

11 LISBON FERRY SERVICES

11.1 THE KEY ISSUES ADDRESSED BY THIS CASE STUDY

The main focus of this case study is the interconnection of the several public transport modes in the metropolitan area of Lisbon. Special focus is given to the integration of the waterborne transport services (ferry services) within the transport system. The integration of modes and of operators (physical integration of services, integration of fares and of information, etc.) is a fundamental requirement to offer travellers a seamless trip. Transport authorities at various levels play a major role in the effectiveness of interconnection in the following case study.

The following aspects have been identified as critical for the case study:

- **Improved interchanges.** Terminal location and development will be discussed along with the potential impact on interconnection of modes.
- **Improved links (technical evolution).** The impact of the conversion of the ferry fleet from conventional to fast catamaran ferries and the impact on the role of ferry services within the transport network have been a main influence on the development of the ferry services. This reflects the importance of technological innovation to maintain or improve a sustainable market share within an interconnected network.
- **Improved links.** Bridges are the main arteries to sustain traffic and have defined capacity limitations. How far do ferry services and their level of interconnectivity play a role in alleviating traffic demand pressure on the bridges?
- **Effective integration.** Lisbon's trains, buses, trams and ferries all accept compatible contactless paper tickets. While there is a clear development towards integrated ticketing to improve the accessibility of the transport system at Lisbon Metropolitan Region level and beyond, integration does not bring equal benefits to all operators and might even influence revenue levels. Therefore co-operation is a publicised strategy, but the actual underlying competition might contradict some of these efforts.
- **Information and marketing.** "Mobility" portals exist that allow for multi-modal trip planning. Nevertheless each transport operator directly markets their own service and this can be in competition with other operators and/or modes on certain routes. Further, it has to be asked if the available "mobility" portals at all times give the full number of options and what might be the underlying constraints to assure the latter.

11.2 GENERAL DESCRIPTION OF THE CASE STUDY

The city of Lisbon is occupied by about 600,000 people. The Metropolitan Area of Lisbon (AML – Área Metropolitana de Lisboa) has approximately 2.7 million inhabitants spread over 2,963 km² and a total of 18 municipalities. Population density is just above 6,600 people/km² which is, for example, about twice as high as Glasgow.

The AML has experienced fast growth in population over the past decades. The average population increase hides strong differences between the municipality of Lisbon itself with a declining population and the suburban regions which grew at rates above 10%.

In 2001 statistics estimate about 1.4 million trips everyday within the AML, with 37% by public transport and 45% by car. By 2005 the share of public transport has increased to 43%, car trips fell by 25%, and active travel modes (walking and cycling) accounted for about 30% of all travel (TTR, 2006). The overall share of public transport within the city of Lisbon is estimated to reach 62% (TTR, 2006). However, latest figures for 2008 estimate 3.8 daily journeys using motorised transport of which 1.37 million daily journeys are made on the public transport system throughout the AML.

In comparison to other cities, Lisbon has a densely developed public transport infrastructure and bus network in relation to the size of its population. Lisbon has three types of rail-based public transport (tram, light and heavy rail), which is relatively uncommon for cities of comparable size. Lisbon's public transport system is planned to be 100% wheelchair accessible, except for buses for which just above

90% are accessible (TTR, 2006). Interestingly, the study does completely exclude ferry services from its analysis.

Lisbon is one of the cities that has shown dramatically increasing level of car ownership following accession to the EU, primarily as a result of the growth in income levels.

The Sistema de Transportes de Lisboa (STL) was a first attempt to counteract a falling and today stagnating public transport share, and aimed to improve the provision of increased and integrated public transport services. This first effort included the three main public operators Carris, Metropolitano de Lisboa and CP (national railways). STL, which was promoted jointly by the Portuguese government, the Municipality of Lisbon and the Metropolitan Transport Authority, started to include other public and private operators. The initiative included extensions of the metro system and building of tramway lines, increased and more reliable bus services, fare integration between various transport companies, and institutional evolutions.

The main focus since the 1990 in the development of the public transport system, particularly to counteract suburbanisation and stagnating public transport shares, has been on improving links and terminals. This includes the extension of the four lines of the Lisbon underground. In relation to interconnection the extension of the blue line to Santa Apolonia railway station and the red line connecting the Estacion Oriente have been major developments. The extension of trams and their interconnection with railway lines have also contributed to a better interconnection between these two public transport options (e.g. Santa Apolonia and the south bank of the River Tagus - Metro Sul de Tejo). The parallel development of light rail, tram and heavy rail also aimed to convert the traditionally radial network into a more circular one, thus creating more direct and faster connections.

The underlying idea of the current network is a three-tier network with each tier fulfilling different functions within the network. The highest level is served by high speed services complementing the heavy rail services (rail and metro) network and comprises light rail and bus services. The structural routes are fed by intermediate level (speed) services. The final local level assures connections to the metro and rail network within a maximum of 10 minutes. This idea has been led by Carris, but has left out ferry services in the consideration of this approach. The new institutional setup (see next section) should help to find more integrated approaches also beyond company borders. Thus, institutional evolution is a key topic in the integration and interconnection in this case of Lisbon. A further focus has been the integration of the fare system in public transport (see integrated ticketing section for details).

It is important to note that this case study focuses on the interconnection of ferry services in the AML and thus the development of the other transport modes, while relevant will only be discussed in relation to the development and functioning of ferry services.

The intermodal connections in the case of Lisbon have various dimensions: a) ferry services form a vital part of the local public transport network (short-to-short distance interconnection) and this can either be uni-modal within the ferry network or intermodal between the ferry, bus and metro network.; b) ferry services traditionally bridged a gap between long-distance rail services; and c) ferry services today interconnect with long-distance rail travel at the train stations.

Lisbon is located on the River Tagus and, despite the construction of the bridge *Ponte 25 de Abril* which links the two sides and carries both rail and road traffic, the ferry network has continued to play a vital part in Lisbon's public transport network. With the opening of the Fertagus railway line and the new Vasco da Gama road bridge, services have been reduced but nevertheless remain frequent to Cacilhas, Barreiro, Seixal and Montijo.

Consequently, it is interesting to note how the ferry services have coped with their changed role after long-distance rail travel was joined by these bridges and the ferry interface was not needed any more. Additionally the ferry services continue to play an important role in the network and research in the organisation of integrated ticketing and terminal development is expected to deliver insights on the reasons for well-functioning interconnection.



(source: Fertagus, 2010)

Figure 11-1 Overview of the Lisbon Transport Network and operators, 2010

11.3 SPECIFIC CHARACTERISTICS OF THE CASE STUDY

11.3.1 Modes and Infrastructure Involved

Ferry services have traditionally closed the infrastructural gap between long distance rail networks in Portugal. As seen above, the construction of a railway link connecting the Portuguese national railway networks has changed the role of the ferry services. Nevertheless, they continue to play an important part within the Lisbon transport network and, despite overall continued passenger losses, the focus on improved terminals seems to partly counteract this negative development. Interconnection of the ferry services to regional and long distance rail is thus in the focus of the case study.

Ferry terminals

Ferry services in the AML are operated from nine terminals. Recent modernisation has included the improvement of interconnection to other modes and application of a universal design to improve accessibility.

The terminal characteristics are outlined below. The terminals Barreiro, Cais do Sodré and Cacilhas offer direct interconnection with CP, the regional railway services. Terreiro do Paço / Sul e Sueste and Cacilhas offer direct access to the Lisbon Metro network. All terminals allow passengers to connect to AML TST bus services. Park and Ride facilities are available at three terminals and seven terminals are also equipped with parking space for bicycles. Taxi services are available at all terminals. In the following data on the accessibility and level of interconnection are given for each terminal.

Montijo - Cais do Seixalinho

- Inaugurated on December 17, 2002
- Opening Hours: weekdays between 06:00 and 23:00; Saturdays between 06:00 and 22:00; Sundays and holidays between 08:00 and 21:00
- Ticket office: weekdays between 05:50 and 23:00; Saturdays between 05:50 and 22:00; Sundays and holidays between 07:45 and 21:00
- Ticket vending machine
- Intermodal connection with TST (local bus services) and taxis
- Parking with capacity for 1,400 vehicles and parking for bicycles

Barreiro

- Inaugurated on September 5, 1995
- Opening Hours: weekdays between 05:15 and 02:00; Saturdays, Sundays and holidays to 04:00
Ticket office: weekdays between 06:45 and 22:00; weekends between 06:45 and 23:30
- Three ticket vending machines
- Intermodal connection with CP - Linha do Sado (regional railway), TST, and TCB taxis
- Parking with capacity for 1,100 vehicles and parking for bicycles

Seixal

- Inaugurated on June 1, 1997
- Opening Hours: weekdays between 06:10 and 23:00; Saturdays between 07:00 and 21:00; Sundays and holidays between 08:00 and 21:00
- Ticket office: weekdays between 05:50 and 23:00; Saturdays between 06:45 and 21:00; Sundays and holidays between 07:45 and 21:15
- Ticket vending machine
- Intermodal connection with TST and taxis
- Parking with capacity for 1,878 vehicles and parking for bicycles

Cacilhas

- Opened in 1978 and last refurbished 2010
- Opening Hours: between 05:20 and 02:00 on weekdays and weekends and holidays
- Ticket office: weekdays between 06:00 and 23.30; weekends between 07.30 and 23.30
- Intermodal connection with TST, MTS (South Metro Transport) - and the green line and blue line, taxis
- Parking for bicycles

Porto Brandão

- Last renovation of the terminal building was in 1986
- Opening Hours: weekdays between 06:00 and 23:08; Saturdays from 06:00 to 22:08; Sundays and holidays between 07:00 and 22:08
- Ticket office: weekdays between 06:05 and 23.10; Saturdays between 06:05 and 22.10; Sundays and holidays between 07:05 and 22.10
- Intermodal connection with TST and taxis

Trafaria

- Last renovation of the terminal building was in 2009
- Opening Hours: weekdays between 06:00 and 23:00; Saturdays between 06:00 and 22:00; Sundays and holidays between 07:00 and 22:00
- Ticket office: weekdays between 05:50 and 23:00; Saturdays between 05:50 and 22:00; Sundays and holidays between 06:50 and 22:00
- Ticket vending machine
- Intermodal connection with TST, taxis and bicycle paths
- Parking for bicycles

Belém

- Last renovation of the terminal building was in 1986
- Opening Hours: weekdays between 06:25 and 23:30; Saturdays between 06:30 and 22:30; Sundays and holidays between 07:25 and 22:30
- Ticket office: weekdays between 06:15 and 23:30; Saturdays between 06:15 and 22:30; Sundays and holidays between 07:15 and 22:30
- Ticket vending machine
- Intermodal connection with Carris, CP - Linha de Cascais, taxis and bicycle paths

Cais do Sodré

- The terminal was inaugurated on May 11, 2004. The interface with the other transport modes was inaugurated on March 13, 2009
- Opening Hours: 05:35 to 02:30 on week days, weekends and holidays
- Ticket office: weekdays between 06:30 and 23:45; weekends and holidays between 08:30 and 23:45
- Four vending machines for tickets
- Intermodal connection with the Lisbon Metro - green line, rail, CP - Linha de Cascais, taxis and bicycle paths
- Parking for bicycles

Terreiro do Paço / Sul e Sueste

- Inaugurated on May 28, 1932
- Opening Hours: between 05:45 and 02:30 Saturdays, Sundays and holidays
- Ticket office: weekdays and weekends between 08:30 and 23:30
- Two vending machines for tickets
- Intermodal connection with the Lisbon Metro - blue line, tram and taxis
- Parking for bicycles

Ferry operators and services

Ferry services have played an important role in the urban development of the AML. As of 1957 three main private operators offered services to passengers and cars; Jerónimo Rodrigues Dorã (JRD), the Empresa de Transportes Tejo (ETT) and the Sociedade Nacional de Motonaves (SNM). The opening of the Ponte 25 de Abril in 1966 resulted in a significant loss in traffic. Further losses were created by the intention to nationalise the ferry services following the 1974 Revolution. The then five ferry companies (ETT, JRD, DVS, SNM and the Sociedade Marítima dos Transportes (SMT)) were finally nationalised at the end of 1975 and the public company Transtejo - Transportes Tejo (TT) was

created, at that point in time owning 26 ferries. In 1975 TT operated services from T. do Paço to Alcochete, Cacilhas, Montijo, Seixal and Cacilhas, and from Cais do Sodré to Cacilhas, and from Belém to Trafaria and Porto Brandão, with an aged fleet. Since 1990 the services to Seixal and Montijo have seen an increase in usage, though the new Vasco da Gama bridge and the new rail services across the Ponte 25 de Abril both threaten future development of ferry routes to these and other locations.



Figure 11-2 Lisbon ferry network

The ferry routes that formed the link between the long distance and regional rail networks to the north and south of the River Tagus were operated by CP (regional railway operator). Since 1994 these have been operated from Sul e Sueste to Barreiro by SOFLUSA (Sociedade Fluvial de Transportes S.A.). Today Transtejo (TT) is the transport operator responsible for all ferry services on the Tagus River.

In 1995 TT started to introduce catamarans on the longer service routes. These higher speed crafts were able to partly counterbalance traffic loss as they shortened the travel time on ferry services significantly. In contrast SOFLUSA ran conventional ferries until 2004.

Since 1997 ferry services have lost over 10 million passengers; most of these were lost to the new Fertagus railway connection and also to the increase in individual car passenger transport. The installation of the Fertagus railway service has opened a competitive alternative to Setúbal and the adjacent areas on the southern side of the River Tagus as it to a certain extent replaced the interconnecting functions of the ferries services between the Portuguese railway networks.

Statistics show that development has consolidated since 2006/2007 and in 2008 an increase in overall passenger numbers for the first time in over a decade was recorded.

It can be assumed that in previous years, the closure of the Cais da Alfândega route in 2001 and the work on the pontoons at Terreiro do Paço which forced the transfer of the Seixal service to the less central Cais do Sodré in 2005, had negative impacts on passenger numbers.

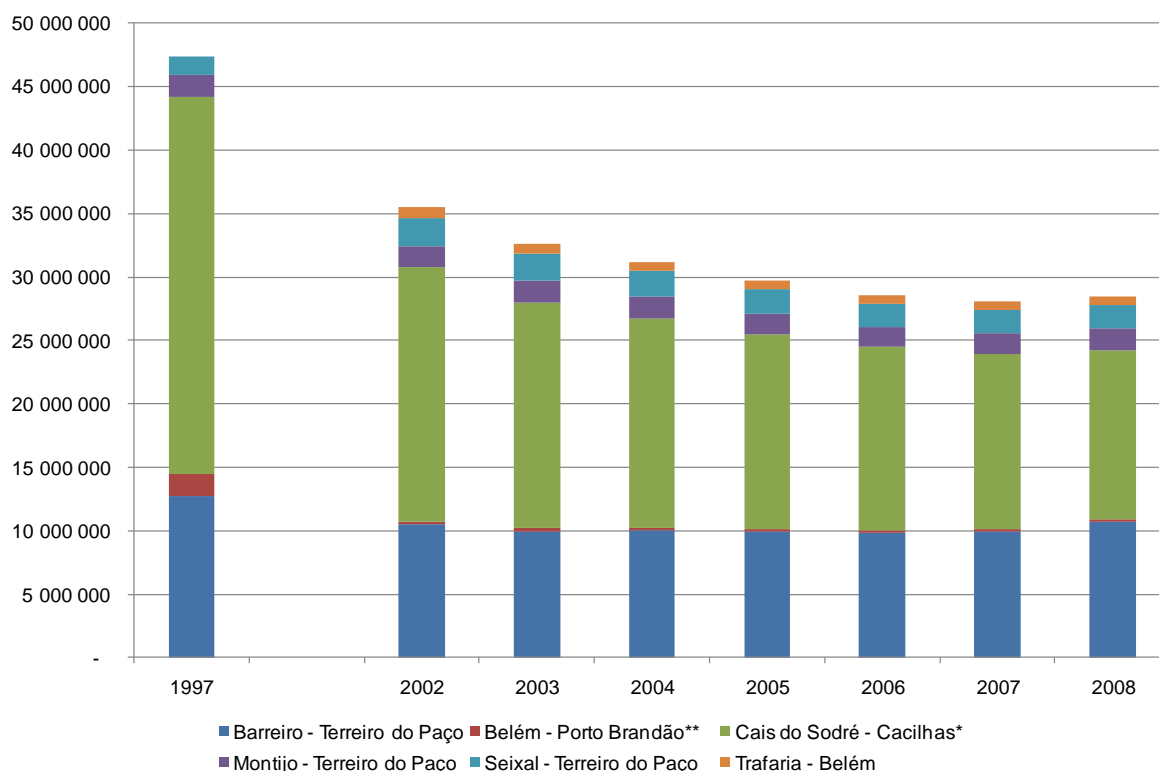


Figure 11-3 Ferry passenger development River Tagus, 1997, 2002 - 2008

Today only one service operates from the traditional Sul e Sueste terminal. This service connects the terminal to Barreiro using a high speed catamaran. This service is the second most important and the only service with growing passenger numbers since 2002. This main purpose of this service is to link to the railway services to southern Portugal at Barreiro. This also strengthens the assumption that interconnection between ferry services and long distance rail continue to be important.

In 2006 the services between Montijo and Barreiro experienced an increase in demand despite the diversion of the Montijo services to Cais do Sodre. Investment in fleet and the newly opened terminal in Terreiro have shown significant influence on the Barreiro route. The positive trend in demand is counterbalanced by the losses recorded on the Cacilhas route. These experienced a 4.1% drop in passenger numbers, which can be attributed to the expanding influence of railway services on the south bank and the obstruction in the access to the Cacilhas due to construction works on the south of the Tagus River. It can be expected that an improved accessibility of the terminal will reverse or at least compensate for these losses.

Table 11-1 Evolution of ferry demand, passengers and passenger km 2007, 2008

Route	2008/07		2008		2007	
	Passengers	Pkm	Passengers	Pkm	Passengers	Pkm
Montijo - Terreiro do Paço	3.2%	3.2%	1,749,749	21,854,365	1,696,042	21,171,068
Seixal - Terreiro do Paço	1.3%	1.3%	1,817,587	18,357,629	1,794,139	18,120,799
Barreiro - Terreiro do Paço	7.8%	7.8%	10,674,469	106,744,690	9,902,682	99,026,820
Cais do Sodré - Cacilhas	-3.4%	-3.4%	13,340,083	28,014,174	13,809,933	29,000,859
Trafaria - Belém - Porto Brandão	-0.9%	-1.2%	864,099	3,185,663	872,008	3,225,617
Total	1.3%	4.5%	28,445,987	178,156,521	28,073,804	170,545,163

Looking at the passenger numbers by terminals it can be seen that Cacilhas experienced the greatest decline, which underlines the potential impact of reduced accessibility through construction and competition from railway services. At the same time passenger numbers at Barreiro increased significantly. However, the reasons for this remain speculative.

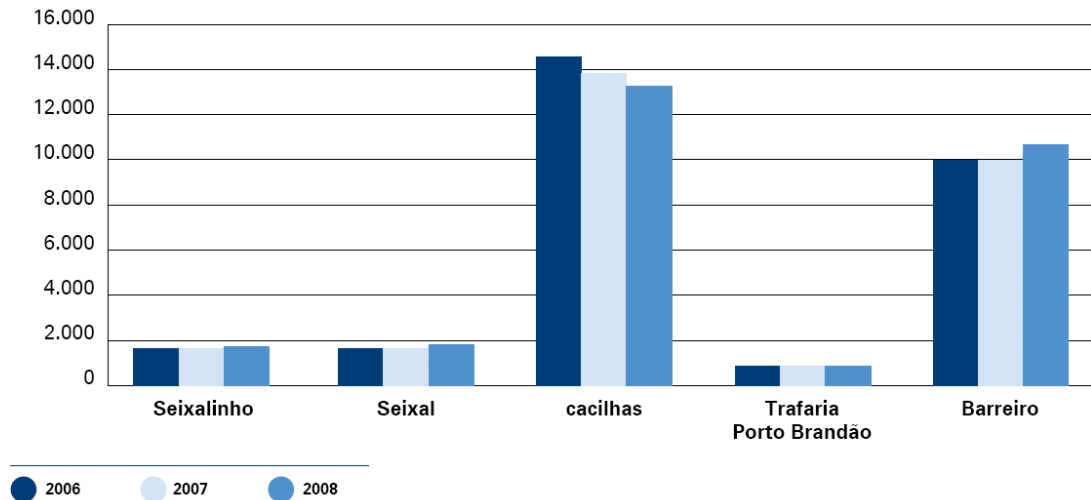


Figure 11-4 Transported ferry passengers, millions, 2006-2008

The ticket structure, in terms of revenue and passenger shares, demonstrates one of the main challenges of the system. While the ferry company's own tickets offer the greatest revenue for the operator, ticket types that strengthen interconnection offer lower revenue levels per passenger. Thus from an economic standpoint of the ferry service provider integration has significant impact on revenue generation. However, combined and multi-modal tickets make up for over 50% of the tickets.

Table 11-2 Ticket structure – revenue and passenger share, 2007, 2008

	Revenue		Passengers	
	2008	2007		
TT tickets	43.3%	44.3%	22.3%	23.4%
Single tickets	34.1%	33.2%	14.7%	14.9%
Pre-purchased	4.5%	6.3%	2.3%	3.3%
Time tickets	4.8%	4.8%	5.3%	5.3%
Combined tickets	21.9%	18.9%	35.6%	33.0%
Multi-modal tickets	34.7%	36.7%	42.1%	43.6%

Rail network

Three rail-based systems are currently operating in Lisbon: trams, light commuter rail and heavy rail. In terms of interconnection the high speed link from Lisbon to Madrid, Spain also needs to be mentioned as relevant besides the long distance rail services to the north and south of Portugal.

Portuguese Railways (CP – Caminhos de Ferro Portugueses, EP) was created in 1975 as a public company in charge of the management of the railway system in Portugal. In 1997, management of the infrastructure was separated from operation of the transport services, the former becoming the remit of REFER, and the latter remaining in concession to CP. The organisational structure of CP currently comprises a number of business units: freight (CP Carga); suburban services (e.g. CP Lisboa); long distance services (CP Longo Curso); regional (CP Regional); and high speed (Alta Velocidade). The network operated by CP consists of a total of 2,830 km of rail. In 2006, 133 million passengers used the service, 86.4% in urban trains.

Operation of suburban passenger transport on the north – south railway axis in the Lisbon Metropolitan Area, via the 25 de Abril Bridge, was contracted out by REFER, through public bidding, to a private company Fertagus (part of the Barraqueiro group). This was the first ever case of management and commercial operation of a railway line by a private operator in Portugal (the line comprises 54 km of railway and 14 stations).

In Lisbon suburban rail services share the railway network with the national and regional rail services. Since 1999 the operator Fertagus has delivered rail services on the north-south line, connecting Lisbon with the city's extension south of the river Tagus and also connecting the regional train services to the north and south of the river. The concession holder Fertagus has to pay infrastructure user fees to the Portuguese rail operator REFER. The Fertagus service was consequently integrated into an extending tramway network on the southern bank of the river.

The major railway stations are Santa Apolónia, Rossio, Gare do Oriente and Cais do Sodré and traditionally also Barreiro which however began to lose relevance once the railway networks to the north and south of the Tagus were interconnected by the Fertagus rail service.

11.3.2 Current Multi-modal Options and Intermodal and Interconnection Opportunities

The multi-modal options in the case of Lisbon that focus on the integration of ferry services depend primarily on the location and interconnection of the terminals. As set out in the description of the terminals the general accessibility to other transport modes is given. However, the dimensions and quality of this accessibility varies. While the integrated ticketing in theory provides seamless transport, the working of the system presents failures in day-to-day use and today only reaches out to the regional level. A ticketing option that allows integration with the national railway network is currently under development.

Further, the available multi-modal travel information systems and portals do not function satisfactorily and have been found to return varying information for similar routes.

Technological change has contributed to the competitiveness of the ferry services within the ALM.

The main opportunities for interconnection arise from improvement of information systems, integration of the national railway within the ticketing options and integrated timetabling particularly for off-peak travel. The fares system of the public transport system, despite efforts to simplify, remains complex and using concentric crown zones includes over 300 ticket types that differ in geographical, temporal and usage validity. Examples include: multi-modal, combined, exclusive, single, daily, weekly, monthly, etc.

11.3.3 Stakeholders Involved in the Portuguese Transport System

The Portuguese Framework Law for Public Transport is defined by Lei de Bases dos Transportes Terrestres, Law 10/90 – LBTT, which has not been regulated. The LBTT contains a "Transport Plan", which also has not been regulated, but not a "Mobility Plan".

The institutional organisation is composed of the following entities:

- **Government** with financial overall responsibility; including the General Directorate for Land Transport and Inland Waterways (Direcção-Geral dos Transportes Terrestres e Fluviais, DGTTF), which holds the responsibility for regulating the land and inland waterway transport sector²³; the railways are overseen by the National Institute of Railway Transport (Instituto Nacional do Transporte Ferroviário, INTF);
- **Municipalities** are responsible for urban and local transport: concessions for urban and municipal transport operators, school transport services and the development of the municipal road network (Law 10/90, LBTT);
- **Metropolitan Areas and Regions**, "Metropolitan Transport Commissions" were created in September 2000, to establish indicative plans for the conurbations of Lisbon and Porto in the

²³ It may be considered that this General Directorate also possesses some competences on the financial level,

matter of "local transport" (thereby overcoming the separation between urban and inter-urban transports). The commissions have no resources and do not finance investment, except interface equipment across modes and operators. Based on the Decree 268/2003, of 28 October 2003, the transport authority of the metropolitan area of Lisbon (LTMA) entered service in July 2009. The main first missions of the authority are the Bill of Transport for the metropolitan area of Lisbon, the elaboration of the urban mobility plan and the mobility survey. In the next years, the major topic will be the implementation of the regulation 1370/2007 on passenger services by rail and by road (also called the Public Service Obligation regulation).

The structure of transport operators can be described as follows:

- The national railways and the principal urban operators (in Lisbon and Oporto) are part of the state's entrepreneurial sector (companies are state owned/controlled). The state directly supports fleet renewal financially as well as the elaboration of transport plans, the first depends directly on government authorisation.
- There are no framework-agreements (contratos programa) and the supply policy is within the operators' responsibility
- There is a wide range of legal titles (concessions, licences...) that provide the basis for the activity of these "public operators"

Four different types of transport operators can be identified: public state owned, public sector controlled, municipal operators and private operators. The relationship between the public sector and public transport service operators takes various forms:

- Exclusive rights for rail operator CP, bus operator STCP in Porto and ferry operator TRANSTEJO in Lisbon
- Concessions: Metro do Porto (Porto LRT), Carris (Lisbon Bus and tram operator), Fertagus and Metro do Sul do Tejo (LRT in the south of Lisbon Metropolitan Área)
- Hybrid regime (after nationalisation): Lisbon Subway
- Bus transport is managed through fixed term renewable concession contracts with a fixed term, interim concessions and grandfathers' rights
- Suburban and regional bus networks are developed by the private sector with no public sector intervention.

Tariffs and fares are established by the government or result from contractual arrangements (e.g. concession contracts). Operators also receive fare compensation payments that are subject to specific EU legal framework (i.e. Regulation 1191/69, as amended by Regulation 1893/91 - version presently in force). The framework gives three possibilities: contracts of supply of transport services, contracts for the provision of services or concession contracts, compensation (for public service obligations). The latter must be defined in advance. The Portuguese government establishes the following fares/ tariffs:

- Rail transport (sub-urban and inter-urban rail transport) – trips less than 50 km
- Inland waterway transport of great intensity

The government also establishes the percentages of the increase applicable to the fares/tariffs.

Regulation 1191/69 does not provide for specific arrangements in relation to procurement procedures Public Service Contracts (PSO), therefore the general EU rules apply. In the case of Portugal the national decree-law 197/99 applies which regulates public tender of public procurement procedure.

The general principles and the revised proposal for a Regulation of the European Parliament and the Regulation on Public Passenger Transport Services by Rail and by Road (COM (2005) 319 final) allow the direct award or direct granting of an exclusive right to an internal operator.

Currently the following public service contracts are relevant in the case study area:

- Fertagus (rail private operator) and MST (LRT private operator) – contracts compatible with Regulation 1191/69

- Carris (Lisbon bus and tram operator) – the agreement is not compatible with Regulation 1191/69
- Lisbon Subway (Metro de Lisboa) and CP (national public rail operator) – contracts have expired

The present legal framework is not adequate as the organisation rules do not allow for sustainability of the transport system and present compensation for PSO is granted pursuing a regime that it is not entirely clear. The regulatory framework does not contain incentives for efficient management of the transport system and for increase of demand for public transport. Therefore several challenges arise that also affect current interconnection and might lead to negative development in the future:

- Institutional Organisation Challenge: AMTs in Lisbon
- Legal Challenge: regulation of the LBTT – co-ordination with other relevant ministries such as Territory, Energy and Environment - and the revised proposal for a Regulation on Public Passenger Transport Services (COM (2005) 319 final)
- Contractual Challenge: new contracts for supply of transport services
- Financial Challenges: new model(s) for financing transport services

11.3.4 Current Cohesiveness of Multi-modal Networks

The current cohesiveness of the network is enhanced with the generation of LTMA (transport authority of the metropolitan area of Lisbon). Nevertheless, success and evolution of cohesiveness will depend on the willingness of individual operators to integrate. At the same time the continued work and expansion of integrated ticketing within metropolitan regions and beyond is strengthening the provision of integrated networks and services. The implementation of the technology to be able to better track the movement of passengers has and will play a major role as this also improves fair revenue splitting and transparency in the fare system. Despite all these efforts the reaction of transport operators to growing competition cannot be estimated.

The provision of integrated networks has been improving continuously, particularly as the metropolitan regions take responsibility to develop terminals and do this under a multi-modal mobility strategy. Integration in terms of interchanges in terminals has been one of the main focuses in the transport network development and was established quite successfully and is still expanding.

Importance on the integration of services has been somewhat defined in terms of information. However, integration of information in terms of routes and timetables and interconnections remains at a very general level at the different transport operator portals. The operator Carris does not even show the ferry routes in its networks map. Multi-modal trip information can only be retrieved from the specifically developed portals: transporlis and transpor. Research has shown that the given information for similar trips and details vary though.

11.4 SOLUTIONS ALREADY IN PLACE

11.4.1 Overview

In order to facilitate the understanding and comparability of the solutions already in place the following refers to the solutions identified in the draft toolkit. The key categories of solutions relevant for this case study are new/improved interchanges, integrated ticketing and information and marketing. From these three categories the following solutions exist:

- Improved interchanges – intermodal ferry terminals
- Integrated ticketing
- Information and marketing

The solutions in place will be described by category and specific reference will be given to the relevant solutions. If the solutions are not listed in the categories these will be referred to as evidence of potential good practice. Where possible the solutions will be assessed against the performance criteria as set out in the draft toolkit.

Existing solutions that are outside the core scope of the case study will be mentioned, but not discussed in detail. Wherever possible reference will be given to work or studies presenting these practices.

11.4.2 Intermodal Ferry Terminals – Improving Interchanges

Problems addressed and description of solution

Improving interchanges through network restructuring (lines, routes, timetable and frequencies) is one possibility. The transport operator Carris is developing the so called “Rede7” (Network 7) plan. This plan includes the underground extension (on the blue line) to Terreiro do Paço and Santa Apolónia. The changes made will improve the interconnections in public transport supply with the other operators in the area, specifically the Lisbon Underground and the ferry operators Transtejo and Soflusa.

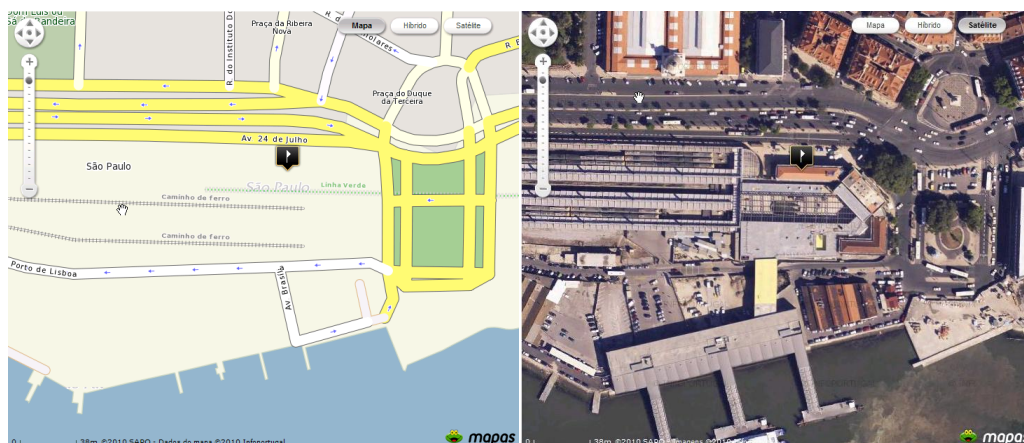
The network overhaul began in September 2006. It is one of the strategic objectives in the process of gaining more customers, and was set out in detail in the Annual Report for that year. It was made clear then that the restructuring would be phased in gradually over the coming years.

The improvement of seamless operation gave positive overall results as seen by the company’s customers. This is clear from the customer satisfaction survey that was carried out in July 2008 by an independent organisation. The results showed an improvement in satisfaction levels, following on from the positive and increasing levels witnessed in the surveys undertaken in 2005, 2006 and 2007.

Until late 1999 the Estação do Sul e Sueste acted as a railway station and ferry terminal. All CP railway services south of Lisbon had to be reached by taking the ferry from here to Barreiro. Since the new Tagus Bridge railway line was linked to the CP mainline on the south bank of the Tagus, through trains are able to run from Lisbon to the southern bank and beyond.

Ferry services today terminate at a modern terminal which provides a covered walkway to Barreiro railway station from where trains leave for Setúbal, Évora and the south of Portugal. Barreiro also connects to the Metro system. Barreira is the only direct interchange between ferry services and the long-distance railway network. Despite losing many of its train services, Barreiro still acts as a large bus terminus, and ferries still leave every 5/10 minutes at peak periods.

Cais do Sodré is one of Lisbon’s principal intermodal interchanges and allows for interconnections between bus, metro, suburban trains ‘Linha de Cascais’ and ferry services. The ferry transport system connects the interchange with Cacilhas, Seixal, Montijo and Trafaria and Porto Brandão. Cais do Sodré also serves westbound suburban rail routes to Estoril, Belém and Cascais, and connects to the metro - green line (Linha da Caravela). Further interconnection with urban buses is possible. It is adjacent to the Lisbon Metro station.



Green Line (Linha da Caravela).

Figure 11-5 Lisbon Cais do Sodre Duque da Terceira square

Other intermodal terminal solutions in place in the Lisbon Metropolitan Area (AML)

The Oriente station was developed to serve as the principal railway terminal of the city. This was driven by the expectation and planning that the metropolitan area is expanding in this area of the city. The Oriente station (Gare do Oriente) is an intermodal terminal; its facilities serve and interconnect several forms of transport. Passengers can change between metropolitan, long- and medium-haul regional and international trains. There are connections into the underground system, national and metropolitan buses or taxis. There is also an airport link (by bus line 44), and check-in facilities.

The station has three self-contained parts and is divided into two levels. The raised level holds the platforms for the national train network; the lower level connects to the underground and emerges at the surface to serve as an entrance and also to connect with the major bus terminal for the city.

The terminal can also be accessed by foot. There is also an airport link which takes seven minutes from the train station to the airport. Taxis are available for this connection, as well. This transfer takes about five minutes and costs between € 5 and € 8. . Gare do Oriente also will be the high speed train stop in Lisbon in the future, so Oriente station will be served by both conventional and high speed trains.

The station has been criticised as inefficient, because the ticketing booths exist as scattered elements all over the place instead of in a central office.

The name of the station is "Oriente" and is the final destination of the red line of the metro of Lisbon. This line provides a connection from the city centre to the intermodal interchange terminal with a length of 6 km and seven stations. Currently, there is not a connection to the airport, but it's foreseen to extend the line to the airport of Lisbon. The airport will be reached within 5 minutes from the station.

Information is also provided inside the terminal via information panels, information desks and electronic panels (real time). The content of the information panels is a floor plan, showing the location of the modes and facilities as well as the network design. Furthermore, a desk of the General Directorate of Land Transport (DGT) is located at the station, providing integrated information about transports online and at real-time. Additionally, two desks of the Portuguese railway infrastructure (REFER) provide information about the trains on upper level. The content of information shown on the electronic panels (real-time) is provided for metro and train concerns. It shows the information about the schedule, waiting times and destinations.

The KITE²⁴ project identified best practice for intermodality and implementation. The following points can also be regarded best practice characteristics for long – short distance interconnection:

- Integration of the transport modes (train, metro, bus, taxi and private vehicle) by levels, in order to have short transfer times/distances
- Availability of good connections to the city centre
- Convenient waiting conditions (e.g. waiting rooms with wireless in the train floor)
- Good fare integration (between train, rent-a-car; train-parking space, contactless smart card for the last urban mile (e.g. metro, urban bus)
- Proximity (direct connection) to a high standard shopping centre (Vasco da Gama: www.centrovascodagama.pt)
- Using the local public transport to reach the railway station is quite economical (€ 0.75 respectively € 0.50)
- Train users with return tickets can use different combination tickets (e.g. concerning parking space)

At the same time improvements can be made in terms of:

- Information about further connections or adjustments of connections, poor information signalling in the station

²⁴ http://ifv-kite.ifv.uni-karlsruhe.de/kite/wiki/index.php/Oriente_Station_Lisbon

- Dispersed ticket offices
- Intermodal luggage handling is not possible
- There is no connection to the airport, but it is foreseen to extend the line to the airport of Lisbon
- The underground and the bus/tram operator of Lisbon are separated, although it is possible to use a special card which is valid for both

11.4.3 Integrated Ticketing

Background

Some form of integrated ticketing in the Lisbon Metropolitan Region has existed since 1976. In its early form transport operators shared a tariff system. This system allowed open access to the public transport network when using a monthly pass. This system also included a clear definition of validation rules and sharing of revenue.

In the early 1990s the reduction of public transport as a percentage in the overall mobility of the Lisbon region and the need to renew ticket validation equipment led transport operators to set up a working group in the form of a company association. This working group, denominated as OTLIS, had the main goal of developing a joint fare policy for the Lisbon region. The groups included seven operators: Carris, Metropolitano, Transtejo, Rodoviária de Lisboa, CP, Rodoviária da Estremadura and Transportes Sul do Tejo.

One way to find a solution was found by engaging in European research and development projects, with the goal to find solid and feasible solutions to introduce no-contact ticketing systems and public transport network operational management²⁵. The driving principle was to identify a system that would facilitate effective sharing of ticket revenues and the obtaining of O/D matrixes (passenger mobility pattern) based on real passenger movements. Additionally, the operators were seeking a system that would permit rationalisation of an overly complex tariff system that contained over 200 multi-modal transport tickets at that time.

In 2001 a new ticketing and access control system was installed across Lisbon's metro network. The major change was from an open access system to a closed one, featuring control lines and access channels equipped with entry and exit doors reading and validating ticket data. The system was based on magnetic tickets and a contactless smart card. The so called "Lisboa Viva" utilises an embedded chip and antenna system, which works by holding the card over a card reader at station entrances and exits. The card allows users to load fares exclusive to each associated operator, along with multi-modal and combined fares, such as using a combination of metro and ferry.

The launch of the integrated ticket was kicked off by Carris and Metropolitano de Lisboa and the single tickets had a validity of 90 minutes, there were also daily passes, and tickets valid for five days. Fare integration was made possible based on a 3.9% raise of fares.

The implementation of contactless tickets has been progressive and the number of operators accepting the technology has been increasing since 2002, under the name of Lisboa Viva card. This contactless, rechargeable card targets non-frequent passengers:

- Underground: Metropolitano de Lisboa (2000)
- Urban Bus and Tram: Carris (2003)
- Boats & Ferries: Transtejo (2004)
- Trains: CP (2005/6)
- Private train: Fertagus (2006/7)
- Private light-rail: Metro Sul do Tejo (2006/7)
- Sub-urban bus (private): several operators (2007),

²⁵ R&D European Projects ICARE and CALYPSO (1996-1999)

In 2004, OTLIS started a daily operation, running the SIIT -the Central Intermodal Information System, and managing LisboaVIVA smart cards, and co-ordinating services for the Lisbon operators and other mobility players.

After the introduction of the electronic ticket to CP and Transtejo a new combined season ticket was made available for these operators and also including Carris and Metropolitano de Lisboa. This made travelling and switching modes on the city and regional services to Sado, Sintra, Cascais and Azambuja paper free and integrated. Further, the complexity of the tariff system was reduced for the user.

By 2010 17 transport operators in the Lisbon area implemented the contactless ticket using the same technology and VIVA system as promoted by OTLIS.

Every transport mode has a mode specific ticket, next to the intermodal contactless smart card "Lisboa Viva", which combines trains, ferries, buses and subways. There is another rechargeable contactless smart card called "7 Colinas" that allows the recharge with several tickets of the same mode. Combined tickets for train, car rent and parking space are also offered. Furthermore elderly people and children receive with special discounts.

Recent developments include an initiative from the Ministry of Public Works and Communications to give all pupils between 4 and 18 years free school transport (Decree Law no. 186/2008 of 19 September). A new monthly ticket, 4_18@escola.tp, was created in 2009 and came into operation on 1st September, with the fundamental aim of supporting families during the school year. Those eligible for the ticket receive a 50% discount on the full fare, including intermodal, combined seasons and all tickets on specific networks or lines.

In 2007 further moves towards a simplification of the fare system were put in place with the launch of the Zapping System. The fare simplification, driven by the Secretary of State for Transport, Carris, Metro, and Transtejo/Soflusa, eliminated 17 different tickets. The resulting structure means that there is one simple ticket for each operator (plus the on-board ticket for Carris and the 24h Carris/Metro network ticket) and one multi-modal ticket, Zapping, valid on the four operators. There are two extras in the system: a bonus on loading for the Zapping (already operational), and the creation of a multi-modal discount on journeys involving two operators within a set time (one or two hours). This discount involving two forms of transport is calculated on the basis of 5% of the total cost of journeys made, applicable on the second form of transport used.

The Zapping ticket that was in use on the "7 Colinas" and "Viva Viagem" cards can now be used on the "Lisboa Viva" card, and this means that a passenger who has a standard season ticket has another option if he or she needs to travel on other operators, or if a season ticket is not needed for a short period of time. This is where the Zapping ticket can be used.

The main driver behind this development is the creation of a more attractive, transparent and easy to use fare system.

Problems addressed

The progressive development of integrated ticketing over the last decade in the AML has addressed a whole range of issues. While uni-modal thinking and strategies of operators remain important, a clear recognition of the necessity of intermodal and long and short distance travel can be observed. It seems clear that rising traffic from increased motorisation and continued suburbanisation can only be counteracted when facilitating whole network mobility as opposed to modal mobility. The introduction of contactless tickets has worked for transport providers and users on both ends. While the operators today have better control over O-D flows and therefore can share revenue in a fairer way, accessibility of the transport system has increased with the complexity of the fare system reducing at the same time.

Consequently, results have included faster ticketing, better knowledge of origin-destination flows within the network, and integrated ticketing between bus, ferry and metro for non-frequent users. The overall result is that the general levels of service and efficiency have improved, meeting user needs and encouraging citizens and tourists alike to use Lisbon's public transport system.

Performance against main toolkit criteria

Cost and feasibility

The overall cost for setting up the new contactless ticketing system since 2001 is estimated to be € 90 million, of which € 20 million was spent on the installation of gates and € 70 million on contactless equipment and associated systems.

The feasibility of the VIVA system was increased by building on full interoperability and by creating a supra-transport operator organisation like OTLIS. OTLIS started out as a working group, but has evolved to being the key to the successful implementation and also creates the structures to extend the system from regional to national level in Portugal.

Impact on users' door to door travel cost

The introduction of contactless ticketing generated an increase in cost. However, the use of multi-modal and temporal tickets allows users to reduce travel costs. However, reduction in travel costs will depend on knowledge of the overall still relatively complex fare system.

Initial impact on comfort or convenience

It is a convenient solution, if understood. So far information in English for tourists is sparse and can make the system appear less convenient, due to a lack of understanding. While the system is comfortable the storage and potential use of personal data on mobility patterns also has to be viewed as potentially being inconvenient.

Users' safety and personal security

Personal security is improved as only people with a valid ticket can enter station areas.

Region's prestige

The VIVA system can deliver to the region's prestige as it creates improved accessibility for the public transport network. As mentioned above it seems necessary to improve the description and information of the fare system in English, if the region's prestige is to increase at international level.

Access for people on low incomes

Reductions are given to pensioners and children.

Access for people with physical disabilities

Access to ticket vending machines and ticket boxes is given for all groups. Information on the accessibility for blind people is not known.

Mode shift, congestion and GHG emission

Impact on modal shift is difficult to measure, but the expansion in the use of the contactless ticket and particularly the combined and multi-modal tickets underlines the positive effect on public transport use the system can have.

Transferability of findings

The solution is transferable to other regions, particularly in multi-operator environments, where the creation of a supra-operator organisation can ease the co-operation between operators. Furthermore, contactless tickets are being used and implemented in several transport networks, thus the technology is well established. In terms of interconnection the organisation of operators in the case of Lisbon offers the greatest potential to be looked into in terms of transferability

11.4.4 Information and Marketing

Problems addressed

As a response to the lack of integrated information on public transport options the DGTTF (Portuguese Land Transport General Direction from the Ministry of Public Building, Transports and Housing), has driven the development of an intermodal transport information system. SIIT is the Portuguese system of intermodal information on transport. The portal is operated by the Institute for Mobility and Land Transport – IMTT, IP. The institute combines the powers of the Directorate General for Transport and Inland Rivers (DGTTF), the National Institute of Railway Transport (INTF, IP), and functions of the Directorate General for Traffic (DGV).

The integrated information about transport is available online and in real-time (www.transpor.pt). TransPOR is a trip planner providing multi-modal transport information between two points within Portugal. The trip planner combines long-distance and short distance travel modes, thus aiming at providing better door-to-door travel information. The user has the option to select one of three priority criteria in the TransPOR Journey Planner. These are least changes, fastest or most economic.

Besides route calculation the site gives information on timetables, fares, routes and networks. The underlying geographic information system also provides the user with a map showing the routing for a selected trip. Timetables and fares are given for all direct transport solutions as a separate option. This however then omits the connection between different transport solutions. Further, the selective display of one of several transport networks of the different transport modes in a single map allows for a good overview of the available transport network across Portugal.

TransPOR is available on the internet or in kiosks at principal transport nodes e.g. Gare do Oriente, Lisbon; Lisbon airport; Oporto airport.

Challenges in the current system

During the case study a number of test of the functionality of the site were conducted. While the results in general were satisfying, particularly the possibility to choose between different options, a number of challenges was identified.

When choosing the Gare do Oriente as a starting point the user is provided with two options a) Gare do Oriente (bus) and b) Gare do Oriente (rail). When requesting a route from these two points in the same interchange (only on different levels within the building), the results are quite different.

Besides the TransPOR site public transport journeys in the AML can also be calculated via the TransporLIS portal (www.transporlis.sapo.pt). This site only includes travel within the AML, but has more detailed origin destination possibilities than the TransPOR portal. A major drawback is the accessibility for tourists as the site only operates in Portuguese. At the same time the system has an advantage as it also allows to search for routes using cars thus allowing the user to make a proactive decision between public transport and individual motorised transport.

Performance against main toolkit criteria

Cost and feasibility

Detailed cost information on the development and maintenance of the TransPOR system are not available. The current development is driven by government rather than the public sector. Therefore it does not address the issue of overcoming the uni-modal thinking of private operators as they do not have a direct involvement in this. Private operators do facilitate the information for the service, but are not ultimately responsible for the functioning of multi-modal options or proactively promote the reduction in waiting times for multi-modal options.

The implementation of such a system does not constitute any significant challenges other than the continuous updating of data and timetable information. Since the running of the system is paid for by the government, no estimation can be made on the actual economic feasibility of the system.

A similar judgement can be made about the TransporLIS travel information system, which is run by the Metropolitan region.

Impact on users' door to door travel cost

The option to choose from different trip possibilities (including the most economic one) allows the user to make a personal judgement of his door to door travel cost, where the user can prioritise costs of the value of time. This does allow users to reduce their overall travel costs, always under the condition that the given information by the system is complete.

Initial impact on comfort or convenience

The service is free of charge and is convenient for internet users and at the locations (kiosks) where the service is available locally. However, the service is not available at all key stations and terminals and neither TransPOR nor transportLIS can conveniently be used using mobile phones. This reduces the comfort of using the system. Further, the language options are not fully available for both sites. English is not available as an option at all for the transporLIS portal.

Users' safety and personal security

Not/applicable

Region's prestige

TBC

Access for people on low incomes

Not/applicable, the service is free of charge.

Access for people with physical disabilities

Accessibility of the system is restricted for blind people and neither portal complies with the accessibility requirements of the blind .

Mode shift, congestion and GHG emission

Modal shift, congestion and GHG emissions cannot be measured. However, it can be assumed that, if users make better informed decisions, these also have a positive impact on congestion and reduction in GHG emissions. Further, door-to-door trip planning might induce modal shift from car to public transport. A comparison of travel time, costs and GHG emissions for a chosen route between public transport and car might help users to make more informed decisions and thus positively contribute modal shift, congestion reduction and decreasing GHG emissions.

Transferability of findings

Multi-modal trip planning portals at national and regional level are transferable to other regions and countries and potentially even beyond national boundaries. One of the more complete examples is the trip planner from Deutsche Bahn (DB) which has continuously expanded its timetable information on European rail services, but also on public transport options. A good feature is the map that visualises the travel route on the TransportLIS portal.

11.4.5 Other Solutions in Place

As can be seen in the description of the ferry terminal characteristics various other solutions are also in place these include:

- Local link infrastructure solutions
 - Park and Ride

All ferry terminals on the southern Bank of the Tagus River have park and ride spaces

- In-road bus lanes

Several of the buses benefit from bus lanes on part of their route.

➤ Improvement of local transport services

- Regular interval timetabling

➤ Improvements at the interchange

- Additional, conveniently located car parks
- Convenient positioning of public transport services

Bus stops are located conveniently and in short distance (usually the opposite site of the terminal building).

- Convenient positioning of taxi ranks

Taxi ranks are very close to the main ferry terminal exits.

➤ Integrated ticketing for local public transport & rail

- Multi-modal journey planner with ticketing - national

11.5 SOLUTIONS ALREADY ENVISAGED

Future Developments in Integrated Ticketing

A principal solution already under development is the CP Card –National Railways Card, which will use the VIVA standard. This rail card will be fully compliant with the VIVA System and supported by existing tools. As such it will allow use of the card for combined tariffs and it will have an interoperable interface with the AML system and other cities and regions. This card will be a consequent step in the progressive introduction of contactless tickets and promotion of seamless travel.

Further, the use of the VIVA cards for car parking especially at park and ride terminal is an already ongoing project in partnership with municipalities, urban parking operators and transport operators.

The use of RFID technology can be expanded throughout Portugal and has been implemented in different environments e.g. highways. It is expected that technology will change from using HF (High Frequency) to UHF (Ultra High Frequency). The main reason being that UHF tags are particularly useful in item and consumer goods tracking, an application previously unreachable by other types of RFID tags. Such development also includes the possibility to combine different functions within a single card e.g. retail and transport information and other public services like libraries.

11.6 SUMMARY OF CONCLUSIONS

The interconnection of long and short distance travel in the Lisbon Metropolitan Area (AML) has progressed over the last years. The case study focuses on the interconnection of ferry services, rather than the level and quality of interconnection of the whole transport system in Lisbon. A number of important solutions and efforts have been developed to improve the integration of the ferry network with the other modes. While the co-operation and co-ordination of the different transport operators was limited until a few years ago, efforts have been made where possible to improve the overall transport system and drive it towards a more sustainable structure.

In contrast to other case studies ferry services in Lisbon have changed their role within the transport system significantly in history. The ferry services historically fulfilled the role of connecting long distance rail (northern and southern Portuguese rail networks). This 'obligatory' role changed with the construction of the rail bridge across the River Tagus. The connection of the rail network thus created competition for the ferry services and also changed their role within the network to 'optional' rather than 'obligatory'.

The physical geography of the AML and the continuous extension of the city on the southern bank of the River Tagus have made ferry services one of the key travel options besides using rail or road transport on one of the two bridges.

In order to stay competitive with the competing travel modes the ferry transport operators embarked first on a technological strategy, by changing the structure of service supply, introducing high speed ferries and thus making the crossing time competitive with the other modes, and at the same time using the advantage of different crossing options. This technological strategy improved services and travel time substantially.

The redesign of ferry terminals with particular focus on improving the interconnection between the ferry services and other transport options is a strategy still under development. Particular emphasis is given to improving the interconnection with public transport systems and active travel modes, but also to improve the potential of ferry terminals as an entry point to the public transport system by creating park and ride facilities. The renovation and redesign is already showing effects in increasing passenger numbers on certain routes where the process has been concluded.

The implementation of integrated ticketing options (including multi-modal and combined ticket options) has been a gradual and expanding process in the AML since 1996. The ferry transport operators joined this development in 2005 and today various combined and multi-modal ticket options are available and further developed under the co-ordinating efforts of OTLIS (Transport Operators of the Lisbon Region).

There is high acceptability of combined and multi-modal tickets as these make up the biggest share of tickets used in the ferry services.

The expansion of this effort is particularly interesting as competing transport operators have agreed to use the OTLIS framework. New initiatives are aiming at stronger integration. Key success factors are the adoption of a smart card that fits the highly complex existing fare system and all networks. This includes the development of common interoperable specification and applications embedded in the smart card and in all equipment, thus building in full interoperability from the start. A further key success factor was the existence of a supra-operator organisation to co-ordinate issues in each market for the successful implementation of an intermodal system. The success of non-formalised frameworks of negotiation stands out between the state government and the private sector and between the central government and regional or local interests (often also represented by the private sector, or by the municipal authorities, in the absence of regional administrations).

While these efforts are positive and aim at including the further transport operators and regions in time, the existing fare system is still complex and not necessarily transparent to the user.

Multi-modal transport information platforms are available for the AML (TransporLIS) and also at national level (TransPOR) these offer a wide range of information and also allow for route calculation including intermodal options. However, at this point in time some errors in the calculation and precision of given multi-modal options are prevalent in the system. Therefore these tools are not 100% reliable.