VIAJEO PLUS

D5.3 – Innovative Public Transport solutions for City Mobility Weeks preliminary set-up

Author(s)	Michele Tozzi, Umberto Guida (UITP)			
Project	VIAJEO PLUS – International Coordination for Implementation of Innovative and Efficient Urban Mobility Solutions			
Date	*Contractual:*	M16	*Actual:*	M18
Project Coordinator	Yanying Li ERTICO – ITS Europe Tel: +32 2 400 07 37 E-mail: y.li@mail.ertico.com			

Abstract	This deliverable summarizes the outcomes of the selection - carried out in the frame of WP5 - of candidate best solutions to be promoted during the City Mobility Showcases in Europe, Brazil, China and Singapore. The set presented is not the final one, since additional solutions can be suggested by the Project partners and included in the selection process till the organization of the last City Mobility Showcase (planned by the end of 2015).
Keyword list	Public Transport, Urban Mobility, Innovative and Effective Solutions, Travel time, Real time Information, Accessibility, Transit - oriented city development.
Nature of deliverable	Report
Dissemination	Public[1]

Project financially supported by	
SEVENTH FRAMEWORK PROGRAMME	**European Commission** **DG Research**
Project number 60558/ FP7- SST.2013.3-2	

[1] This is either: Public, restricted to other programme participants, restricted to a group specified by the consortium, confidential

Document Control Sheet

Version history:

Version number	Date	Main author	Summary of changes
1.0	10/08/2014	Michele Tozzi	First working version
1.1	09/10/2014	Michele Tozzi	Consolidated version
1.2	16/10/2014	Paul Batty	Revised version of v1.1
1.2	17/10/2014	Monica Giannini	Revised version of v1.1
1.2	21/10/2014	Alessandro Santiago	Revised version of v1.1
1.2	21/10/2014	Fatma Betül Güney Akbiyik	Revised version of v1.1
1.3	27/10/2014	Michele Tozzi	Final version

Approval:

	Name	Date
Prepared	Michele Tozzi, Umberto Guida (UITP)	09/08/2014
Reviewed	Yanying Li (ERTICO)	20/10/2014
Authorised	Yanying Li (ERTICO)	29/10/2014

Circulation:

Recipient	Date of submission
EC	
VIAJEO PLUS Consortium	

Table of Contents

1. Executive Summary

D5.3 – *Innovative public transport solutions for City Mobility Weeks – preliminary set-up* provides the preliminary list of candidate best solutions selected to be promoted and demonstrated during the City Mobility Showcases planned in the frame of the Viajeo PLUS Project.

A specific methodology for the selection and the analysis of the candidate solutions have been developed in WP2 by UNEW and briefly summarized in this report for the sake of clarity.
The set of solution chosen and described in the following has been proposed by the WP5 partners together with some members of the expert group set up in the frame of WP5.

The 15 selected candidate solutions cover all the Project's regions (Europe, China, Latina America and Singapore) and deal with almost all the public transport modes available in urban settings (bus system, metro systems, suburban rails) as well as with private cars and soft modes (walking and cycling).

The set presented is not the final one, since additional solutions can be suggested by the Project partners and included in the selection process till the organization of the last City Mobility Showcase (planned by the end of 2015).

2. Introduction

2.1. Rationale

In the last few decades, sustainable transport solutions have been developed and implemented in many cities across the world. These solutions can be enabled by new technologies, particularly with the rapid development of Information and Communication Technologies (ICT), or are driven by policies, e.g. demand management and road charging, or are enabled through innovative concepts, design and planning, e.g. Bus Rapid Transit. These transport solutions not only improve quality of mobility and the efficiency of transport in a city, but they also significantly reduce local air pollution and greenhouse emissions, making a positive contribution to citizens' quality of life.

Viajeo PLUS is committed to identifying promising good practices implemented in Europe, Latin America, China and Singapore which deal with the following 5 topics:

- effective mobility management
- deployment of clean vehicle solutions
- innovative public transport solutions
- enabling infrastructure
- sustainable city logistics solutions,

and facilitate the sharing of such good practices through case studies, showcases and capacity building, fostering collaboration between the above mentioned regions and Mediterranean Partner Countries (MPC). The proposed methodological approach will lead to the identification and definition of deployment strategies focused on increasing the uptake of such innovative solutions in urban transport. ViajeoPLUS builds upon and extends the five-step approach (Figure 1) ERTICO has been implementing in International Cooperation projects (funded by the European Commission) in which it has been working on over the past few years.

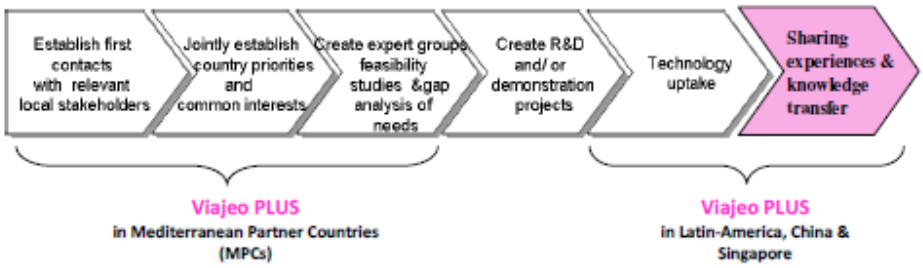


Figure 1 - ViajeoPLUS and the ERTICO International Cooperation Roadmap

Numerous previous EC projects, such as SIMBA and SIMBA II cover the first three steps of the approach, whilst Viajeo and Stadium are relevant R&D and demonstration projects. Building upon this experience, Viajeo PLUS aims to speed up the technological uptake, disseminate successful experiences and transfer knowledge on the global stage.

2.2. Project Goal and Overall Approach

The goal of Viajeo PLUS is to benchmark outstanding solutions for innovative and green urban mobility in Europe, Latin America, China and Singapore and subsequently facilitate the uptake of these solutions across different cities in these regions, and Mediterranean Partner Countries (MPCs).

To meet the Viajeo PLUS vision, successful experiences of implementing innovative urban mobility solutions across the world have been identified and shared. In the frame of the Project, the Viajeo PLUS consortium is currently working to develop a 'Virtual Solution Book' to provide a detailed description of these initiatives and implementation plans for greater uptake by cities intending to implement any of these solutions.

Viajeo PLUS will also facilitate "cross learning", i.e. a two-way approach introducing innovative urban mobility solutions in European cities to Latin American and Asian cities plus MPCs and vice versa, whereby European cities and industrial organisations will gather first-hand experience of mobility solutions on the global stage.

The cross learning process will also develop a comprehensive understanding of state-of the-art, R&D trends and policies in different regions, in order to empower European industry for future global competition and to support European cities in their role to meet sustainable urban mobility objectives established by the European Union. The cross learning process will also be extended to MPCs where European industry and researchers currently have limited knowledge and local contacts. Overall, Viajeo PLUS will significantly help European industry to strengthen its competiveness in the global markets.

Finally, Viajeo PLUS will prepare the foundations for future collaboration with global cities. It will define clear implementation strategies for the successful deployment of innovative and sustainable urban transport solutions. It will also prepare recommendations for the EC on future collaboration with other global regions.

3. Structure of the Report

This Deliverable presents the best practices collected by the members of WP5 on the topic Innovative Public Transport Solutions to be promoted during the City Mobility Showcases in Europe, Brazil, China and Singapore.

The document is structured as follows:

- Section 4 summarizes the general scope of WP5.
- Section 4.1 presents the methodology developed by UNEW for selecting the candidate best solutions. This methodology has been discussed by the Project Partners and described in D2.1 - Best Solution Selection Methodology.
- In Section 4.2 the complete set of preliminary solutions selected in WP5 are presented by region.

4. Contributors

Company	Names	Company Info
UITP	Michele TOZZI Umberto GUIDA Pauline BRUGE	International Association of Public Transport www.uitp.org
CRTM	Laura DELGADO	CONSORCIO REGIONAL DE TRANSPORTES DE MADRID www.crtm.es
IMM	F. Betül GÜNEY AKBIYIK	Istanbul Metropolitan Municipality www.ibb.gov.tr
IPT	Alessandro SANTIAGO DOS SANTOS	Instituto de pesquisas tecnologicas do estado de Sao Paulo SA
PLUSERVICE	Monica GIANNINI	Pluservice srl www.pluservice.net
Tsinghua University	Prof. YANG Xinmiao Zhao Qingyuan	Tsinghua University www.tsinghua.edu.cn
Shenzhen Metro	DONG Sanxi	Shenzhen Metro www.szmc.net
UNEW	Roberto Palacin Paul Batty	University of Newcastle upon Tyne

5. WP5 : Innovative PT Solutions

WP5 focuses on the topic "Innovative Public Transport Solutions" and is aimed at:

- Benchmarking current solutions relating to Innovative Public Transport in different cities following the methodology defined by WP2, then identifying the best solutions
- Collecting information on R&D and policy development related to Innovative Public Transport Solutions in Latin America, China, Singapore
- Assisting with the organisation of City Mobility Weeks
- Developing capacities for future research cooperation with Mediterranean Partner Countries (MPCs)
- Developing recommendations for deployment and identify needs for standardization
- Setting up a task force and operate it to support case studies and the development of recommendations.

This deliverable presents the outcomes of the selection of candidate best solutions as a preliminary set-up for inclusion in the Virtual Solutions Book and the City Mobility showcases.

5.1. Selection process of Candidate Best Solutions

A significant number of initiatives has already studied best practices affecting urban transport. In Viajeo PLUS a specific methodology has been defined by the Newcastle University in agreement with the consortium's partners (WP2 – *Technical Coordination, Methodology and Recommendations*), as a guideline to select promising solutions already implemented in urban areas in the Project's four regions (Europe, China, Latina America and Singapore).

According to the developed methodology, a candidate "best solution" must show a level of innovation and/or deliver a proven increase in effectiveness or efficiency of the PT system. More in detail, the selection methodology is based on the following criteria:

- Why the existing solution was originally implemented by the host location, to mainly identify the key drivers behind the implementation.
- How, why and when the solution was implemented. Information on the actual process developed in bringing a solution to fruition is needed to help potential adoption cities in identifying how such solutions could fit with on-going strategic plans. In this section the timescale involved in the initial planning stage and in the implementation stage is investigated together with the funding mechanism used and the degree of cooperation between different stakeholders required.
- Benefits of the solution, to provide the potential adoption cities, on one hand, with information about the solution's ability to deliver actual results and, on the other hand, to recognise any significant problem originally encountered and overcome by the host location.
- Interest of host location for participating in Viajeo PLUS activities and sharing, the consortium agreed that it is important to identify existing solutions which had a host location willing to share knowledge and participate in relevant activities. Conversely, it was suggested that there may be locations with

excellent examples of a given solution but, for any number of possible reasons, could not or would not be able to share their knowledge and experience. If this was the case, and the identified solution was thought to be a leading option in the project, then it was important to try and identify any other existing examples of the solution.

- Optional items for consideration. To make the solutions more attractive to potential adopters, when available further information have been collected, namely:
  - any targets set by the host location and to what extent such targets have been actually achieved;
  - figures and statistics on the uptake, usage or improvement of the PT system affected by the solution's implementation
  - end users' feedback.

For all the candidate solutions the above information have been collected through the Best Solutions Data Gathering Template (Annex 1) developed by the University of Newcastle.

The flow diagram for decisions on the ultimate set of solutions is shown in Figure 2. The overall process allowed for the reduction of the initial set of solutions to those suitable for inclusion in the Virtual solutions book and for demonstration during the city mobility showcases.

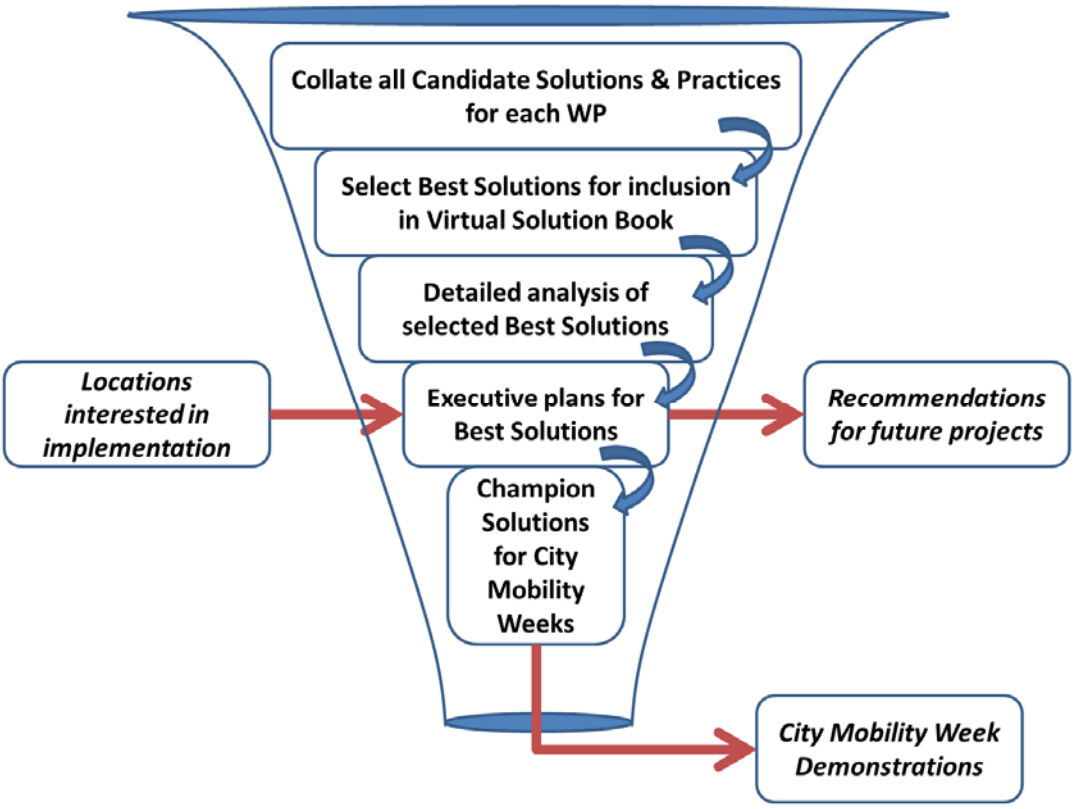


Figure 2 - Viajeo PLUS Flowline for Selecting Ultimate Set of Best Solutions

5.2. Candidate Best Solutions

In this section the set of preliminary solutions selected in WP5 are presented by Region. In total, 15 candidate solutions implemented in Europe, China, Latin America and Singapore have been considered to be discussed and/or demonstrated during the City Mobility Showcases. The complete list of solutions is shown in Table 1.

Name	*Implementation Area*
BIP Integrated Smart Ticketing	Piedmont Region (Italy)
Public Transport Interchanges Plan	Madrid (Spain)
Metrobus BRT System	Istanbul (Turkey)
Traffic Density Map	Istanbul (Turkey)
Gondola Lift system	Rio de Janeiro (Brazil)
Eco-Frota Programme	São Paulo (Brazil)
BRT for large events	Brazil
Intelligent ticketing systems in Brazilian PT	Brazil
Zaozhuang City BRT System	Shandong Province (China)
Combined Rail and Property Investment	Shenzhen (China)
Land Transport Master Plan	Singapore
Diversification of services	Singapore
Congestion charge	Singapore
MyTransport.sg	Singapore
Travel Smart	Singapore

Table 1 – Candidate best solutions selected in WP5

5.2.1. Europe

BIP Integrated Smart Ticketing (Piedmont Region, Italy)
In 2008 Piedmont Region (Regione Piemonte) started the Biglietto Integrato Piemonte (BIP) project (Integrated Ticket for Piedmont Region).
BIP is a region-wide integrated smart-ticketing, fleet monitoring and video surveillance system whose main objective is to develop a collective public transport system, improving accessibility through the introduction of an integrated regional ticket and fare integration. The new integrated approach aims at the interoperability among public transport operators involved, reduction of fraud, collection of ticketing and validation data to improve the quality of the public transport system, improve security on board of buses, rationalize the ticket sales network.
The project foresees several implementation phases during which the subsystems at provincial level and the central regional system will be implemented.

The BIP project involves over 100 transport operators, the retrofitting of 3400 buses and 400 train stations for a total budget of 50 Million euro.

The core innovation of the BIP system is a double level clearing house:

- CSR (Centro Servizi Regionale) is the Regional Central Clearing System
- Sub-clearing systems at provincial level manage apportionments within the provincial area

The entire system is work in progress and at this stage the central regional clearing house and 2 provincial systems have been implemented.
The BIP project represents an innovative case of Integrated Fare Management (IFM) with various innovative aspects at policy and technological level.

In 2009 the first step of the BIP project started with the provision contract for the Cuneo province BIP implementation. This was awarded to a venture formed by Pluservice and Thales, and initially required developing a thorough understanding of the fare policies and rules at regional level. The system was fully operative by March 2011, after assessment by Piedmont Region officials to ensure full compliance with regional interoperability standards. The total project budget was €5.4 million.

The first step required a high degree of co-operation between all involved stakeholders, including local and regional authorities agencies, 18 different transport providers including bike sharing (operating within the Cuneo province), 315 retailers and 25 depots throughout the territory. Uniquely, all 18 transport providers used one common control centre for all activities and processes regarding ticketing, monitoring and video-surveillance while maintaining their total autonomy in management of their own data and confidential information, to ensure confidentiality of specifications and data.

Figure 3 - BIP Contactles card (source: www.buscompany.it)

This system allows useful data to be acquired, relating to such characteristics as the frequency and occupancy of each journey, the locations of residence of each user and the punctuality of the service performed. Furthermore, this scheme has developed a stronger relationship between PT operators and users, and has led to a number of online tools to aid public transport usage, in the guise of web-based tools and as smartphone applications.

The Piedmont Region has launched also a special card for young people called PYoung card. This card is interoperable with the BIP card, but it integrates additional services related to museums, cinemas, libraries, marketing and incentives for young people.

Figure 4 - Pyou - BIP Contactles card (source: www.pyoucard.it)

Madrid Public Transport Interchanges Plan (Spain)

Transport interchange stations are a crucial part of the PT system, allowing travellers to make multi-leg trips with ease and comfort. In Madrid, the core of the transport system is the Madrid metro, which is complemented by the urban bus network. To ensure transfers were made as simple as possible to increase the quality of public transport journeys, the Madrid Interchange Plan was developed, the planning of which started in the mid-1990s. It consisted in the construction of 5 main interchanges in the nodes where the metropolitan bus lines terminals linked to the Circular metro line (Moncloa, Prinicipe Pio, Plaza Elíptica, Avenida de America an Plaza Castilla).

The process started in 1990, when there was a need of structuring the mobility in the territory and boost the potential of each mode to improve the system´s efficiency. At that time the end of the metropolitan bus lines arriving to Madrid city where spread in the surface, with no connection or few information about them. The need of concentration of bus terminals into one single point and its good connection with metro and other modes gave birth to the Madrid Transport Interchanges Plan.

This plan achieved an important improvement in the quality of the service, in the quality of the transfer and in the increase of the demand. The location in the city, integration with the public transport system and concentration of terminals are the three basic elements in the Plan of Transport Interchanges for suburban buses. These interchanges have the following functional characteristics:

- To use as point of confluence for radial buses lines that accede to the city of Madrid and are distributed by the city across the Metro network and of the urban buses network.
- To reduce the times of trip and to improve the quality of the service

- To create nodes that simplify the conditions of transfer: shorter time and distances when transferring between modes (either public or private, motorised or non-motorised).
- To reduce the costs of exploitation of the transport services allowing to increase the journey frequencies.

Figure 5 -Madrid Interchange Plan (source CRTM)

The project was funded through a 30-year concession, to cover the construction and operation of the infrastructure, where private companies recover their investment by collecting a fare from each bus passenger getting on or off at the interchange.
Cooperation between all relevant stakeholders (including the city council, the public transport authority and transport operators) was key to the success of the project.
The interchanges have achieved their main objectives, including reduced journey times and an improved quality of service. Two further main interchanges are to be built (Conde Casal and Legazpi), with continued work to improve the intermodality in smaller areas of the city set to continue.

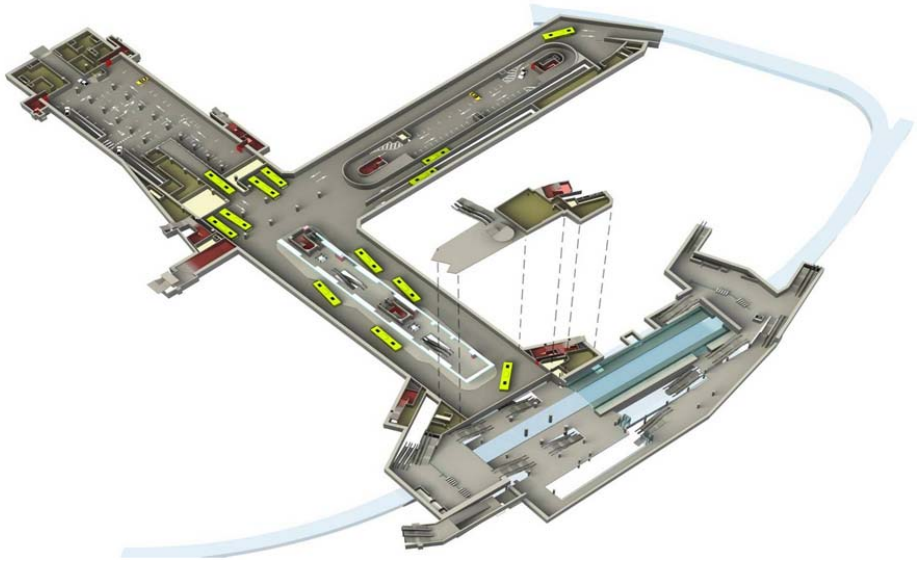


Figure 6 - Plaza Castilla interchange (source CRTM)

Istanbul Metrobus BRT System (Turkey)
ISTANBUL is one of the largest cities in Europe with a population of over 14 million people who generate over 20 million trips per day. More than half of these journeys are made using motor vehicles, with 21% by private cars, causing significant levels of congestion during peak times. Like other megacities, Istanbul has to meet the challenge of satisfying a rising demand for accessibility within a context of growing sustainability concerns.

Metrobus is a 24-hour BRT (Bus Rapid Transit) scheme, travelling from Beylikdüzü Tüyap in the west of the city to Söğütlüçeşme in the Anatolian area of the city. This 52km journey (constructed in four steps), which initially took 180 minutes, now takes an average of 100 minutes, with a frequency of 30 seconds. The buses utilise hybrid technology to help reducing emissions and improving energy efficiency. Daily ridership is approximately 800,000 – the system is highly popular as it provides a high frequency connection across Istanbul especially on the weather that doesn't allow using the waterway. Moreover, the integration with other transportation modes and the implementation of "distance based fare" promoted the usage of the system.

Figure 7 - Metrobus BRT System (source:web)

Numerous factors were considered during the conception phase of the Metrobus, including the current mobility patterns, future areas of growth within the city and hence future trip generation, which helped define the route of the Metrobus network. The funding for the scheme was provided by Istanbul Metropolitan Municipality

Istanbul Traffic Density Map (Turkey)
The traffic density map is a web-based map application that shows real time traffic density information, camera images and other important traffic information throughout the city.

The solution has been implemented in 2006 mainly to:

- increase the safety of roads for all pedestrians, passengers and drivers;
- provide a more accessible urban traffic;
- set up and operate an effective traffic monitoring system in terms of time and cost.

Users choose their Origin-Destination and receive for the selected route traffic images and traffic information (estimated travel time, average speed, weather data, sensor

points, and warnings about important accidents or road works). To answer the users' need to access to real time traffic informations via mobile devices, a dedicated mobile phone application has been developed**.** The average daily number of users is 100.000 (September, 2014).

Initial versions only presented data provided by the municipality, but in later versions data provided by other stakeholders is also used, which are being continuously added. Validated data from traffic management systems ensures car users are more aware of the current traffic situation, to allow for the increase in capacity across the network by more efficient route planning. At the same time, the data is used as input for development and future projects.

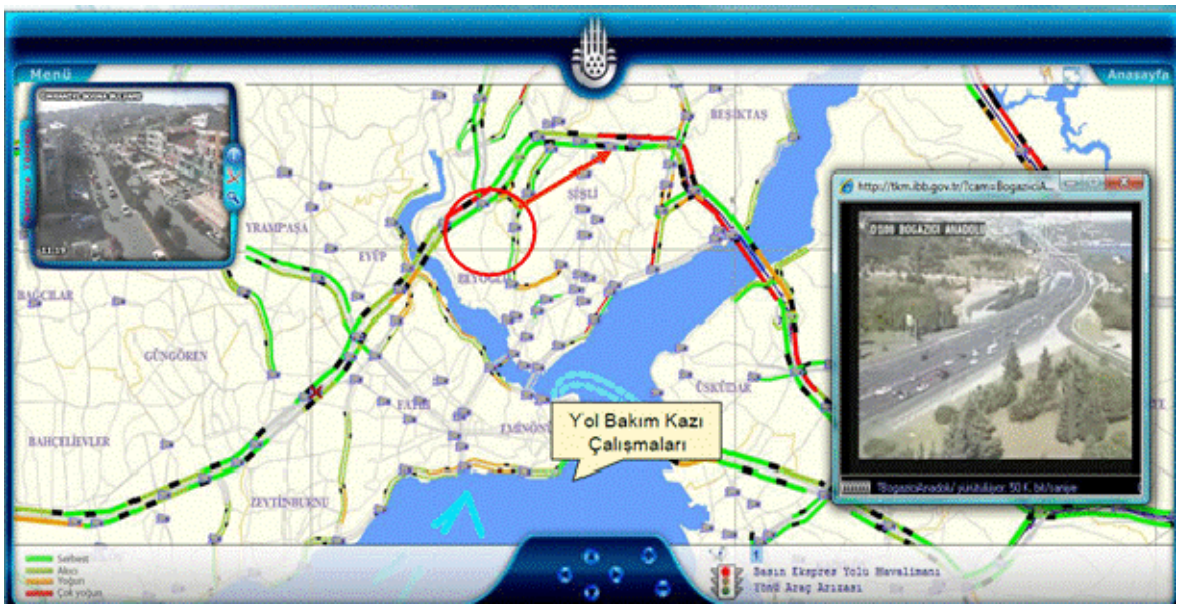


Figure 8 - Istanbul Traffic Density Map (source: web)

Expanding the network area by increasing data sources is being planned. However, as with all smartphone applications, due to the variety of phones and operating systems, it can take a long time to ensure compatibility across all platforms.

5.2.2. Latin America

Gondola Lift system (Rio de Janeiro, Brazil)
The gondola lift system is commonly used for tourist purposes, although the use of this system for public transportation purposes is an important innovation and brings several benefits to the inhabitants in cities where the topography favours such a solution. Gondola lift systems integrated into the city's public transport network provide quick and safe transportation for those who live in the neighbourhoods situated on mountainous regions of the city's suburbs. Such systems have been already implemented in Colombia, Venezuela, Brazil, Singapore and European countries.

In Rio de Janeiro a gondola lift system is operational and runs through the Complexo do Alemão connecting the residents of the neighbourhood to the city's rail network. In total the line measures 3.5km and includes 6 stations.

Figure 9 - Gondola lift System Complexo do Alemão (source: web)

The system appears to have social mandates similar to those implemented in Medellin and Caracas. Local residents can apply for a RioCard which grants them two free trips per day on the teleferico to be able to access the same jobs and opportunities as those living elsewhere within the city.
In Rio de Janeiro the solution was founded as part of the Brazilian infrastructure development plan known as the Growth Acceleration Program (PAC, in Portuguese).

Eco-Frota Programme (São Paulo, Brazil)
The "Program Ecofrota" had its origin linked to the objective of meeting the requirements of the Law 14.933/09 Climate Change in the City of São Paulo in June 2009. It recommends that the entire system of public transport in the city should operate with renewable fuel by 2018 and, from 2009, gradually reducing the use of fossil fuels by at least 10% each year.

The technologies to achieve this goal are varied, including: biodiesel, ethanol, sugar cane diesel, electricity powered engines, hydrogen, hybrids and battery technologies.
The diversity of technologies brings a number of advantages, such as better distribution of the energy matrix, further development of technologies, best option of choice due to the cost / benefit / use and, finally, lower costs due to competition.

Figure 10 - EcoFrota Programme (source: web)

The Programme was launched in February 2011 and by February 2012, the Ecofrota already had more than 1,600 buses, divided into 200 lines, which corresponded to 11% of the total fleet of the municipality (15,000 buses). During this period there was a 6.3% reduction in emissions of pollutants and a 6.7% in CO2 emissions The changes thus far in energy usage bring benefits to the city's economy, the quality of life of its inhabitants and the preservation of its environment.

BRT for large events (Brazil)

Cities often host large events, such as sport competitions, concerts, cultural festivals, demonstrations, religious pilgrimages and business conventions. Large events require major changes to the transport organisation of the host city, since the the existing transport infrastructure needs to cope with considerable additional traffic flows that are generally very intense and highly polarized.

For the FIFA World Cup in 2014, 9 of the 12 host cities (Belo Horizonte, Rio de Janeiro, Porto Alegre, Curitiba, Natal, Fortaleza, Recife, Salvador and Manaus) chose to introduce or further develop BRT systems to ensure a high capacity public transport service.

Bus Rapid Transit (BRT) is a modern transit system with the flexibility of buses, and the speed, comfort and reliability of rail and at a much lower implementation cost: 4 times lower than light rail and 20 times lower than an underground metro system. They are also able to implement in a much lower timescale.

The BRT systems already in place allow football fans much easier access to the stadia from the city centre; for example, in Belo Horizonte getting to the World Cup via BRT takes approximately 20 minutes, whereas travelling via car takes approximately 1 hour and 30 minutes. In Rio de Janeiro, two BRT corridors are already operational, with two more expected to be completed by the 2016 Olympic Games. These corridors will encircle the city and move 1.6 million passengers per day.

Figure 11 - The TransOeste BRT system in Rio de Janeiro (source: web)

Intelligent ticketing systems in Brazilian PT

The first initiative of ticketing system in Brazilian big cities dates back 1970. The new generation (smartcard contactless) started on 2000 in Salvador and Recife city. The

biggest case (Bilhete único) started in Sao Paulo Municipality around 2001. Nowadays, those core solutions are mature and cities and metropolitan areas are adding new features to improve security and governance. Figure 11 shows the generic model for ticketiing system used in Brazilian implementations.

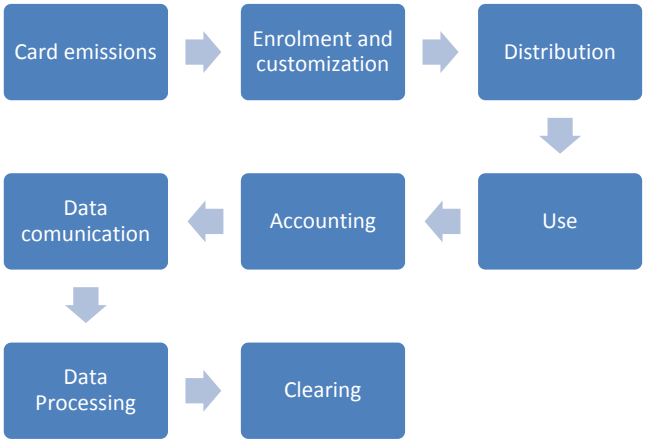


Figure 12 - Ticketing system model. Source: ITS Technical Report 8 from ANTP (2012)

Most common features in this models are:

- Multimodal Integrated System
- Flexible fare policies according to the user type, journey duration and transport modality
- Integration with parking lot
- Biometric technology for control of special cards (elderly / student)

For example, since 2006, the Bilhete Único is multimodal, and its ticketing system integrates bus, metro system (municipality) and CPTM (Trains for the metropolitan area). Regular users pay R$ 3.00 for up to four bus rides in a three-hour period. Boarding the rapid transit or the train costs R$ 3.00. An integration between systems allow for up to three bus rides and either a rapid transit or train ride in a three hour period for R$ 4.65. Students and teachers pay half price, while persons with disabilities and seniors have free access. Other modalities are available, as the monthly Bilhete Único.
Regarding parking lots, since 2009, the integration near the Metro stations allows users greater ease in shifts in São Paulo(E-Fácil). Upon access to the facility, a parking fee is debited and granted two trips on public transportation system. These trips can be used in Metro, CPTM or Municipal bus from São Paulo and are valid during the period in which the vehicle remains in the parking lot. The value debited allows the permanence of the car for up to 12 hours; after the 12 hours is charged an additional amount for every hour spent. This system has more than 16,000 readers and 18,963,000 cards.

Another interesting feature is the control for reducing illegal use of special cards for elderly and students, since those users are eligible for reduced fare. Biometric solutions identify the legal user for the card. For example, Ilhéus city (Bahia State) deployed facial recognition in 2012, and the results was 17% of 10,000 specials cards

were blocked due to illegal use[2]. Similar deployments are located in Fortaleza (220,000 cards), Limeira and Angra dos Reis.

Figure 13 - Facial recognition for ticketing system

Managers and operators have a tool to compare the proposed transaction with held, help analyze the discrepancies and guide in formulating improvements.

In summary, the electronic ticketing had a direct effect on the efficiency of the transport system and beneficial to all actors: managers, operators and users. However, undoubtedly, the pricing flexibility permits deriving the greatest benefit to users.

5.2.3. China

Zaozhuang City BRT System ((Shandong Province, China)

Zaozhuang is one of the first cities in China for planning and implememting BRT systems; Line B1 from Downtown Zaozhuang to Xuecheng was initially implemented on August 2nd, 2010. Today, the BRT lines in Zaozhuang have the longest distance among all the cities in China and have formed a network: 65km of dedicated BRT lanes and includes bus traffic signal prioritisation (133km in total), which has allowed a greater connectivity throughout the city. Besides, other lines are still under construction.

The construction of the first line (Line B1) was totally founded by the city government; from the second line, city government invested to design the lines and purchase the buses, and the district governments invested to the construction of the roads, station and supporting equipment.
The system has aided the development of the whole city through greater accessibility for citizens and a more enjoyable and easy to use system for tourists. However, there

[2] http://www.empresa1.com.br/en/index.php/cases/ilheus-controle-de-evasao-de-receitas-com-biometria-facial/

has been insufficient investment during the planning stages of the project, which has led to many BRT stations not having bicycle/car parking facilities.

Figure 14 - Zaozhuang City BRT System (source: web)

Combined Rail and Property Investment (Shenzhen, China)
In June 2008, Shenzhen Metro Group Co., Ltd. obtained the overhead land use rights for property development over QianHai Bay Depot, Metro Line 1, which launched Shenzhen's practice of "rail transit + property" development model.

The goal of such a model is to integrate the construction of PT systems with underground and aboveground land use development, maximising the social and economic benefits in metro construction and operation and making full use of the along-metro and over-metro regenerated land space. Moreover, the introducing of social capital to participate in metro construction and property development is of utmost importance in order to enhance the financing ability, establish the safe fund chain and guarantee a beneficial cycle of investment enterprise's sustainable development.

The main key drivers for the implementation can be summarised as follow:

- Previously, the financing model used by the government was burdensome to the government itself whilst also limiting the development of Shenzhen Metro.
- The great success of MTR in Hong Kongmade beneficial enlightenment to financing model innovation by Shenzhen Metro Group Co., Ltd.
- The Shenzhen's high prices of land and on housing made it suitable the implementation of Shenzhen Metro "rail transit + property" investment and financing model.

Shenzhen Metro financed the new metro project through bank loans, corporate bonds, medium-term notes and financial leasing. They designed the underground and aboveground space by combining metro and overhead property projects. Income from property development surrounding the metro systems is used to repay the loan and its interest for the metro construction. The scheme required collaboration between the Development & Reform Commission, the Urban Planning, Land & Resources Commission, the State-owned Assets Supervision & Administration Commission, the other relevant departments of the Shenzhen Municipal Government.

This "rail transit + property" development model has greatly reduced the pressure on the government's financial demand while intensively developing rail transit in Shenzhen City. It has also alleviated the shortage of land resources, expanded the space of urban development and stimulated economic growth along the new metro lines.

5.2.4. Singapore

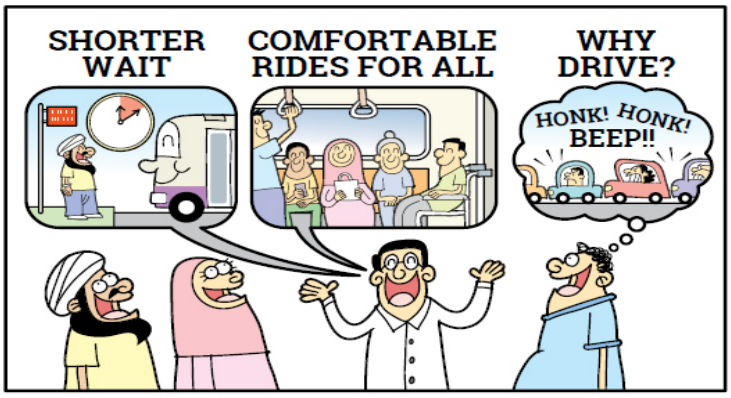
In 2015 Singapore will host one of the four City Mobility Showcases organized in the frame of Viajeo PLUS to show real examples of smart mobility systems, services or measures which have a great potential in promoting a sustainable urban development. Moreover the showcase will allow local stakeholders to share their experience in planning, operating and financing those systems with key representative of other cities.

5.3. The preliminary list of candidate solutions is reported in Table 2.

Land Transport Master Plan (2013)

Singapore is a city well known for its mobility master plan which is closely linked to the main urban development projects in the city. The mass transit system, including major bus lines, is used as the backbone for city development. In 2013 the Singapore Land Transport Authority (LTA) published the new Land Transport Master Plan that sets out its vision for land transport in Singapore for the next 20 years. This vision is that by 2030, Singapore will have:

- 8 in 10 households living within a 10 minute walk from a train station;
- 85% of public transport journeys (less than 20km) completed within 60 minutes; and
- 75% of all journeys in peak hours undertaken on public transport.



Diversification of services

Premium Bus Services (PBS) are bus services that offer more comfort versus other bus services or other forms of transport. They cater towards commuters who do not mind paying higher fares for a more comfortable and direct journey to their destinations.

Almost all Premium Bus Services concentrate on catering towards commuters heading to and from the Central Business District (CBD) during the morning and evening peak hours. The direct nature of Premium bus routes makes it more appealing than ordinary bus routes or taking a train, as passengers are assured of a seat onboard, plus it costs a lot less to travel by Premium bus than by taxi. Premium buses are operated by both public and private bus companies. Currently, a total of about 70 PBS operate from various major residential areas to the CBD (source: http://www.publictransport.sg/).

Congestion charge

Singapore has been one of the first cities worldwide to implement an effective congestion charge zone (1975), charging drivers a certain fee when entering the central business district during peak hours. The system improved during the years, from a low tech manpowered system to a high tech digital system. The government has now announced the introduction of a km based congestion charge using GPS and satellite based technology to track cars. This will allow authorities to charge on basis of real case use and control more accurately and effectively care usage and traffic in the city.

MyTransport.sg

MyTransport.SG is a one-stop portal providing information and eServices for all land transport users, commuters, motorist or even cyclist.

A mobile penetration rate reaching as high as 144% in 2010 and the corresponding rise of mobile surfing, in tandem with the increase of resident population, has created the need for new channels of disseminating timely traffic and transport information to the transport users. MyTransport.SG was designed with smartphones in mind to cater to a growing population of users who demand user-friendly information on the go. The main solutions developed include:

- A mobile platform with location-based service technology built-in to give public easy access to real-time public and private transport
- Easy-to-use search function to draw key transit and traffic information from multiple sources

▪ Location-sensing technology to inform commuters on facilities and transport points of interest nearby.
Travel Smart Travel Smart is a programme addressed to commuters and companies to influence travel behaviours, to shift travelling commuters to off-peak periods, encourage a switch to more sustainable modes of travel (e.g. public transport, car pooling, car sharing, walking and cycling) or reduce travel demand altogether. Travel Smart is based on the concept of travel planning, which is widely implemented by companies worldwide. Essentially, travel planning is a means of evaluating how the employees of an organisation currently travel to work, and during the day as part of their work. Based on the analysis of existing patterns and attitudes with regard to travel, an action plan for improved transport efficiency and sustainability is prepared. LTA is launching a new Travel Smart Network to intensify efforts and encourage more companies to implement measures such as flexi travel arrangements to support employees who may wish to travel during off-peak periods. For a start, LTA will partner companies with a staff strength of more than 200 employees in major employment centres located near MRT stations and that are willing to trial travel demand initiatives (source: http://www.lta.gov.sg).

Table 2 – Candidate Best Solutions - Singapore

6. Conclusion to Deliverable D5.3

This deliverable summarizes the outcomes of the selection of candidate best solutions to be promoted during the City Mobility Showcases in Europe, Brazil, China and Singapore. The set presented is not the final one, since additional solutions can be suggested by the Project partners and included in the selection process till the organization of the last City Mobility Showcase (planned by the end of 2015).

The 15 solutions chosen so far cover all the four Viajeo PLUS regions and are dealing with almost all the public transport systems available in urban settings, including bus, metro systems and suburban rails as well as with private cars and soft modes (walking and cycling). The relevance of the solutions analysed to the Project focus areas is detailed in Table 3.

	Project Focus Areas			
Candidate Solutions	Integrated network Management	Clean vehicle solutions	Innovative public transport solutions	Enabling infrastructure
BIP Integrated Smart Ticketing	X		X	
Public Transport Interchanges Plan			X	X
Metrobus BRT System		X	X	X
Traffic Density Map	X		X	
Gondola Lift system			X	X
Eco-Frota Programme		X	X	
BRT for large events			X	X
Intelligent ticketing systems in Brazilian PT	X		X	
Zaozhuang City BRT System			X	X
Combined Rail and Property Investment			X	X
Land Transport Master Plan	X		X	X
Diversification of services			X	
Congestion charge	X			X
MyTransport.sg	X		X	
Travel Smart			X	

Table 3 – Relevance of the solution to the Project focus areas

7. Annex 1

Best Solutions Data Gathering Template (v1)

Details Required – Please provide as much information as possible	
Name of solution/practice	
Brief description of solution/practice	
Relevant WP	5 – Innovative Public Transport Solutions
Where and when the solution/practice was initially implemented	
Key drivers/rationale behind implementation	
Timescales involved in initial planning stages	
Timescales involved in implementation stages	
What funding mechanism(s) were required for implementation	
Was this solution/practice implemented as a stand-alone initiative, or was it delivered as part of a wider package of solutions/practices?	
What degree of co-operation was required between different stakeholders? *(e.g. joint effort between individual departments within Government authorities; different transport providers collaborating as one etc.)*	
Main benefits to host location *(innovation, improvement in efficiencies etc.)*	
Any significant problems/issues to host location?	
What are the future plans of the host location for this solution/practice?	
Will host location be interested and willing to participate in the V+ knowledge sharing programme?	
Are there any other existing examples of the solution/practice which V+ should also	

consider?	
Will the solution/practice be demonstrable at one of the V+ City Mobility Weeks?	
Were there any targets set by the host location, and if so, were these achieved? ***(opt.)*** - If not, what was achieved and are there any indications as to why this might be?	
Any available facts/figures/statistics etc. on uptake, usage, improvements ***(opt.)***	
End user feedback on solution/practice ***(opt.)***	
Other key points/issues that need to be considered in the final selection process ***(opt.)***	