional challenge for the systems.

C26 Punctuality
- Punctuality is a very important indicator of the operation and level of service and affects directly the opinion of end users i.e. passengers. Technically it’s a challenge to determine if a delay is due to the operations of this terminal or perhaps late arrival due to late departure and thus referring to previous terminal operations etc.

Figure 29. Quality in the ground materials and signalling in the Armentières interchange (photo L’Hostis-Belibi)

Figure 30. Passenger hall with information board at Kamppi bus station in Helsinki (Source: Kamppi 2012)

For more information, see D3.1, D3.2, and D5.2.
3 National city terminals, other city or local terminals

3.2 Emerging mobility schemes

3.2.1 Mobility trends

Description
Three main emerging mobility schemes affecting mobility trend have been identified
- Young adults in cities prefer public transport
- Parents take children by car
- Enhanced bicycle use.

EMS1 Young adults in cities prefer PT
In a growing number of European states cars become less important among young adults who live in cities. More and more members of this group use PT whenever possible. While the car is losing its position as a symbol of status, other state-of-the-art technologies, such as smartphones, for instances, take up this position. Those new trends provide public transportation operators with new possibilities to spread information and by increasing the knowledge about available services, the usage of tram, bus and train will ascend even more. But this trend has to be reflected in terminals, especially in inner city terminals. They have to be adapted to young peoples' needs as special services, Wi-Fi access etc.

Impacts on the interchange point and access/egress:
- Planning PT for the last mile with respect to young peoples' needs (e.g. neighbourhoods)
- Improving terminals and vehicles to support the young peoples’ interest, e.g. wireless LAN.

EMS2 Parents take children by car
More and more parents take their children to and from school, and even to and from leisure time activities, by car. There are multiple reasons discernible for this behaviour. One is for example the parents’ feeling of security. Measures as more light and more staff in interchange terminals, video control, and safe sidewalks can help to reassure the parents. Another reason is the additional time needed when sending the children by PT. This can be reduced by high frequency and appropriate interconnections as well as a smart planning.

Impacts on the interchange point and access/egress:
- More bicycle stands at terminals
- Safe bicycle stands
- Possibility to take bicycles into vehicles.

EMS3 Enhanced bicycle use
More and more people use bicycles for the last mile. Besides, the number of e-bikes, bicycles with an electric motor, is rising, which allows less athletic people to cycle as well. But terminals have to be prepared for this trend, providing safe bicycle stands and the opportunity to reload batteries.

Impacts on the interchange point and access/egress:
- More bicycle stands
- Safe bicycle stands
- Possibility to take bicycles into vehicles.

Figure 31. Bicycle rail on the side of the stairs to the platform in Armentières (photo L’Hostis-Belibi)
Good practices

Armentières railway station

- Armentières is a true multimodal interface with the co-presence of rail, buses, bicycles and private cars; the surroundings are designed and implemented with coherent approach.
- The exchange pole is equipped with a parking area for bikes. One open parking of 50 slots and one closed with about 30 slots with human security.
- Trains can accommodate bicycles. The stairs for access to the platform are equipped with devices for bikes on the side of the stairs.

Recommendations

- Take account of the needs of children and young people in planning the network, interconnections and terminals as well as in frequency.
- Take account of security and safety both in terminals, vehicles and parking facilities, and in access/egress.

Challenges

- The relevance of these emerging mobility schemes has been assessed high especially for other city or local terminals and “enhanced bicycle use” high also for national city terminals. This puts a high pressure on the terminals and interchange points to accommodate the requirements of these EMS.

Figure 32. Cycles are welcome on the S-trains and thousands of bicycles are transported from the one end of the city to the other. There are over 140,000 cyclist and bikers in Copenhagen (Source: Copenhagen central station)

Figure 33. More than 3500 cycles are parked alongside the Copenhagen Central Station area every day (Source: Copenhagen central station)

For more information, see D2.2 and D5.2.
3 National city terminals, other city or local terminals

3.2 Emerging mobility schemes

3.2.2 Improved public transport services

**Description**
The following main emerging mobility schemes affecting public transport have been identified:
- Flexibilisation of services
- Simplifying the payment
- Real time information
- Personal navigation
- Cooperation of transport operators
- Individual access and egress.

**EMS4 Flexibilisation of services**
Neighbourhood busses and busses on demand are part of the customary services in many regions. Besides, for people with special needs and seniors, more can be done. Information, which is specifically prepared in order to meet the clients’ demands, can be provided. Mobility guides, people who can be called when help is needed for someone with problems to manage a trip, are even more helpful.

Impacts on the interchange point and access/egress:
- Design and implementation of flexible services.
- Recruitment of staff as guides at terminals, especially for people of special needs.

**EMS5 Simplifying the payment**
Especially at the interface between short and long distance transportation there are some current efforts, testing new or enhanced concepts. A lot of effort is put on the simplification of the process of buying a ticket.

Impacts on the interchange point and access/egress:
- Equipment for electronic payment services at terminals.
- Equipment for electronic registration in terminals.
- Ticket control mechanisms for eTickets.

**EMS6 Real time information**
During the past and also in current projects a lot of endeavour has been made to enhance the information of passengers. Scheduling information and real time information about departures is available combining information from different transport operators and for different modes and different devices.

Impacts on the interchange point and access/egress:
- Scheduling and rescheduling of routes on base of real time data encompassing disturbances.

**Figure 34. Real time information in Dresden**

**EMS7 Personal Navigation**
The next step behind routing and real time data for public transportation is a navigation system on mobile phones as it is well known for individual car travelling. But this scheme is more related to personal devices than to terminals.

Impacts on the interchange point and access/egress:
- Availability of localisation information in terminals.
- Information about personal navigation systems in terminal (especially those used by many foreigners).

**EMS8 Cooperation of transport operators**
Cooperation between transport operators is an important trend in public transport. While there was a situation based on rivalry in the past, transport operators learn to work together on a regional base, supported by transport associations especially founded for that reason. There is also an increase of bilateral cooperation, for example the inclusion of on-demand services (usually special taxi services) where regular public transport services are inefficient, or air & rail services.
Connecting Long and Short-distance networks for Efficient Transport

D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

Impacts on the interchange point and access/egress:
- Shared terminals
- Coordination of schedules, especially important when the frequency of local public transport services (i.e., services for last mile) is low.

Core indicators reflecting the impacts:
- C1 Multimodality rate
- C2 Modal split in access/egress
- C22 Ticket integration
- C23 Information integration.

EMS9 Individual Access and Egress
For customers preferring to manage the last mile on their own, a lot of concepts dealing with bikes or car sharing are coming up. While bikes are more important at inner city terminals, car sharing is an important topic at all types of passenger terminals.

Impacts on the interchange point and access/egress:
- Sufficient, safe and affordable parking areas/stands for private vehicles
- Appropriate equipment and facilities in the terminal area
- Release of barriers for private access/egress (bicycle lanes and parking facilities; promote car sharing and carpooling, etc.).

Good practices

Armentières railway station
- The railway station is equipped with computer service for tickets, but only rail tickets are included, bus tickets are separate.
- All transport authorities involved in the project have encouraged cooperation and coordination of timetables. Thus it was made a success to the interchange to adapt schedules through negotiations with the transport operators.
- The Armentières bus station is operated by one single transport operator and is served by several transport operators. The timetables of the buses are adapted to fit with train schedules.

Oslo Bus Terminal Vaterland
- In Norway there are national projects aiming at developing a national system for travel information, travel planners and eTicketing (also including mobile phones). It is for instance possible to buy train tickets by mobile phones.

The system is operated by NSB (the state-owned monopolist rail passenger company in Norway), and it has just included local public transport trips within Oslo and Akershus. Ruter (a company responsible for planning of public transport) is also developing an application of their own for mobile ticketing. Unfortunately, presently all information is only available in Norwegian but English is planned to be added.
- Real time information boards in terminals and scheduling of routes on base of real time data is limited to the busses trafficking in the terminal. This excludes the local buses, trams and subways covering the Oslo area; real time information on these routes is available either via the internet or via the Ruter application for mobile phones.
- Cooperation of transport operators relate to shared terminals and coordination of schedules.
- Tram, metro and local buses have such a high frequency that it is not that necessary to coordinate schedules with regional travel modes.

Recommendations
- The PAG members have highlighted the following indicators which affect to the EMS: C11 Saturation ratio, C12 Expandability and C13 Distance from city centre and C19 Clarity of ways

Challenges
- The relevance of these emerging mobility schemes has been assessed as high for all city or local terminals (except of “personal navigation”). This puts a high pressure on the terminals and interchange points to accommodate to the requirements of these EMS, especially to introduce
  - full integration of tickets systems, ticket buying systems and equipment
  - full integration of all information using real-time data; and its output in a user friendly manner.

For more information, see D2.2 and D5.2.
3 National city terminals, other city or local terminals

3.2 Emerging mobility schemes

3.2.3 New technology

**Description**

Regarding new technology two main emerging mobility schemes have been identified:

- Electromobility
- Driverless transportation.

**EMS10 Electromobility**

Personal electric cars are more and more available and because of their current cruising radius, they are especially interesting for the last mile. The inner city terminals should be prepared to provide possibilities to charge the batteries. Besides, vehicles that are powered solely by electricity are only one part of electro mobility. Hybrid drives and the usage of range extenders are very common alternatives, leading to similar requirements at airports or stations outside of cities.

The public transport industry itself introduces more and more electric or hybrid drives in busses, requiring fast recharging during the boarding time.

Impacts on the interchange point and access/egress:

- Possibility to charge batteries in the parking area for cars and at stops or waiting areas for buses.

**EMS11 Driverless transportation**

Driverless vehicles are available in special areas already and may become a comfortable way to ensure high frequency in public transport, but can also be used in on-demand travel service for the last mile even in regions with a minor demand. But, at the moment driverless systems still require separate driveways of their own to operate safely. Terminals providing such services must meet special precautions to protect passengers.

Impacts on the interchange point and access/egress:

- Driverless vehicles and appropriate (and safe) lanes
- Multilingual, understandable signature describing the usage.

For more information, see D2.2 and D5.2.

**Recommendations**

- To provide infrastructure for charging or replacing batteries in the parking areas for cars and at stops or waiting areas for buses.

**Challenges**

- The relevance of these emerging mobility schemes has been assessed high or moderate for all city or local terminals, which puts a high pressure on the terminals and interchange points to accommodate to the requirements of these EMS.

![Figure 35. Hybrid bus](image)

![Figure 36. Electric motorbike](image)
3 National city terminals, other city or local terminals

3.2 Emerging mobility schemes

3.2.4 Avoiding traffic, especially during rush hours

Description
There are two main mobility schemes that still affect the daily commuting trips and also business trips
- Home office
- Video conferences.

EMS15 Home office
Working in a home office gets more and more usual. Especially employees who want to reconcile family and career often spend parts of their working time in home offices. For terminals this might lead to fewer passengers. But the relevance is rather low.

Impact on the interchange point and access/egress:
- Few impact on terminals and last mile
- Broadband internet must be available.

EMS16 Video conferences
The videoconferencing market has shown a remarkable growth during the past 15-20 years. Videoconferencing has replaced, and will continue to replace, some business travel, but has not much relevance for the interconnection terminals.

Impact on the interchange point and access/egress:
- Few impact on terminals and last mile
- Broadband internet must be available.

Challenges
- The “new” still growing working trends are important in reducing travel especially during rush hours in cities but the effect at terminals is minor. In addition, the globalisation of work may cause new travel which cancels out the reduction especially regarding air travel.

For more information, see D2.2 and D5.2.
4 Specific issues of terminal properties and performance

4.1 Environment and ecology

Description
Transport terminals have various environmental and ecological impacts. These include direct impacts of the functioning of the terminal and indirect impacts taking place in the transport system affecting various dimensions in the society.

Regarding the wider scope of environmental impacts the whole transport system has to be assessed where the land use and terminal location as well access/egress possibilities plays an important role in the competition between car and public transport in long and medium long distance transport. In other words the accessibility of an terminal is a key issue as the traveller makes his/her mode choice decision based on the door-to-door trip.

Direct (negative) environmental impacts of a terminal are the same as those associated with sectors such as transport, construction and buildings. Sector specific impact assessment methods and reduction measures can be applied to the context of terminals and even schemes focussing on transport terminals have been established. These go beyond the scope of this guidebook, except for the topics affecting passenger terminals such as adapting to the requirements of new technologies in passenger transport.

In addition to energy use and emissions there are several other environmental aspects that need to be considered:

- Noise plays an important role especially regarding airports but also railway stations with heavy traffic.
- Heavy traffic caused by the terminal can be annoying for the neighbourhoods affecting road safety and causing noise (e.g. a ferry terminal taking in a large number of cars).

The distance from the city center is a very ambiguous indicator looking at the environmental point of view as sometimes the location in the city or close to it is preferable but sometimes not as argued above. However, in all cases the most important issue is to provide such public transport connections for access/egress that are competitive to car, i.e. fast (time distance), transfer distance, easy to travel with luggage, cheaper than car use (integrated ticketing) and well informed in real time (integrated information).

Challenges
- Identification of methodologies for quantifying carbon emissions from the operation of an interchange.
- Identification of methodologies for total environmental assessment regarding the operation of an interchange.

![Figure 38. Schiphol tower and a departing airplane (Source: airliners.nl)](image-url)
Connecting LOng and Short-distance networks for Efficient tRansport

D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

4 Specific issues of terminal properties and performance

4.2 Equity of special traveller groups

Description
The equity among all traveller groups should be considered in the planning phase of the interchanges and implemented accordingly. All the relevant end user quality aspects (safety, security, feeling of safety, accessibility, comfort etc.) are essential for all travellers, but in addition, the special needs of people with reduced mobility, permanently or temporarily, should have special consideration in the planning and operation.

There are several different groups of people with reduced mobility or special needs:
- People with reduced mobility (PRM):
  - Children (with families and as independent transport users)
  - Elderly
  - People with baggage or other large/heavy items
  - Physically impaired
- Foreigners, tourists
- People without access to the internet or smartphone
- Commuters’ need to be able to work on board.

The special needs of people with reduced mobility and other special traveller groups should be taken into account already in the design of the terminal, its functions and operations. This includes both the built environment and facilities and services provided at an interchange, i.e. ticket sales, information boards and kiosks, waiting rooms, concourses, shelters, toilets, shops, cafes, other retail etc.; and parking areas. The needs and facilities may vary according to the type of interchange, modes concerned and its importance (large international, medium and smaller interchanges, including those that are on-street). The location, guidance and signalling of services are key issues for all travellers.

Recommendations / passenger terminals
- Provide safe entry and exit to the terminal, as well as safe waiting areas, to meet the needs of vulnerable user groups such as children and the elderly.
- Provide terminal information translations in English, or in other relevant languages, to assist tourists and other foreign user groups.
- Take into account user groups with no advanced technological equipment, such as smartphones, or access to the internet.
- Adjust terminal infrastructure to suit travellers with reduced mobility (also temporarily) by avoiding problematic structures (for example stairs and lengthy walking distances) or provide special solutions to facilitate transfers (for example lifts, escalators and personal movers).

Challenges
- Special needs of often forgotten user-groups e.g. seniors, children, foreigners and inexperienced passengers need to be acknowledged and actions taken.
- Cost-benefit analysis does not always favour investment and upkeep of costly and rarely used services for special user groups.

Good practices
Armentières railway station
- Legibility of space reduces the need for information and makes the interchange easy for all travellers.

Figure 39. Armentières bus terminal, an aesthetic design with functional shortcomings (photo L’Hostis-Belibi)
4 Specific issues of terminal properties and performance

4.3 Safety and security

Description

Safety and security issues in the context of short- and long-distance transport interconnections overlap with those related to general transport safety and security. However, a number of additional concerns occur because in addition to its role as an interchange point a transport terminal serves as an interface between different operators and organisations, information flows, transactions, etc.

Safety and security at a terminal in physical terms as well as in the immaterial sense relates to three main categories:

- Passenger safety and security:
  - access, flows
  - passenger screening, privacy
  - physical transport safety
  - health aspects
  - information security
  - safety of equipment.
- Safety and security of employees
- Information security (relates to all information handled and transferred in the terminal)

Safety and security of transfer at a terminal or other interchange point is important for all kind of terminals, but it is difficult to find appropriate specific indicators like number of people killed and injured, as such events are rare at terminals. The efforts put into safety and security procedures, security control, and terminal design are important and have greatly reduced negative behaviour and improved safety and security, but finding an appropriate measure to assess the effect of these measures is difficult. The topic is particularly complex because passengers’ perceived risk for safety or security-related incidents subjectively i.e. it often is a personal feeling of the traveller.

Navigation systems and monitoring and guidance of passenger traffic flows, as well as the most efficient use of space can reduce insecurity. In addition, providing services which attract a wider public may create a good sense of place and thus improve attractiveness and security of the terminal.

For more information on terminal safety and security and customer satisfaction surveys could be used to help better understand people’s needs at interchanges, as well as their rational and emotional responses to such issues like “an agreeable place to change when travelling long-distance” and “perception of a secure environment”.

Figure 40. Fences on platform 1 at remièrres railway station (photo L’Hostis-Belibi)

Figure 41. Poor social control and security at western entrance to Puotila metro station in Helsinki (Source: YTV)
Recommendations

- To carry out customer satisfaction surveys regularly to find out the needs of different user groups.

Challenges

- Identification of methodologies for assessment of terminal safety and security

Figure 42. Customer survey results for Oslo Vaterland station (Source: Scandiaconsult 2003:20)
Guidance and recommendations for interconnection between long distance and local/regional passenger transport

References

1. CLOSER research reports


(To be published in 2013) Guidance and recommendations for interconnection between long distance and local/regional freight transport. Deliverable 6.2. CLOSER - Connecting LOng and Short-distance networks for Efficient tRansport.
D6.1 Guidance and recommendations for interconnection between long distance and local/regional passenger transport

(To be published in 2013) **Decision-making guidebook for the interconnection between short and long-distance transport networks.** Deliverable 6.3. CLOSER - Connecting LOnG and Short-distance networks for Efficient tRansport.

(To be published in 2013) **Final Report.** Deliverable 1.2. CLOSER - Connecting LOnG and Short-distance networks for Efficient tRansport.

2. **Other references**


